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# Royal Commission on Agriculture in India.

## VOLUME XIV.

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## Appendix to the Report.



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## PREFACES TO THE PROVINCIAL VOLUMES OF EVIDENCE.

### ASSAM

#### 1. GENERAL FEATURES.

The Province of Assam, ceded to the British by the Burmese in 1826, was administered as part of Bengal until 1874 when it was formed into a separate province under a Chief Commissioner. It was merged into Eastern Bengal in 1905 but again became a separate province in 1912. Including the area occupied by the hill tribes under the political surveillance of its Government, it covers some 77,000 square miles. The area under regular administration is about 53,000 square miles; thus the territory to which this introduction refers is nearly as large as England and Wales. The present population is about 8,500,000. The inhabitants are very unequally distributed; the density of the population in some tracts may be as much as 500, in others there are no more than 7 persons to the square mile. About eighty-eight per cent of the people are dependent on agriculture, and there are only six towns with more than 10,000 inhabitants, of which the largest is Shillong with a population of about 17,000.

Roughly conical in outline, its northern base bedded on the Himalayan mountains which rise steeply and to great heights above the broad valley of the Brahmaputra, its southern apex the Lushai Hills, wedged between the Chittagong hills of Bengal and the Chin hills of Burma, the Province of Assam, though the smallest in cultivated area and in population among the major provinces of India, may claim to rival any of them in interest. It includes within its borders a variety of peoples and languages, and a wealth of natural gifts that make an immediate appeal to the traveller, and dispose him to accept, despite the objections of philologists, the conventional derivation of the name of the province from the Sanskrit *asamā* or 'peerless'.

Whence come the people of Assam? Its large immigrant population makes this a sufficiently complicated subject for modern census commissioners to unravel. Whence they came in the far distant past, none can say. Immigration into its fertile valleys is much older than history. The earliest people to whom legend permits the use of the term "immigrant" were Aryan priests and warriors; and they found, settled along the banks of the Brahmaputra, tribes of Mongolian affinity, and in the Surma Valley people of Dravidian type. Here, in this north-eastern corner of India, centuries before any written records were made, three of the world's great races met and fused. When, in the seventh century of the Christian era, a Chinese traveller first provides a description of the people, he tells of a small but sturdy dark yellow race, fierce of countenance, but upright and—be it noted—studious, learning the tenets of a new religion from the Brahmins. In the centuries that followed, Koch kings from the west, Thoms from the east, Muhammadans from the south and Himalayan hill

men from the north struggled for the possession of these fertile valleys. The broad alluvial plains of the Brahmaputra and Surma preserve ruined records of these struggles. The character and customs of the people themselves disclose their diverse origin. But yet throughout these troubled centuries there existed human sanctuaries within Assam. The thick jungles of the lower hills repelled invaders, and in the uplands there dwelt apart tribes who have preserved their purity of race and have retained their ancient languages and customs. To the Sema Nagas, who visited Jorhat so that their food difficulties might be explained to the Commission, the seventh century description of the Chinese traveller could have been applied with little need for modification. They had not embraced the Hindu religion but otherwise, they were, as were their predecessors thirteen centuries before, small of stature, sturdy, dark yellow skinned and fierce of countenance. They gave no indications of being studious (indeed schools were regarded by them as somewhat of an infliction) but they were certainly intelligent. To the ethnologist Assam offers a field of enquiry unequalled elsewhere in India, and it is a fortunate circumstance that the province has found competent students of this subject. The daily programme of a Royal Commission, though it offers no opportunity for independent study of the peoples met with, permits some realisation of the opportunities that exist for others, just as it permits glimpses of the wonderful natural setting in which these types of mankind have been evolved. And this natural setting may occupy our attention for a moment, for the agriculture of Assam is everywhere conditioned by the physical features of the country.

The province is entered from the north-west by the Eastern Bengal Railway. The line traverses the administrative districts of Goalpara and Kamrup which are bounded on the north by the Himalayan State of Bhutan and on the south by the Brahmaputra. These two districts occupy a wide alluvial plain intersected by rivers of large size which debouching from the mountains and crossing the plain, lose themselves in the giant Brahmaputra. But the Eastern Bengal Railway follows an artificial avenue; the natural gateway to Assam is reached on the Brahmaputra. No Indian province, not the western presidency with its Bombay harbour, modern sea gateway to India, not the North-West Frontier Province, with its rugged Khyber, ancient land gateway to the plains of Hindustan, can raise higher anticipations in the traveller approaching for the first time than does Assam when entered by the river gateway by which its former capital of Gauhati and its present capital of Shillong are reached. The visitor, who quits the railway to cross the Brahmaputra while the sun struggles for supremacy with the mists on the river and sets his course for the blue Khasi Hills, serrated in outline and rising tier upon tier above the river's southern bank, enters this province by a gateway that compels expectation. Nor is he disappointed. Assam cannot, and does not, boast of its road system, but few roads can traverse so varied a country as does the road which the traveller may now follow southwards for 100 miles. From the Brahmaputra plain it rises to over 5,000 feet; from its sta-

near Gauhati, with a rainfall of between 60 to 70 inches, it leads to Cherrapunji, where falls varying from 350 to 900 inches have been recorded. The alluvium of the valley is soon exchanged for the rugged gneiss of the hill sides, and when the hill is climbed, the highway for many miles traverses a changing upland country showing harsh metamorphosed sandstones, castellated trap rocks, rich, easily weathered limestones and surface seams of coal, each of which confers characteristic features on the landscape and vegetation.

## 2. NATURAL DIVISIONS.

This Gauhati-Cherrapunji road may conveniently form the starting point for a reference to the natural divisions of Assam, for it begins in the Brahmaputra Valley, one great natural division; in its course, it traverses a district typical of the many hill tracts of the province, and it terminates on the edge of an escarpment, from which one may see, 4,000 feet below, the great Surma Valley, which stretches for miles in a north-easterly and south-westerly direction and forms the third of the great natural divisions of Assam. The valley of the Brahmaputra is an alluvial plain running roughly east and west for a distance of 450 miles, and covering an area of nearly 25,000 square miles. On the north, it is shut in by the Himalayas and, on the south, by the elevated plateau known as the Assam Range. In general, the valley is about fifty miles broad, but, here and there, spurs from the Assam Range run right down to the river, and about the centre of the valley there is the isolated block of the Mikir Hills. It is only in such places where the hills force the river to keep to a definite channel that the traveller up the Brahmaputra can see any signs of towns or large villages. Elsewhere, the river, by constantly changing its course, has appropriated to itself a belt of land extending perhaps to as much as half a dozen miles on either side of the stream. This *chhipari* land, as it is called, is in the main a wilderness of marsh and grassy jungle, interspersed with patches of mustard and broadcast paddy brought under fluctuating cultivation by immigrants from eastern Bengal. Further inland, on either side of the river, there is a belt of low-lying level in which long-stemmed paddy is grown. Thereafter comes a zone of higher and more thickly populated land, where there is still much grassy jungle and forest but where there is also a considerable amount of permanent cultivation, mainly transplanted-rice. Further inland, towards the hills on either side, the population becomes more scanty and cultivation begins to give way to extensive forests and grass savannahs. Transplanted rice is grown on fields irrigated from hill streams, and tea on the high flats and hill slopes.

The valley of the Surma, at any rate that part of it which falls within the Province of Assam, is small in comparison with that of the Brahmaputra, covering only 7,247 square miles. To the north, and rising in an abrupt wall 4,000 feet high, stands the plateau of the Khasi and Jaintia Hills, and further east the angular and serrated range of the Barrail or "Great Dyke." Enclosing the valley on its eastern border are the parallel ridges of the mountains of Manipur, while, on the south, similar parallel ridges belonging to the same system



extend from the Lushai Hills, and from the Tippera Hills in Bengal, for some distance into the plain. The physical conformation of the Surma Valley differs in many respects from that of the Brahmaputra Valley. The reason is that throughout its course in Assam, the Brahmaputra is a comparatively swift moving river flowing between sandy banks which it is continually making and unmaking. The rate of flow of the Surma and its tributaries is slow by comparison and they deposit large quantities of silt every year, with the result that the highest lands in the delta proper lie nearest the river banks and it is there that the soil is most fertile and the population densest. From the river banks the surface slopes backward into great hollows or *haors*, many of which hold some water all the year round and all of which become extensive lakes during the flood season. So low, indeed, is the general level of the western Sylhet portion of the valley that the flood water reaches right up to the foot of the hill ranges and the only dry spots are the artificially raised sites on the river margins, on which the villages are built. Conditions are less unfavourable in eastern Sylhet and Cachar where the level monotony of the plain is broken by ridges which extend inwards from the hills to the south, and where *tilas* (small isolated hills) are a common feature. In the low-lying tracts, the main crop is *aman* (long-stemmed) rice; *boro* (spring rice) is grown, in the dry season, on terraced land at the water-edge of the *haors*; on the *tilas*, or elevated portions, are found not only the village sites but fruit gardens and tea plantations.

The third natural division of the province consists of the Hill Tracts. These do not form one great compact block as does each of the other two natural divisions, but the various tracts are sufficiently similar in their characteristics to be considered together. The northern portion consists of the Assam Range interposed between the two valleys, and the Mikir Hills which project from that range into the Brahmaputra Valley. In the south there are the Lushai Hills and the ridges which run northwards from these and from Tippera into the Surma Valley. The central portion of the Assam Range consists of a table land at an elevation of nearly 6,000 feet, but on the east and west it becomes broken up into sharply serrated ridges where hill and valley alike are covered with forests. Great stretches of the central plateau consist of undulating grassy hills with occasional groves of pine and oak. The Lushai Hills in the south, which divide Burma from Assam and run at right angles to the Assam range, harbour a scanty population, being for the most part covered with dense bamboo jungle and rank undergrowth.

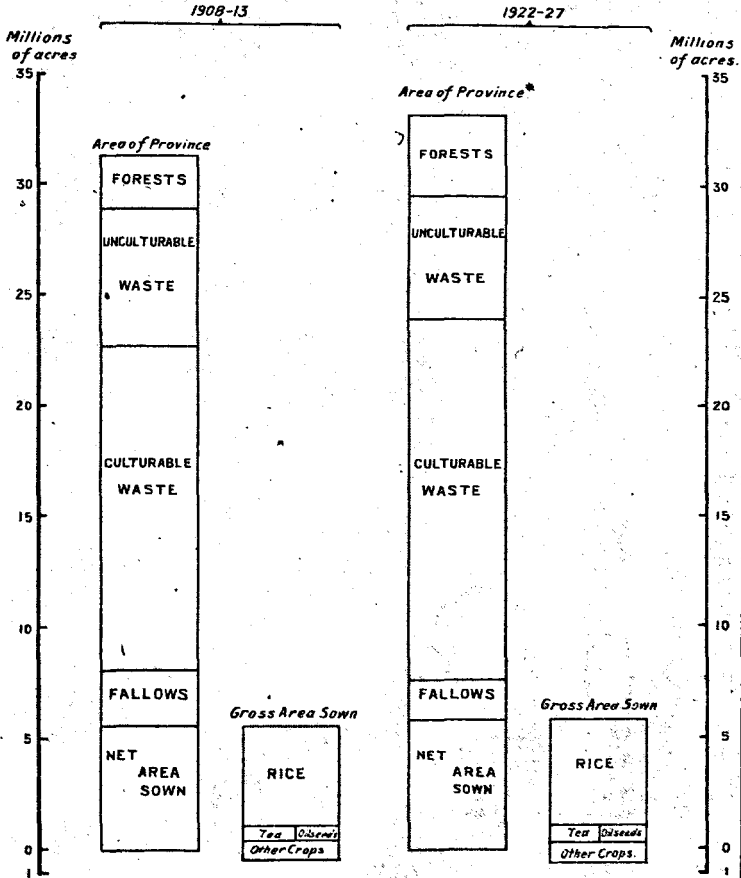
Most of the cultivation in the Hill Tracts is done on the *jhum* system. The jungle is cleared with axe and fire, and the seed of hill rice, millets, cotton, potatoes and vegetables is dibbled in among the ashes. A plot is cultivated for two or three years in succession, then allowed to relapse into jungle again for a period varying from three to eight or ten years or more, according to whether land is scarce or plentiful. The best farmers are the Khasis who grow their rice in terraced and carefully irrigated fields in the shallow valleys which are common in the central

# ASSAM

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS

(5 Year Averages)

Note. The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.



\* Difference in acreage between 1908-13 and 1922-27 is due to revision in 1922-23 by the Director of Surveys.

plateau. Terracing for rice is also resorted to by the Angami Nagas under much more difficult conditions which require stone retaining walls instead of earthen dykes, and to a limited extent, also, by the Sema Nagas and other tribes. Other interesting features of Khasi cultivation are the introduction and rapid expansion of potato growing and the betel and orange groves and pineapple gardens which flourish on the hills and slopes facing Sylhet.

The total area classed as 'culturable' in the province, excluding States and tribal areas, is 23,543,871 acres, out of which only 6,014,317 acres were under crop in 1926-27. The areas under the principal crops in that year were—

Rice	..	..	..	..	4,685,228 acres.
Tea	..	..	..	..	420,664 "
Fruits, vegetables and root crops	..	..	..	..	472,050 "
Rape and mustard	..	..	..	..	365,361 "
Jute	..	..	..	..	186,058 "
Sugarcane	..	..	..	..	40,037 "

Tea occupies a very important place in the agriculture of Assam, not only on account of the area grown, but also because of the high value of the product. It is cultivated in all the plains districts, but more especially in the Sibsagar, Lakhimpur and Darrang districts in the Assam Valley, and Sylhet and Cachar in the Surma Valley. Altogether there are over 900 gardens, the outturn from which amounted to 240 million pounds of black tea in 1926, the average outturn per acre being 602 pounds valued, roughly, at 13 annas per pound. The gardens give employment to about half a million permanent labourers who are practically all immigrants from other parts of India. Investigations in connection with the cultivation of tea and its preparation for market are carried out by the Scientific Department of the Indian Tea Association at Tocklai. Towards the cost of this work Government make a contribution of Rs. 10,000 annually.

As may be inferred from its geographical position and natural features, the climate of Assam offers many contrasts. As a whole, coolness and high humidity are the features which distinguish it among Indian climates. Thus, for example, tea plantations, which in south India are found at elevations of 3,500 feet and over, are found on the plains of Assam a few hundred feet above sea level, and at the elevation which the tea plant requires in the south, the varieties of potatoes usually grown in Britain and many other plants common in English gardens flourish in Assam.

The range in rainfall is much more marked than in temperature; it varies from comparatively light falls in parts of the plains to the world's record for average rainfall of about 450 inches at Cherrapunji.

### 3. PROVINCIAL INCOME AND EXPENDITURE.

The introduction of the Reforms brought about a complete change in the financial relations between the central and provincial governments. Provincial governments had, up to that time, no separate revenues of their own, their resources being mainly obtained from a share of divided heads

of revenue and from lump assignments from Imperial revenues. With the advent of the Reforms, however, definite sources of revenue were allocated to the provincial governments and there was a complete separation between the revenues and expenditure of the central and provincial governments. In addition, the expenditure on leave allowances and pensions incurred in England, which used to be met by the central Government, became a charge on the provincial governments.

The province started, in 1921-22, with an opening balance of Rs. 32 lakhs and it was anticipated that the prosperity that followed the war would continue and that the year would close with a balance of Rs. 43 lakhs. The wave of depression, however, which swept not only over India but over the world in that year severely affected the finances of the province with the result that the closing balance was only Rs. 6½ lakhs. This serious state of affairs continued during the year 1922-23 and it was necessary for the province to borrow a sum of Rs. 13 lakhs from the Government of India to enable it to meet obligatory expenditure. The strictest economy was enforced and, in 1923-24, retrenchment in every possible direction effected recurring savings to the extent of Rs. 11 lakhs. The Legislative Council also agreed, in 1922-23, to the raising of the fees under the Stamp and Court Fees Acts for a period of three years, bringing in an extra revenue of Rs. 3 lakhs per annum. These Acts were extended for a further period of three years which ends on the 30th April, 1928, and the Council will shortly be asked to make the enhanced fees permanent. Registration fees were also permanently raised in 1923 and resulted in an increase of half a lakh of rupees per annum. The subvention from the central Government towards the cost of maintenance of the Assam Rifles was increased from Rs. 14 to Rs. 16 lakhs in 1923-24, with retrospective effect from 1921-22. The opening of the Goalpara tram line also had an appreciable effect on the forest revenue.

All these measures enabled the province to tide over the crisis and, with the turn of the tide in 1924-25, it was possible to repay the loan taken from the central Government and to make a beginning on the expansion of activities in the nation building departments. In 1925-26, the temporary remission of Rs. 6 lakhs in the contribution to the central Government enabled further allotments to be made for expenditure on transferred departments. Remission of the full contribution of Rs. 15 lakhs in 1927-28 (of which Rs. 8 lakhs was permanent), coupled with an increase in land revenue as a result of resettlement operations in certain districts, has enabled further progress to be made and has also permitted the gradual restoration of the economies effected in 1923-24. From 1928-29 the provincial contribution has been finally and completely remitted.

**Assam**

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**REVENUE AND EXPENDITURE CHARGED  
TO REVENUE**

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## GOVERNMENT

(Figures are in  
Revenue and Expenditure

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue .. .. .	96	92	1,03	1,05	1,07	1,07
Excise .. .. .	60	54	60	66	74	72
Stamps .. .. .	15	18	20	21	22	23½
Forests .. .. .	13	17	20	25	30	31½
Other heads .. .. .	5	3	6	7	8	7
Railways .. .. .	-0½	..	..	..	..	..
Irrigation .. .. .	..	..	..	..	..	..
Interest Receipts .. .. .	0½	1	1	1	1	1
<b>Civil Administration—</b>						
Administration of Justice .. .. .	1	2	2	2	2	2
Jails and Convict Settlements .. .. .	1	1	1	1	1	1
Police .. .. .	1	3	1	3	2	2
Education .. .. .	2	2	2	2½	2	2½
Medical .. .. .	..	..	..	0½	..	..
Public Health .. .. .	1	1	1	0½	1	1
Agriculture (including Co-operation and Veterinary) .. .. .	..	..	..	..	..	..
Industries .. .. .	..	..	..	..	..	..
Other departments .. .. .	0½	..	2	..	1	..
Civil Works .. .. .	3	4½	4	5½	4½	4½
Miscellaneous .. .. .	1½	1	3	5	3½	3½
Miscellaneous adjustments between Central and Provincial Governments .. .. .	..	..	..	0½	..	..
<b>Total, Revenue Receipts ..</b>	<b>2,00</b>	<b>1,99½</b>	<b>2,26</b>	<b>2,45½</b>	<b>2,59</b>	<b>2,58½</b>

*Capital Receipts*

<i>Capital Receipts</i>						
Revenue Surplus .. .. .	..	..	21	30	22	0½
Famine Insurance Fund .. .. .	..	..	..	..	..	..
Loans and advances by Provincial Governments .. .. .	2	4	4	5	1	1½
Loans between Central and Provincial Governments .. .. .	..	13	..	..	..	..
Advances from Provincial Loans Fund .. .. .	..	..	..	..	..	..
<b>Total, Capital Receipts ..</b>	<b>2</b>	<b>17</b>	<b>25</b>	<b>35</b>	<b>23</b>	<b>2</b>
Opening Balance .. .. .	32	6½	..	23	44	65
<b>Total ..</b>	<b>34</b>	<b>23½</b>	<b>25</b>	<b>58</b>	<b>67</b>	<b>67</b>

OF ASSAM  
lakhs of rupees)  
charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
Direct Demands on the Revenue—						
Land Revenue .. .. .	13	15	16	16	17	18
Forests .. .. .	10	11	11	14	15	14
Other heads .. .. .	5	4	5	4	17	13½
Capital outlay on Forests .. .. .	..	..	..	..	1	1
Railways .. .. .	1½	1	1	1	1	0½
Irrigation—Revenue Account .. .. .	1½	0½	1	1	1	1
Irrigation—Capital Account charged to Revenue .. .. .	..	..	..	..	..	..
Debt Services Interest .. .. .	-0½	-0½	1	-1	-1	-1
Civil Administration—						
General Administration .. .. .	28	27	28	26	27	27½
Administration of Justice .. .. .	7	9	8	9	9	9
Jails and Convict Settlements .. .. .	5	5	5	4	4	5
Police .. .. .	29	31	18	22	24	26
Education .. .. .	23½	23	23	24	25	27
Medical .. .. .	10	10	10	10	11	11½
Public Health .. .. .	6½	5	5	5	10	10
Agriculture (including Co-operation and Veterinary) .. .. .	5	4	4	4	5	5
Industries .. .. .	1	1	1	1	1	1½
Other departments .. .. .	1	2	..	2	2	1½
Civil Works .. .. .	43	41	38	38	40	50
Miscellaneous .. .. .	16	16½	15	20½	19	22
Miscellaneous adjustments between Central and Provincial Governments .. .. .	..	..	..	..	..	..
Provincial Contribution .. .. .	15	15	15	15	9	15
Assignments to the Central Government .. .. .	3	..	..	..	..	..
<b>Total, Expenditure charged to Revenue ..</b>	<b>2,23½</b>	<b>2,20½</b>	<b>2,05</b>	<b>2,15½</b>	<b>2,37</b>	<b>2,58</b>

and Expenditure

<i>Capital Expenditure</i>						
Revenue Deficit .. .. .	23½	21	..	..	..	..
Forest, Irrigation, and other Capital outlay not charged to Revenue .. .. .	..	1½	1	1	..	2
Famine Insurance Fund .. .. .	..	..	..	..	..	..
Loans and advances by Provincial Governments .. .. .	4	1	1	1	2	1½
Loans between Central and Provincial Governments .. .. .	..	..	..	12	..	..
Provincial Loans Fund .. .. .	..	..	..	..	..	..
<b>Total, Capital Expenditure ..</b>	<b>27½</b>	<b>23½</b>	<b>2</b>	<b>14</b>	<b>2</b>	<b>3½</b>
<b>Closing Balance ..</b>	<b>6½</b>	<b>..</b>	<b>23</b>	<b>44</b>	<b>65</b>	<b>63½</b>
<b>Total ..</b>	<b>34</b>	<b>23½</b>	<b>25</b>	<b>58</b>	<b>67</b>	<b>67</b>

#### 4. REVENUE ADMINISTRATION AND LAND RECORDS.

It is a difficult matter within the limits of space here permissible to convey to the reader any useful account of the land revenue systems which history and natural features have imposed on successive generations of administrators in Assam. In general, the earlier collectors of revenue were faced with the problem of getting what they could from any particular locality; and the arrangements they made were of a kind which left their successors much scope for ingenuity in giving the revenue administration some degree of system and uniformity in its modes of assessment and methods of collection. Sometimes, indeed, those successors were left no choice; for, following the Bengal lead, permanent settlements had been effected at an early stage of British occupation. Thus, in the important district of Goalpara, about two-thirds of the land was permanently settled by the representatives of the East India Company for a sum of Rs. 11,411 annually; which works out at less than one rupee per 100 acres. The foundation for this bargain was laid by the Moghuls who, being unable to subdue the district, were content to take what was offered and payment was made in kind. "Kind" was converted into "cash" by the British about 1793, at the figure above mentioned. Moghul revenue collectors were more successful in the rich and populous district of Sylhet. Here, towards the end of the sixteenth century, they are said to have derived a revenue of about Rs. 1½ lakhs, and when a permanent settlement was made some two centuries later, their British successors fixed a payment of Rs. 3¼ lakhs on about 1,350,000 acres of land, or Rs. 24 per 100 acres.

In Cachar, the basis of the early settlements had been laid down by the Kachari Rajas who, whatever the principles were on which they ruled, believed in communism between those from whom they extracted revenue. Occupiers of land were grouped territorially into communities or *khels* having nothing in common in race or religion, but sharing an unlimited liability to contribute to the sum due from their *khel* until the Raja's demand was satisfied. The *khel* system too was taken over by the British, and revenue continued to be levied from communities until the end of the nineteenth century, when the land was classified in accordance with modern methods.

Natural conditions, like history, raised difficult questions for the early settlement officers of Assam. It was not merely that the soil varied as it does in other Indian provinces, but, in the Brahmaputra Valley, there was much good culturable land lying waste so that the peasant dissatisfied with his acres, or his land tax, could easily abandon his holding and go in search of better conditions elsewhere. Thus, when land had been surveyed and the assessment fixed, it by no means followed that a village, or group of villages, would yield their estimated revenue even in good years, for a substantial percentage of the area included as cultivated might be relinquished. Again, in the hilly districts, occupied largely by the tribes practising *jhum* cultivation and shifting from place to place at intervals of a few years, special and varying methods of raising land revenue were called for.



A century's experience has now been codified in the Fourth (1921) Edition of the Assam Land Revenue Manual, which sets out the law governing the subject. The Manual contains the "Assam Land and Revenue Regulation, 1886," the rules made under the Regulation for settlement, survey, registration of title and other matters engaging the attention of revenue officers; and also the "Assam Local Rates Regulation, 1879" defining the measures to be taken for raising local rates and meeting expenses incurred for the prevention and relief of famine in different parts of the province.

Outside the permanently settled and hill districts, the ordinary Assamese ryot holds on an annual tenure or a decennial lease. The lease confers a right to possession on re-settlement and a heritable and transferable title; the tenant is not bound to retain possession for the term of his lease, but may relinquish at any time on giving the prescribed notice to the local revenue officer. The annual tenant has in theory no right to retain his land beyond the year for which he has taken it, but, in practice, so long as he pays his taxes he is not disturbed. A cultivator may enter on, and cultivate, any unoccupied waste land without notice, provided he pays the revenue demand; and, if he makes an application for the waste, he can secure a title to possession after a fresh settlement of the village has been made. In some districts, the practice of entering on waste land is very common and much of the time of local revenue officers is spent in surveying newly reclaimed land and issuing leases to applicants for possession.

Early in the present century, the system of revenue settlement common in many other parts of India was introduced into Assam and the quality of the land held by a cultivator was taken into account in fixing his land revenue. These revised settlements are now in progress. This system took the place of a more summary system under which land was merely classified under the three heads, homsteads, transplanted rice lands and other lands.

In the late "thirties" of the nineteenth century, the revenue authorities in Assam were called upon to deal with a land question of a novel kind. The discovery that good tea could be grown in the province led to applications for land by companies and private planters. Special rules, the first of which were issued in 1838, were framed for those desiring to take up the new industry. At first, grants of land were offered in the Brahmaputra Valley on condition that one-fourth of the area taken up should remain revenue-free in perpetuity; the remaining three-fourths became subject to revenue after from five to twenty years according to the amount of reclamation called for. In 1854, these rules underwent some modification and they were extended to the Surma Valley; but soon afterwards, in 1862, new regulations provided for the acquisition of land by tea planters in fee-simple, and land was sold free of revenue demand at rates varying from Rs. 2-8 to Rs. 10 per acre. Advantage of this offer was taken by most of those engaged in tea cultivation and about 330,000 acres became private property, free from the future demands of the revenue officer. In 1876, the rules were again altered and those requiring land for tea are

now charged Re. 1 per acre for the concession of a 30-year lease. For two years, the land is held free of revenue and thereafter the rates rise to 8 annas per acre in the eleventh and Re. 1 in the twenty-first year. After the lease expires, a reassessment is made.

In the Brahmaputra Valley, the special terms above referred to were intended for persons engaging in the tea industry, and land could only be acquired for tea if it was not needed for growing food crops; but in Cachar, waste land could be acquired on similar special terms for ordinary cultivation. The rules governing the concessions varied, but leases for from twenty to thirty years, with freedom from revenue for two or three years, were usual.

Throughout the hill districts of Assam, the revenue is not assessed on the quantity of land, but on each house occupied. A usual rate is Rs. 2 to Rs. 3 per house.

Outside the hill districts, the province is divided into two commissioners' divisions for revenue, as for other administrative purposes. The populous Surma Valley is composed of two, and the Assam Valley of six, districts, each in charge of a Deputy Commissioner with the duties of the Collector and Magistrate of other provinces; and, as elsewhere, the Deputy Commissioner is assisted by members of the Indian and Provincial civil services. Outside the civil services there is, in the temporarily settled districts, a group of men occupying an intermediate position, in that they are not regularly salaried officers, but are paid as revenue collectors on a commission basis. They are known as *mauzadars*; each has charge of a *mauza*, or small group of villages. To the people they represent the Government, to the Government the people. They are a survival of an old form of agency for revenue collection. Originally the *mauzadar* was a petty revenue farmer, who contracted to pay over the revenue due by his *mauza*; so long as he paid up a fixed sum, he could keep the balance of the money he extracted for himself. This was obviously an undesirable method of revenue collection, and it was replaced by a system under which an annual settlement was made with the *mauzadar* and he was paid by a commission sufficiently liberal to satisfy him and to cover his bad debts.

Some years ago, an attempt was made to abolish the *mauzadar* system, and to substitute salaried tahsildars responsible for revenue collection in groups of *mauzas* forming a tahsil. But under Assamese conditions, it was found that this ordinary Indian method was a doubtful benefit, and *mauzadars* have been restored in some of the areas from which they had been displaced by salaried officers.

The appointment and dismissal of *mauzadars* rest with the Deputy Commissioner of the district, subject to the Commissioner's approval. On the death of a *mauzadar*, the claims of members of his family to the succession are first considered, and a son, if he has the requisite qualifications of character and education, is appointed. If no member of the family is suitable, some other person of the same race as the majority of the population of the *mauza* is chosen; for it is important that this officer should be a man of the people. As a rule, the *mauzadar* is required to reside in

his *mauza*. Apart from the collection of revenue, he is entrusted with numerous duties of the kind performed by naib-tahsildars elsewhere; such as the supervision of village headmen, the submission of weekly crop reports and of monthly vital statistics. He must also report persons who allow their cattle to trespass, or who encroach on roadside lands, must receive applications for waste land, issue forest permits and assist in assessing income-tax. He is thus not merely a revenue farmer, but a responsible local person entrusted with the charge and welfare of his *mauza*, and paid by results when he produces the proceeds of revenue collections. The *mauzadar* on the plains corresponds to the petty chiefs, characteristic, under both ancient and modern administrations, of the hills of Assam.

In five of the districts of the Upper Brahmaputra Valley, there are village headmen, as in most Indian villages. In Assam, they are known as *gaonburas*: they are the "elders and spokesmen" of their people, and they are expected to act as leaders in carrying out works for local benefit. The repairing of wells, the fencing of public tanks, the maintenance of rights of way, the condition of the village school room, are all matters for the *gaonbura*. He has also the oversight of affairs that his fellow-villagers may regard as benefiting the Government rather than the village, for he must assist the *mauzadar* to collect revenues, and he helps the police by reporting when criminal matters crop up. For these duties he is entitled to some remission on his own land revenue, but the maximum remission is Rs. 8; so that the village elder of Assam must look to the dignity of his office, rather than to the direct emoluments, for his reward.

*Land Records and Survey.*—For the purpose of land records and survey the province may be divided into three sections:

- (1) The hill districts;
- (2) The temporarily settled areas;
- (3) The permanently settled areas.

In the hill districts, the rights in land have not generally reached a stage which requires a cadastral survey and no such survey has as yet been undertaken.

In the temporarily settled areas, the survey of cultivated lands is practically complete and, as cultivation spreads in these areas, the cadastral survey keeps pace with the extension.

No survey of the permanently settled areas has, as yet, been made. Power exists under section 27 of the Assam Land and Revenue Regulation for the recovery from proprietors and landholders of the cost of survey and of erecting and repairing boundary marks. But the main object of such a survey is to prepare a record of rights and no power at present exists for the recovery from the proprietors and landholders of the cost of preparing the record. An experimental survey conducted in the district of Sylhet, between 1914 and 1918, showed that the cost of preparing a general record of rights would impose an unduly heavy burden on

provincial revenues. An attempt to obtain the necessary power to recover the cost from the proprietors and landholders was made but the Legislative Council rejected the measure.

### 5. THE CULTIVATOR.

The total population of the British Territory of Assam in 1921 was 7,606,230 of whom 7,428,085, or 97·7 per cent, who lived in 30,957 villages, were classed as rural; the remainder of the people lived in 28 towns, most of them of small size. Only thirteen of these towns had a population exceeding 5,000. Conditions vary widely within the three natural divisions. In the Brahmaputra Valley, the most densely populated district is Kamrup with 197 persons to the square mile, whilst, in the district of Balipara, only seven persons per square mile are found. The density of population in the Surma Valley is thrice that in the Brahmaputra. In the district of Sylhet there are 472, and, in the plains part of the Cachar district, 269 persons to the square mile.

The most densely populated area in the province is the subdivision of Habiganj in the district of Sylhet with 545 persons to the square mile.

The hill tracts are sparsely and unevenly peopled; only at the headquarters of the administration in Shillong, which has 17,700 inhabitants, is there any considerable density of population.

As contrasted with the state of affairs in most parts of India, the boundaries of Assamese villages are often ill-defined. Detached hamlets and cottages are a common feature.

The wealth of racial admixture which has gone to the formation of the present day cultivators of the plains of Assam, favoured as the country is by good soils, and in most parts by a reasonably good climate for crop growing, should, by a process of natural selection, have thrown up groups of husbandmen who might have been expected to compete in skill with the Arains and Jats of the Punjab or the Kunbis of Gujarat. But Assamese history has not been of a kind that stimulated the peasants of the plains. Even when they satisfied the demands of their Rajas, their crops were never secure from the attention of the black-mailers of the hills; and British protection has not long enough been available to allow of the emergence of agricultural talent, unless indeed it be among the small caste of Baruis or betel vine growers of the Surma Valley.

Apart from race and history, two circumstances may be noted as explaining the lack of agricultural achievement. In the Upper Brahmaputra Valley, land is, or was until recently, abundant, and communications are poor. Until tea gardens provided a local market, there was little stimulus to enterprise. A cultivator grew what was required to feed his household and to pay the revenue collector; and if it is asked "what more was required?" the answer is that he neglected to provide for his cattle, as he might have done; for he was not faced with the great difficulty in finding food for them that confronted the peasants of Lower Bengal. The second circumstance

is one over which the cultivator himself has no control. The people of the submontane tract of the Goalpara district, known as the Duars, work in a notably unhealthy tract where vitality is low. The cultivators of the Surma Valley, too, experience a peculiarly relaxing climate; and they at least can claim that under difficult circumstances they do contrive to grow reasonably good crops of rice.

The hills of Assam are occupied by races many of whom are not, and do not aspire to be, cultivators; but these hillmen, when they do settle down to crop-growing, show enterprise and skill. Potato cultivation is carried on extensively by the Khasis, and they show much intelligence in laying out and preparing the land for this crop in places, however difficult of access, where the rock has a fair covering of soil.

At the census of 1921, slightly under half a million people, or 6·2 per cent of the total population, were shown as literate, that is, as being able to write a letter and read the answer to it. The proportion of literates is low compared with that in the neighbouring provinces of Burma and Bengal, but the percentage compares favourably with the figure of 4·7 recorded at the previous census. General education is dealt with in the section on that subject.

## 6. THE AGRICULTURAL DEPARTMENT.

The history of the "Agricultural Department in Assam" dates back to 1882. In the early days, the department was concerned mainly with the organisation and maintenance of village land records but it made at least one solid contribution to agriculture by starting an investigation which ultimately led to the introduction of exotic potatoes in the Khasi Hills. That other lines of investigation failed to produce any very abiding result is not surprising in view of the fact that the department had neither any experimental farm of its own, nor any agricultural expert to plan and supervise the experiments. A graduate in agriculture was appointed Assistant Director in 1897 and the Upper Shillong experimental farm was opened in the same year. Land records, however, continued to be the main concern of the department until 1907 when, as a result of the constitution of the new province of Eastern Bengal and Assam, a separate Department of Agriculture was created with a civilian Director of its own. Between 1907 and 1911 several experts were recruited so that, at the latter date, the staff consisted of two deputy directors, a fibre expert, a chemist, a botanist, three superintendents of agriculture, an entomological collector and a mycological collector. The rapid progress made during these years met with a serious check as a result of the annulment of the partition of Bengal and the reconstitution of the Province of Assam in 1912. Along with the districts which were handed back to Bengal went the economic botanist, the fibre expert, the three superintendents of agriculture and the two collectors, and the department was again combined with that of Land Records. Between 1912 and 1921, however, two Imperial Service officers and a number of subordinates were added to the cadre and several stations were opened—an experimental fruit garden at La Chaumiere, a rice farm at Karimganj

and a sugarcane farm in North Kamrup. The sugarcane farm was given up in 1920 and a like fate overtook the fruit garden in 1921. In 1922, the Department of Agriculture was, for the second time, separated from that of Land Records and placed with the departments of Industries and Co-operative Societies under one Director.

What was described as a minimum scheme for the development of the department was submitted, in 1921, by the then Director of Agriculture, and received the general approval of Government, whose intention it was to carry it out over a period of five years subject to the provision of funds by the Legislative Council. The scheme provided for a considerable expansion of staff of all grades and for the opening of several new stations, and would have entailed an expenditure of Rs. 5.5 lakhs as capital cost and Rs. 3.90 lakhs recurring. Unfortunately, a period of financial stringency supervened, with the result that only a fraction of the expansion originally contemplated has been carried out. Twenty-six non-gazetted assistants have been added since 1923, one rice farm was opened in the Upper Assam Valley in 1923, and a cattle breeding farm was established in the same locality in 1927; but meanwhile the two Imperial officers had left the service. The average net expenditure on the department is about two lakhs of rupees, or one per cent of the total provincial expenditure. The present gazetted staff consists of a deputy director, an economic botanist and three superintendents; in the non-gazetted grade there are two botanical assistants, one entomological assistant, one chemical assistant, one mycological assistant, sixteen agricultural inspectors, sixty demonstrators, one fruit inspector and four farm managers. For experimental work there are four stations, at Upper Shillong, Jorhat, Titabar and Karimganj; and three depôts have been established for seed distribution, at Gauhati, Jorhat and Sylhet. A Development Board has recently been constituted, the membership of which consists of two officers from each of the Agricultural, Co-operative and Industries departments and of non-officials elected by the Legislative Council; its function is to advise with regard to the activities of the three departments.

The planning and the control of the experimental work on the farms is shared by the economic botanist and the deputy director, the former being responsible for the botanical experiments and the latter for general experiments and farm management. At the Karimganj rice experimental farm, a considerable amount of work has been done on pure line selection with the object of evolving improved strains suitable to the locality, and work on cross-breeding, root systems, water requirements, transpiration and seed testing is in progress. Six improved varieties have been distributed, *viz.*, the *Georgesail*, *Indrasail*, the *latisail* and *murali aus*, *basmati* (fine *aus*) and *birpak* (coarse *asra*). Several hundreds of types are at present under observation, including varieties from other parts of India and from abroad.

The Titabar rice station was opened in 1923 to provide for the needs of the Assam Valley. Here again several hundreds of types have been isolated but the work has not yet reached the stage at which seed can be given out for distribution.

Work on sugarcane has been in progress at the Jorhat farm since 1906. It includes the acclimatisation, testing and selection of varieties, local and exotic, and manurial and rotational experiments. As a result, several varieties of cane have been ascertained to be suited to the needs of the local cultivators, *e.g.*, B 147, B 376, B 3412, J 33 (a), D 74 and Co 9. Manurial experiments have indicated the advisability of correcting acidity in high land by the application of lime or wood ash, and the beneficial effects of ploughing in *dhaincha* and cowpea as green manure.

One of the principal objects with which the Upper Shillong farm was started in 1897 was the introduction of superior varieties of potatoes. The extent to which this object has been achieved is abundantly evident in the wide areas which are now under exotic potatoes in the higher plateau of the Khasi Hills. The crop has brought with it many problems which the department is patiently trying to solve; the problem of storage; of combating 'blight'; of eliminating varieties that are susceptible to disease; manurial problems and methods of cultivation; whether to plant whole or cut, large or small, potatoes, etc. The success of the introduction of potato cultivation has brought with it its own peculiar responsibilities. Few crops degenerate so quickly and so completely when left to themselves as does the potato, and, in important potato growing countries, research is ever on the alert to evolve new varieties from seed to replace varieties which are becoming played out. It, therefore, seems worthy of notice that some of the sixteen varieties now being grown for distribution on the Upper Shillong farm were imported as long ago as 1912 and that more than one of the varieties which have achieved a wide distribution, *e.g.*, the Up-to-date, have already faded into comparative obscurity in England. The department is, however, continuing to import new varieties for trial.

Horticultural work is in the charge of the recently appointed fruit inspector. He is now trying to introduce methods of manuring orange orchards, irrigating them during the winter and pruning the trees, besides teaching better methods of picking and packing the fruits for long distance transit by rail. There are several government orchards scattered throughout the province. Orange seedlings and pine-apple suckers are distributed every year from the departmental seed depôts.

A small herd of cattle is maintained at the Upper Shillong farm. Some twenty years ago, the herd consisted of three groups—a group of somewhat obscure origin but believed to be a cross between an English and an Indian breed and known as the Patna-Taylor breed, a second group which was a cross between the above-named and the Khasia cattle, and a third group which consisted of crosses between the Patna-Taylor and the Bhutia cattle. The second and third groups have been discarded. The few bulls produced by the twenty cows which now constitute the herd meet with a ready sale for breeding purposes. On the new breeding farm at Khanapara, a herd of pure Sindhi cattle has been established, and a herd of cows from Sonapur in Bihar is being crossed with bulls imported from Rangpur. A few Thar Parkar cows and bulls have also recently been imported.

For district work the province is split up into three divisions, each in the charge of a superintendent, who has a staff of inspectors and demonstrators under him. The superintendents' charges consist of the Upper Assam Valley, the Lower Assam Valley and the Surma Valley. Demonstration work in the Khasi and Jaintia Hills is directly under the deputy director of agriculture, who also exercises general supervision over the superintendents' charges. The department has no demonstration farms, all the demonstrations being done on the cultivator's own fields. Each demonstrator concentrates his energies on five or six groups of villages, each group consisting of one or more villages covering an area of two to three square miles. The main subjects of demonstration are the improved varieties of rice, potatoes, jute and sugarcane, the introduction, where suitable, of crops like pulses, groundnut, *arhar*, cotton, and fodder crops, conservation of the manurial resources of the village, and terracing in the hills and upland valleys. To the actual demonstrations in the field and village are added lectures and exhibitions, and work through honorary correspondents and co-operative societies. Distribution of improved seed, as well as implements and manures is done through the three permanent depôts, and temporary depôts at different centres fed by these permanent depôts, which purchase their stocks out of an annual grant allotted by Government. On an average, the depôts between them distribute 1,150 *maunds* of improved paddy, 2,500 *maunds* of seed potatoes, 100 *maunds* of jute seeds, one lakh of sugarcane setts, 200 cane mills and about 2,000 *maunds* of bonemeal each year. The latter is in considerable demand as a manure for rice in the intensively cultivated terraced fields in the Khasi and Jaintia Hills.

There is no agricultural college in the province. Youths who have been chosen for eventual appointment as demonstrators in the department are given stipends and sent for two years' training to one or other of the experimental farms. Students destined for the Subordinate Agricultural Service are sent to agricultural colleges in other provinces, the local Government concerned being paid a fixed sum for each student trained.

## 7. THE VETERINARY DEPARTMENT.

The Veterinary Department in Assam is under the administrative control of the Superintendent who is the only Imperial Service officer in the cadre. His staff consists, at present, of four inspectors and sixty-one veterinary assistants in the Subordinate Service, all of whom are graduates of the Bengal Veterinary College. Of veterinary institutions there are six under the control of the department, three hospitals and three dispensaries. Each of these institutions is in the charge of an assistant. The rest of the assistants excluding staff and reserve assistants (about twelve in number), are lent to local boards and are in charge of local board dispensaries of which there are thirty-nine. Financially, the boards are responsible for two-thirds of the assistants' pay, for their travelling allowances, and for the dispensary buildings. Government pay the remainder of the salary, supply instruments and make a



small contribution towards the cost of medicines. Transfers of assistants are arranged by the Superintendent after consulting the wishes of the boards concerned.

The three inspectors in administrative charge of circles are entirely under the control of the Superintendent. Their duties are to supervise the work of the assistants, to make returns to the Superintendent, and to inspect under the Glanders and Farcy Act. Full use is made of the veterinary hospitals and dispensaries by cultivators who are fortunate enough to live within reach of them but such institutions are few and far between and can obviously only deal with but a small part of the work waiting to be done. The vast majority of the cultivators have to depend for veterinary advice on the chance visits of the touring assistants. How heavy are the odds against a cultivator in the Surma Valley getting his sick animal treated can be gauged from the fact that an assistant in that locality is responsible, on the average, for about 137,000 cattle scattered over an area of 1,489 square miles.

The main work of the department is concerned with the combating of contagious diseases by inoculating the healthy, and isolating and treating the sick, animals, treating ordinary ailments at assistants' headquarters, village to village inspections, and lectures to cattle owners. During the year 1926-27, the assistants visited 10,000 villages, performed 42,000 inoculations and 1,600 castrations, and treated 28,000 contagious and 50,000 non-contagious cases. Rinderpest in cattle, which, in each of the years 1925-26 and 1926-27, carried off more than 30,000 animals (more than half the total deaths among all kinds of animals from all contagious diseases), is the most serious problem with which the department has to contend.

Laboratory work consists in the examination of suspected material for contagious diseases and parasitic infection. No staff is available for systematic experimental research but investigations in the treatment of diseases are made as opportunity arises.

Selected students who aspire to enter the department as veterinary assistants are given a stipend of Rs. 20 a month for the three years' course and sent to the Bengal Veterinary College for training. At present, four to six stipends are granted annually by Government. Some difficulty has been experienced in getting the right type of students to come forward but it is expected that the recent slight increase in the initial pay of assistants will improve matters. Stipendiaries are bound by contract to serve in the department for a period of five years after completing their studies.

## 8. IRRIGATION.

There are no government irrigation works. In the valleys, more damage is done by floods than by lack of water. On the hill slopes, the cultivators, following traditional methods and often displaying great ingenuity, irrigate their rice land terraces from the numerous small streams. The only assistance rendered by Government is to the Sema

Nagas who are being encouraged to exchange shifting or *jhum* cultivation for settled cultivation. So far, two tribesmen have been trained as instructors and are teaching about six villages the art of constructing irrigated terraces for rice cultivation.

### 9. FORESTRY IN RELATION TO AGRICULTURE.

Of the total area of the province, nearly twenty-seven per cent (20,738 square miles) was under forest in 1927. There are two main classes of forests, *viz.*, reserved forests which have been legally constituted as permanent sources of forest produce, or for other economic reasons, and the unclassified State forests which include all unoccupied government waste lands. In addition to these, there is a small but increasing class consisting of tracts which have been reserved as village forests for the provision of the ordinary petty requirements of the people. The distribution between the three classes is as follows:—

	Sq. Miles.
Reserved forests .. .. .	6,011
Unclassed State forests .. .. .	14,675
Village forests .. .. .	52

In the year 1926-27, 4,101 square miles of forest were closed, and 14,998 square miles were open, to grazing to all animals and 1,587 square miles to all animals except browsers. But, as extensive grazing grounds are available outside the forests, there is little demand for grazing within the forests. Cultivators' cattle are admitted on various terms—at full rates, privileged rates, by right under settlement, and free during the pleasure of Government. Under all four categories combined, the total number of cows, bullocks and buffaloes admitted was less than 28,000. Although, in certain parts, fuel and timber for local use are obtainable only at a high cost, there is no general dearth of timber for agricultural purposes. All persons who hold land direct from Government are allowed to remove from unclassified forests, free of charge, inferior kinds of timber and other forest produce sufficient for their own requirements. The chief minor products removable under permit are bamboos, canes, reeds and thatching grass, the value of such products removed under free grant in 1926-27 being 2½ lakhs of rupees. Of direct importance to agriculture, too, is the large amount of timber used by the fourteen sawmills engaged in the manufacture of tea chests, which absorb more than two million cubic feet of timber annually.

The formation of village forests represents an attempt at providing for villages the permanent supply of their forest requirements (fuel and building materials) near at hand. Whether the scheme is going to be a success or not, it is yet too early to say. That hopes are entertained for it, is evident from the fact that new areas are being added yearly, but the Conservator of Forests is of the opinion that the importance of proper management is not yet fully appreciated by the average villager and that more importance is likely to be attached to immediate needs than to the demands of the future.

## 10. GENERAL EDUCATION.

The total expenditure on education in Assam was Rs. 43·84 lakhs in 1926-27 as compared with Rs. 32·7 lakhs in 1920-21 and Rs. 25·6 lakhs in 1916-17. Of the total expenditure in 1926-27, 58 per cent was met from provincial revenues, 13 per cent from local and municipal funds, 17 per cent from fees and the balance, 12 per cent, from subscriptions and other sources. In 1916-17, provincial revenues supplied only 39 per cent of the expenditure whilst local and municipal funds supplied as much as 30 per cent.

The total number of male scholars at recognised institutions in 1926-27 was 235,742, of whom 183,650 were attending primary schools. Taking the primary school age as from 5 to 10 years and using the 1921 census for that age-period, the proportion of boys of primary school-age attending primary schools of all kinds in 1927 was 28·9 per cent.

The total of the female scholars at recognised institutions in 1926-27 was 34,691, of whom 30,025 were attending primary schools. Calculated in the same way as for male scholars, the proportion of girls of primary school-age attending primary schools in 1927 was 4·84 per cent.

The notable feature of the female education in Assam is that half of the total scholars are receiving their education in schools for boys.

In addition, 17,572 boys and 615 girls were attending unrecognised institutions.

The following Table gives further particulars regarding male education in recognised educational institutions in the province :—

Kind and number of institutions	Number of pupils	Percentage at each kind of institution	Cost per pupil
3 Arts Colleges ..	1,040	0·41	Rs. 340·8
1 Professional College ..	91	0·04	200·4
45 High Schools ..	15,299	6·06	46·5
300 Middle Schools ..	31,013	12·29	13·7
4,377 Primary Schools ..	199,903	79·19	5·1
155 Special Schools ..	5,074	2·01	35·6
<b>4,881 Total ..</b>	<b>252,420</b>	<b>100·0</b>	<b>10·7</b>

A compulsory Primary Education Act was passed in 1927 under which local authorities may submit schemes for compulsory education in their areas. As the Act was passed so recently as last year, there has been no time to permit of schemes being submitted. The view of the Director of Public Instruction, in the evidence which he gave before us, was that compulsion might be introduced in very limited areas, if local bodies could obtain financial assistance from provincial revenues, but that for the mass of the people the incidental expenses of clothes and school books would be a burden.

There is provision in the province for training the teachers required for primary and middle schools. Teachers for high schools receive their training in Bengal. It has not been found possible to make any official provision for adult education. Night schools for men have been started by the Social Service League and other agencies and assistance has been given by Government.

As the percentage (4·8) of girls of school-going age actually at primary schools shows, female education has as yet made little progress. In the Khasi Hills female education is, thanks to missionary efforts, more advanced than in the plains. The Director of Public Instruction was able to tell us that, though opinion moves very slowly on the subject, yet it does move in the direction of providing education for girls. Ten years ago there was no high school for girls, whereas now there are five such schools, in which, in 1927, over 1,000 pupils were enrolled.

Higher and secondary education for boys is but little developed and there has so far been no attempt to give an agricultural bias to it by providing agricultural classes with farms or school gardens attached. But, in a recent revision of the middle school curriculum, provision was made for various optional courses, of which agriculture would be one, to be instituted if and when a demand arose.

Assam has a special problem in bringing education within reach of the tribes in the Khasi and Jaintia Hills, and the Naga, Garo, Lushai and other hill tracts. Considerable progress has been made in the Khasi and Jaintia and Lushai Hills. Among the Nagas, also, a number of schools have been established, particularly in the Angami country. Luzeku Sema who gave evidence before the Commission for the Sema Nagas, for whom one school only has so far been opened, no doubt correctly represented the general view of his people in regard to education when, in reply to a question, he said "some boys would like to learn when they are young, and the parents are quite ready to give them education, but during the years of education they have to feed them without getting any return from them, so that people are not very keen about it." In 1926-27, 2,401 boys were receiving primary, and 79 boys secondary, education in government schools in the Naga Hills; this represented an increase of 114·3 per cent over the number of pupils in 1921-22.

## 11. CO-OPERATION.

Although the co-operative movement in Assam began with the constitution of Eastern Bengal and Assam as a separate province in 1905, little headway was made till 1919, when the staff under the Registrar of Co-operative Societies was strengthened. The need for the movement was as great in this province as anywhere else in India. Agriculturists in Assam have always depended on traders and moneylenders, whether local or Marwari, for providing them with the credit they require for agricultural and other purposes. The loans, however, which they get from this source are usually obtained on very hard terms, the rate of interest being seldom less than 25 per cent and, in some cases, being as

high as 60 per cent per annum. Long-term credit is obtained only on mortgage security, and the borrower also incurs substantial loss by being compelled to sell his produce through the moneylender.

Attempts to improve the financial condition of cultivators by the formation of co-operative societies began to be made in 1905. The societies formed were credit societies, and development until now has been almost entirely on the credit side of the movement. At the end of March, 1919, the province had 333 agricultural credit societies with a membership of 11,465 and a working capital of Rs. 5 lakhs. To finance these societies there were 15 central banks with a working capital of Rs. 4½ lakhs. By the end of March, 1927, the number of agricultural societies went up to 998; the membership to 42,500; and the working capital to Rs. 18½ lakhs. Of the working capital, Rs. 78,000 formed the share capital, Rs. 1½ lakhs was held on deposit from members, Rs. 1½ lakhs on deposit from non-members, while Rs. 10½ lakhs were borrowed from co-operative banks or societies; the reserve fund amounted to Rs. 3½ lakhs. To finance the primary societies there was the Provincial Bank with a capital of Rs. 2½ lakhs, and 15 central banks with a capital of Rs. 10½ lakhs. During the year societies of all descriptions advanced to their members loans amounting to Rs. 11½ lakhs. The usual rate of interest on the loans was 15½ per cent. Although this rate is high, it compares favourably with the average rate on loans given by moneylenders, which is 36 per cent.

An attempt is now being made to organise the supply of long-term capital to agriculturists; and a start has been made by the formation of one land mortgage bank in Kamrup and another in Sylhet. There are, at present, no separate purchase societies but the Agricultural Department distributes seed and implements through the medium of existing credit societies. The transactions of this kind amounted to Rs. 17,000 last year. Attempts to organise co-operative sale have so far not met with much success. But a jute sale society has recently been formed.

The department is controlled by the Registrar who also holds the post of Director of Agriculture and Industries. For the co-operative work, he has under him one assistant registrar, a provincial auditor, and eleven inspectors. The audit of societies is done by these government-paid inspectors who do both the work of inspection and of audit. Fees for audit are recovered from societies. The department is assisted by honorary organisers, of whom there are twelve at present. These help the official staff in doing propaganda and in popularising the movement.

A recent development has been the formation of the Surma Valley Co-operative Organisation Society which was registered under the Act in 1925-26, and has as its objects the spread of the principles of co-operation and the carrying on of rural development work in the Surma Valley, in the direction of improved sanitation, medical aid, and promotion of rural industries through the medium of co-operative organisations. Though of recent origin, it has, by the publication of a quarterly journal and in other ways, done much to stimulate interest in the movement.

It will be seen, both from the membership and the capital involved, that the movement has so far only touched the fringe of the problem of rural development in Assam.

## 12. COMMUNICATIONS AND MARKETING.

Although there has been a considerable extension of roads and railways in recent years, the chief means of communication in the province is still its waterways. The Brahmaputra is navigable by large passenger and freight steamers as far up as Dibrugarh; large steamers can get as far up the Surma River as Silchar in the rainy season and to Fenchuganj in the cold weather. Small feeder steamers ply on the larger tributaries in both valleys, while ordinary country boats are very largely used on the network of streams which intersect the Surma Valley and, to some extent also, in Lower Assam. The smaller rivers and streams in Upper Assam do not admit of navigation throughout the year, the bulk of the trade being carried to and from the Brahmaputra by road.

The first railways to be constructed in Assam were two small systems in the north-east corner of the province—a portion of the Dibru-Saidya Railway, constructed and controlled by the Assam Railway and Trading Company, to connect the tea estates on the left bank of the river with the steamer ghat at Dibrugarh, and a portion of the Jorhat Provincial Railway which provided a similar outlet further down the river at Kohilamukh Ghat. Some years later (1894), the Tezpur-Balipara Railway provided a third outlet at Tezpur. These three systems acted merely as feeders to the steamer traffic on the Brahmaputra which was still the sole channel of communication leading to the outer world, and this distinction remained unchallenged until the first section of the Assam Bengal Railway in Assam, from Akhaura to Badarpur, was opened for traffic in 1896 and, five to seven years later, extended to Tinsukia where it joins the remotest of the early railways, the Dibru-Saidya Railway. A third outlet was provided when the branch from Lunding to Gauhati was connected up to the Eastern Bengal Railway at Amingaon on the opposite side of the river, thus establishing direct communication with Calcutta. The total length of railways in the province is a little over one thousand miles.

There are three main trunk roads in the province, *viz.*, the North Trunk Road, the Assam Trunk Road and the Cachar Trunk Road. The first of these lies on the north bank of the Brahmaputra and runs from Dhubri through the headquarters towns of Mangaldai, Tezpur and North Lakhimpur to a point on the Brahmaputra immediately opposite Dibrugarh on the south bank. The Assam Trunk Road runs from Fakirganj on the south bank of the Brahmaputra through Goalpara, Gauhati, Nowgong, Jorhat and Dibrugarh to Saikhowa on the south bank opposite Saidya. The Cachar Trunk Road lies wholly in the Surma Valley and connects the two district headquarter towns of Sylhet and Cachar.

Two other important roads are those which run from Gauhati through Shillong to Cherrapunji on the south slope of the Khasi Hills, whence a

bridle path winds down to the plains of Sylhet, and the road from Dima pur (a station on the Assam Bengal Railway) through Kohima in the Naga Hills to Manipur. This road is continued as a bridle path into Burma. These two roads are metalled throughout and are the only metalled roads of any considerable length in the province.

The total mileage of the roads, including village roads and bridle paths, is 9,821 miles, of which only 579 miles are metalled. The Public Works Department is responsible for the upkeep of about three-quarters of the length of metalled roads, and for about two-fifths of the length of unmetalled roads including bridle paths and village roads; the remainder is maintained by local bodies. On account of the physical and climatic conditions, the construction and maintenance of roads is a costly business and the rate of expansion is not so rapid as it would be if more funds could be set aside for the purpose.

Trade in Assam is carried on in two different directions: firstly, the external and internal trade by rail and river, and, secondly, the trans-frontier trade with the States and tribes which border the province in the north and east. The external trade is almost all with Bengal, chiefly with Calcutta which receives about sixty per cent of the exports and supplies seventy per cent of the imports. The principal agricultural products are tea, paddy, oil-seeds, jute, cotton, potatoes and oranges. Lac, too, is important. Nearly all the paddy exported goes from the Surma Valley; on the other hand, rice is imported in considerable quantities by the tea gardens in Upper Assam. Tea is consigned straight from the gardens to Calcutta, and to an increasing extent to Chittagong also, either to be sold or shipped to other countries. A large proportion of the export trade in mustard from the Assam Valley is in the hands of a class of traders who are natives of Kamrup district; but almost all the rest of the export traffic in that region, and nearly the whole of the import traffic, is carried on by Marwari traders from Rajputana, known as *kaiyas*. In the Surma Valley, the local population contains a large trading element and the *kaiyas* are comparatively rare, but here too the foreign trader is represented in considerable force by merchants from Dacca.

The extent to which the hill tribes engage in trade varies very considerably from tract to tract. The people of the Khasi and Jaintia Hills keep much of the trade in their own hands, and merchants from among them travel as far as Dacca and Calcutta to sell their produce. Most of the tracts, however, do not produce sufficient food for the people to live on, and traffic with the plains therefore becomes a necessity. In general, it takes the form of simple barter, commodities like cotton, wax, ivory and forest produce being exchanged for rice, salt, dried fish, clothing, etc. The trans-frontier trade, too, is largely carried on by the barter of commodities such as rice, cotton cloth and yarn, silk and metals in exchange for Assamese ponies and such products as lac, spices, raw sugar, blankets and musk. All over the province there are numerous *hats*, or markets where business is done once or twice a week. The

following statement, taken from the 1921 Census Report, gives an idea of the area and population served by such rural markets :—

District	Actual number of markets	Number of markets per 100,000 of population	Average number of square miles served by a market
Goalpara .. ..	110	14	36
Kamrup .. ..	41	5	94
Darrang .. ..	57	12	51
Nowgong .. ..	43	11	86
Cachar Plains .. ..	118	24	17
Sylhet .. ..	313	15	15
Khasi and Jaintia Hills .. ..	104	43	58
Garó Hills .. ..	27	15	116

These are centres at which all the necessities and a good many of the luxuries of life can be bought and sold—grain, fish, fruits and vegetables, salt and groceries, tobacco and betel, oil and *gur*, cloth and yarn, implements and utensils, fancy and miscellaneous articles. The small cultivator's produce is brought for sale either by the cultivator himself or by the local trader who has bought in the villages. From the *hat* the surplus produce finds its way through various intermediaries to the large local consumers and to the Indian and export market. The well-to-do cultivator is generally in a position to deal directly with the larger merchants or the agents of big Calcutta firms. Agents from those firms are sent up at special seasons to buy special crops—cotton, lac, jute and mustard. Traders from Bengal come in boats and buy quantities of rice from the interior in the Surma Valley. Frequently, money is advanced against the standing crops a month or two before the harvest. An example of a *kaiya's* transaction, given in the Census Report, shows that the lender reaps a profit of 47½ per cent in three months on his money.

### 13. LOCAL SELF-GOVERNMENT.

The provincial Government in Assam is of the same type as obtains in other Indian provinces. The Governor acting with two Ministers administers the "transferred" departments, *viz.*, Education, Agriculture, Veterinary, Industries, Co-operative Societies, Registration, Local Self-Government, Medical Services, Public Health and Excise.

The unit of local administration is the local board. These boards are regulated by the Assam Local Self-Government Act of 1915 with subsequent amendments, of which the Act of 1926 (No. VIII) is the most important as it made the election by the board of its chairman the normal procedure and also gave the boards power to levy annual license fees on motor vehicles, carriages and carts. The boards are confined to the districts in the plains, and number nineteen in all, twelve in the Assam and seven in the Surma Valley. They are responsible for communications, vernacular education, medical and veterinary dispensaries, sanitation and water supplies.



The Local Self-Government Act of 1915 provided for the setting up of village authorities. By the end of 1927, 239 such authorities had been established. In 1926, the Assam Rural Self-Government Act (No. VII) was passed. This Act, which extends to the whole of Assam, enlarged the powers conferred on the village authorities by the Act of 1915. This Act will probably be brought into force in the course of 1928. Under it an authority may be constituted for a village or a group of villages; it will consist of such number of members not exceeding nine as the local Government may fix in each case; all members are to be elected; the electorate will consist of all male persons over twenty-five years of age and resident in the village; every one qualified to be an elector will also be qualified to stand for election as a member of the village authority. The primary responsibilities of the authorities are communications, sanitation, water supply and medical relief. The local Government may also transfer to approved authorities, under certain conditions, the management of village forests. A Village Development Fund, financed chiefly from provincial revenues, will be created for the whole of Assam. A contribution may be made from the fund to the expenses of each village authority which are also met in part by a contribution from the local board of the area and by the proceeds of penalties, fines and fees. The Act of 1926 empowers a village authority to raise money by imposing an assessment on the village.

Under the same Act, village benches may be set up for the trial of minor criminal offences and village courts for the trial of minor civil offences. Both bench and court consist of three or more residents within a village area who may or may not be members of the village authority. A complete scheme of village self-government has thus been provided. Up to the end of 1927, 239 village authorities and 92 village benches and courts had already been constituted under the provisions of the earlier Act of 1915. They are all situated in the Assam and Surma valleys.

#### 14. PUBLIC HEALTH AND SANITATION.

The medical institutions in the province are under the control of the Inspector General of Civil Hospitals. His staff consists of nine civil surgeons belonging to the Indian Medical Service, each of whom is in charge of a district; the remaining districts are in the charge of military or civil assistant surgeons. Including the institutions directly under the Public Health Department, the total number of institutions for the treatment of disease numbered 237 in 1926, and at these over a million-and-a-half of patients received treatment.

The Public Health Department is administered by a Director who is a member of the Indian Medical Service, assisted by an Assistant Director. The staff consists of a vaccination inspector for each district and a sub-inspector in each subdivision if the district is divided into subdivisions. In addition, there are two mobile units specially trained for epidemic duties, each consisting of three sub-assistant surgeons and six disinfectant carriers, and there is a special organisation for dealing with *kala-azar*, consisting of six assistant surgeons and 113 sub-assistant surgeons.

The Public Health Laboratory undertakes the analysis of water and food samples brought for examination by a peripatetic sample taker. Vaccine lymph is made at the provincial vaccine depôt at Shillong.

General public health projects affecting the province are considered by the Provincial Public Health Board. For the control of epidemics, there is a special Health Board (Epidemics) which co-ordinates the activities of the Public Health and Medical departments.

Most of the time of the Assistant Director is devoted to epidemic duties including *kala-azar*. The inspectors and sub-inspectors inspect the work of the large staff of vaccinators employed by local boards, and of government vaccinators in the hill districts, under the general supervision of the district surgeons. The epidemic units, or sections of them, are sent out to deal with outbreaks as occasion arises, sometimes under the personal supervision of the Assistant Director. In districts in which *kala-azar* infection is heaviest, the special *kala-azar* organisation supplements the efforts of the government and local board dispensaries, and maintains special institutions of its own, when necessary, where no others exist. Each of the six special assistant surgeons has been posted to an infected district and does all the *kala-azar* work of that district under the civil surgeon, besides helping with any other epidemic that may arise as well as public health propaganda.

Some idea of the immensity of the public health problem can be gathered from the figures of the number of patients treated in 1925-26, just quoted, which was of the order of about one in every five of the population. Housing, rural water supply and sanitary arrangements leave much to be desired and most of the ills which afflict the ryots in other provinces are present here also, plague being a notable exception and *kala-azar* perhaps a still more notable addition. Assam is indeed the home of *kala-azar* and has probably suffered from it to an extent unknown in any other country in the world. The first epidemic concerning which information is available occurred in 1881; in the succeeding decade, it exacted a terrible toll of human life, leaving whole tracts deserted and uncultivated. Between 1891 and 1901, the population of Kamrup decreased by seven per cent and in Nowgong by more than one-fourth. From that time a period of quiescence intervened although the disease lingered on in endemic form in certain areas. In 1920, a general recrudescence occurred in those areas, together with a tendency for the disease to spread further afield. Providentially for Assam, medical science has discovered an effective treatment and though there has been an increase in the number of deaths, particularly between 1922 and 1925, there are indications that the disease is now under control and that its further spread has been arrested. Over 60,000 cases were treated in 1925, the mortality in the same year being 6,365. Twenty years ago practically all of the 60,000 would have been doomed to death.

Next to *kala-azar*, malaria is probably the most potent enemy to human life. In a few localities, special anti-malarial measures, such as the clearance of jungles and undergrowths, the improvement of drainage and the treating of sheets of water with kerosine are being carried out

by Government and by tea companies. Quinine is sold, below cost price, through the post offices and other agencies, at the rate of  $4\frac{1}{2}$  annas per 20 tablets of 4 grains each. Enclosed with the treatment is a printed copy of instructions to enable the patient to treat himself.

The organisation for dealing with small-pox has succeeded in bringing the mortality due to that disease to a very low figure. The staff of vaccinators maintained by the local boards is sufficiently strong to permit of each village being visited during the vaccination season from October to March. Vaccination is not compulsory, but sometimes it is necessary to introduce temporary regulations making it compulsory in villages in which there is opposition to vaccination and small-pox is prevalent. Cholera inoculation has come rapidly into favour since the two epidemic units started work in 1925.

A considerable amount of propaganda work is carried out among the general public and in schools by the *kala-azar* assistant surgeons. Lantern demonstrations are given dealing with the prevalent epidemic diseases; bulletins and pamphlets are issued and pictorial posters are freely displayed in public places.

The local boards are responsible for village sanitation, watersupply, conservancy and drainage, and have their own staff of engineers for drawing up schemes. In some cases, the boards have delegated certain powers to local *panchayats* or 'village authorities' which control groups of villages. Government placed at the disposal of local boards a sum of Rs. 3 lakhs in each of the years 1925-26 and 1926-27, and of Rs. 4 lakhs in 1927-28, to be used entirely at the boards' discretion for the improvement of rural watersupplies.

## BENGAL

### 1. GENERAL FEATURES AND NATURAL DIVISIONS.

In 1854 the Presidency of Bengal, which had till then been directly in charge of the Governor General, became a Lieutenant-Governor's province. At that time, it included practically the whole of the present provinces of Bengal, Bihar and Orissa and Assam. It is unnecessary to give details here of the changes in the territorial limits of the province between that date and 1912 when the existing limits were fixed and Bengal again became a presidency. It has a total area of just over 52½ million acres or 2 million acres more than the area of England including Monmouthshire. Of this area the Indian States of Cooch Behar and Tripura account for some 434,000 acres. The presidency is bounded on the north by Nepal, Sikkim and Bhutan, beyond which lies Tibet. A traveller entering the presidency from this direction, would descend from the Himalayas into the submontane districts of Darjeeling and Jalpaiguri. Continuing his journey south he would pass rapidly into the vast and fertile alluvial plain, the gift of the Ganges and the Brahmaputra, which forms the main part of the presidency, and, after a journey of some 300 miles from the point of entry, would reach Calcutta, the capital, beyond which lie the forests, creeks and swamps for ever wresting from the Bay of Bengal fresh additions to the cultivated area which lies behind them. The presidency is bounded on the east by Assam and on the west by Bihar and Orissa. Its greatest width (about 250 miles) is in the south. In shape, Bengal is, therefore, true to the conventional picture of a delta which, in fact, it is, for the low lying laterite tract of the *barind* in the north-west and the undulating laterite tracts traversing the four western districts of the presidency, though of importance in considering the agricultural features of the country, are insignificant in extent in comparison with the true deltaic areas.

Broadly speaking, the country is homogeneous. Divisions such as north, west, central and eastern Bengal depend on various stages of the process of land making by the great rivers whose vagaries determine the physical geography of Bengal.\*

Since Major Rennell's survey of the rivers of Bengal, between 1764 and 1775, successive changes in the course both of the main stream of the Ganges and its tributaries have greatly altered the physiographical character of the country.

North Bengal extends from the lower spurs of the Himalayas to the Ganges. It has been subject to great fluvial changes, and the country is seamed with silted channels. The "old alluvium" appears in the south-western portion of this area.

Western Bengal may be divided into two distinct zones, one a low-lying delta formed by the Bhagirathi, Damodar, Ajay and Rupnarayan

\* For a detailed description see Oldham's *Geology of India*.

rivers, the other a rolling upland country with conditions approximating to those obtaining in the arid plateau of Central India. A considerable part of this tract has a hard ferruginous soil unsuitable for cultivation, but this division of the presidency is specially rich in mineral resources.

Central Bengal is typical of a delta in which the process of land formation has almost entirely ceased. It lies between the Bhagirathi on the west and the Padma on the north-east. The greater portion of this tract is free from inundation and is described as a land of dead and dying rivers, a land of low rice plains and swamps.

In contrast to central Bengal, eastern Bengal is a delta in which the creative energies of the Ganges and the Brahmaputra are still at work. The land is consequently subject to annual inundation and receives annually a deposit of fertilising silt. As the country is covered by a network of rivers, streams and creeks, the huts of the cultivators are usually clustered together on the high river banks and on artificial mounds. During the rains all communication is by boat. "A visitor to one of these hamlets in the rains," it is stated in the Settlement Report of 1917 of the typical district of Dacca, "may see a grey-bearded patriarch swimming towards him from the fields and may be asked for alms by an old woman standing in water breast high amongst the jute plants." Indeed, the people who live in these tracts are almost amphibious in their habits.

The southern portion of eastern Bengal is known as the Sundarbans, meaning literally the forests of *sundari* trees (*Heritiera littoralis*). The area is approximately 6,500 square miles in extent, or about half the size of Holland.

In the north of this tract the morasses have been converted into fertile rice fields, and cultivation is gradually extending southwards. Its spread is conditional on the eradication of jungle, the construction of dams and dykes to keep out salt water, a rainfall sufficient to wash the salt out of the soil, and, last but not least, a supply of drinkable water—that first essential of human settlement.

In addition to the areas described above, there are two tracts outside the alluvial zone, namely, (1) the Chittagong Hill tracts and Hill Tippera and (2) the frontier district of Darjeeling.

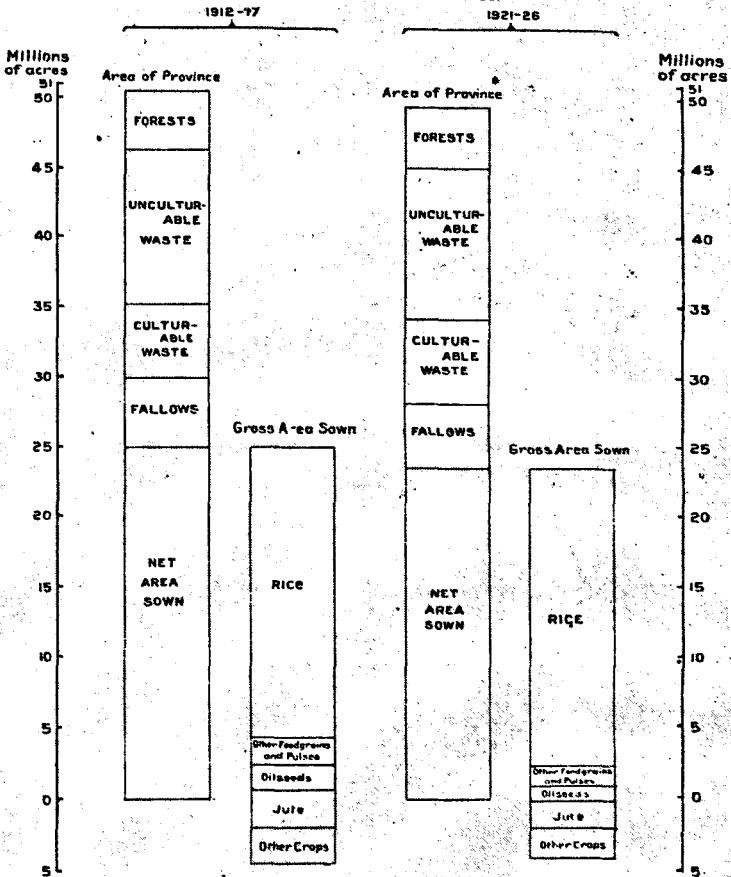
Bengal receives its rainfall from the Bay of Bengal monsoon current and by far the greater part of it falls between the months of June and October. The distribution is uneven, ranging as it does from 50 to 60 inches westward of Calcutta and from 60 to 120 inches further east and north until, as the hill areas are reached, rainfalls of as much as 154 to 209 inches are recorded. The climate is warm and damp and frost is unknown, except in the districts of Darjeeling and Jalpaiguri.

The soils of Bengal are almost entirely of alluvial origin though of two very different types. The more important type, as regards area, is what is usually termed the new alluvium which consists of mixtures of sand, silt and clay in widely differing proportions and of very varying

# BENGAL

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 YEAR AVERAGES)

NOTE:- The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.



\* The apparent reduction in the area of the province since 1912-17 is due to more complete surveying

degrees of fertility. Its general characteristic is, however, easy cultivability. The old alluvium—the second type—which occurs mainly in the west and west central districts consists of laterite formations of varying grades of sand and clay with nodules of hæmatite which give them their characteristic reddish colour. Cultivation of these soils in a dry state presents great difficulty and, for the most part, therefore, crops are only sown on them during the summer rains (*kharif* crops), whereas on the new alluvium, crops are also sown during the winter (*rabi* crops).

The cultivated area in Bengal is approximately 28½ million acres or 58 per cent of the total area. Of the gross area cropped (*i.e.*, including the double cropped area), about 84 per cent is under food crops, 9 per cent under jute, nearly 4 per cent under oil-seeds and the remainder under various non-food crops.

Bengal is perhaps the foremost rice-producing region of the world. The physiographical characteristics of the tracts described above largely determine the manner in which rice can be grown and also the variety of rice to be chosen. The numerous varieties of rice grown in Bengal may be divided into three groups, according to the time at which they are harvested. These are—

(1) *Aman* (winter paddy), sown from March to May, harvested in November and December.

(2) *Aus* (autumn paddy), sown from March to May, harvested from July to September.

(3) *Boro* (spring paddy), sown in November to January, harvested from April to May.

Of these, *aman* rice is the most important and occupies about three-quarters of the rice area.

The millets, maize and sugarcane are characteristic crops of the old alluvium. With these exceptions, the crops of Bengal are grown chiefly on the new alluvium. The most important crops are rice and jute; next to these come oil-seeds, followed by various pulses, tobacco and sugarcane. The relative importance of these staple crops has not changed materially since the beginning of the century.

There thus seems no reason to believe that the increase in the area under jute has made a serious inroad on the food supply of the province. Jute is not a rival to *aman* paddy which is transplanted after the jute harvest or grown in land unsuitable for the common varieties of jute. Very little cotton is at present grown in Bengal.

Important crops, though their precise area is not known, are vegetables (of which the brinjal or egg plant and two varieties of cucumber are the most considerable with potatoes as a crop of rapidly increasing importance), *pan* or betel leaf, arecanut and fruits which comprise the coconut, plantain (banana), mango, pineapple, jack, guava, custard apple, *lichi* and several varieties of melon.

The crops are, in short, characteristic in their variety and richness of a fertile well watered delta favoured with a sub-tropical climate. It is chiefly in the tracts of old alluvium where millets, maize and sugarcane are grown, that the water supply is insufficient and irrigation is required.

Raw jute, rice and oil-seeds are the three principal exports of agricultural produce from Bengal. The following Table shows the extent of the export during the last ten years :—

## EXPORTS

				Jute (raw)	Rice	Oil-seeds
				Cwts. (000's)	Cwts. (000's)	Cwts. (000's)
1917-18	..	..	..	5,561	1,428	1,202
1918-19	..	..	..	7,914	3,069	2,902
1919-20	..	..	..	11,718	963	3,135
1920-21	..	..	..	9,432	210	2,274
1921-22	..	..	..	9,335	234	2,545
1922-23	..	..	..	11,513	4,158	3,342
1923-24	..	..	..	13,184	5,976	5,123
1924-25	..	..	..	13,827	6,472	4,451
1925-26	..	..	..	12,812	2,370	3,430
1926-27	..	..	..	14,118	2,184	2,600



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**2. PROVINCIAL INCOME AND EXPENDITURE.**

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## 2. PROVINCIAL INCOME

The attached Table shows the main heads of income and expenditure.

The outstanding feature of the revenue of Bengal is the effect which the rise in the value of land and its produce.

## GOVERNMENT

(Figures are in

*Revenue and Expenditure*

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Taxes on Income ..	93	....	....	....	....	....
Land Revenue .. ..	302	313	313	311	301	311
Excise .. ..	183	201	210	215	228	225
Stamps .. ..	274	302	317	337	358	332
Forests .. ..	19	23	23	25	28	31
Other heads .. ..	25	49	47	47	59	55
Railways .. ..	2	....	1	1	1	1
Irrigation .. ..	....	....	3	3	....	....
Debt—Interest .. ..	4	3	3	3	3	4
<b>Civil Administration—</b>						
Administration of Justice ..	12	15	13	13	14	14
Jails and Convict Settlements..	15	11	13	13	11	12
Police .. ..	4	6	5	7	7	6
Education .. ..	11	10	10	11	12	13
Medical .. ..	6	6	8	7	8	9
Agriculture (including Veterinary and Co-operation).	2	3	3	3	2	4
Industries .. ..	15	7	6	7	7	5
Other departments .. ..	....	....	9	1	1	2
Civil Works .. ..	6	8	6	7	6	6
Miscellaneous .. ..	15	28	23	21	24	20
Miscellaneous adjustments between Central and Provincial Governments.	....	....	....	2	....	....
<b>Total, Revenue Receipts ..</b>	<b>988</b>	<b>985</b>	<b>1,013</b>	<b>1,034</b>	<b>1,070</b>	<b>1,050</b>

\* The interest on the whole of the capital expenditure on irrigation, whether provided by loans or by

† The head "Debt—Interest" represents the total payments for interest on loans, less the amount for the inclusion of interest on capital provided from revenue, exceeds the interest on loans, a minus

## AND EXPENDITURE.

ture during the six years ending 1926-27.

the permanent settlement has had in depriving the State of a share in

## OF BENGAL

lakhs of rupees)

charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
Direct Demands on the Revenue—						
Land Revenue .. ..	36	29	23	31	36	39
Forests .. ..	13	13	13	15	14	18
Other heads .. ..	40	42	41	41	54	53
Irrigation (Interest on debt and miscellaneous expenditure) Revenue account.*	27	29	37	32	34	36
Irrigation—Capital charged to Revenue. Account	35	-21	18	4	-3	....
Debt—Interest† .. ..	-8	-8	-6	-8	-8	-8
Civil Administration—						
General Administration ..	118	121	120	116	120	124
Administration of Justice ..	104	113	109	110	111	111
Jails and Convict Settlements..	38	36	33	32	31	33
Police .. ..	193	187	179	182	183	190
Education .. ..	121	123	125	122	133	137
Medical .. ..	58	55	51	57	59	59
Public Health .. ..	23	25	24	29	24	34
Agriculture (including Veterinary and Co-operation).	21	21	20	18	20	22
Industries .. ..	12	13	10	10	12	12
Other departments .. ..	3	6	4	13	11	11
Civil Works .. ..	142	102	93	96	111	113
Miscellaneous .. ..	81	73	78	76	89	87
Contributions and assignments to the Central Government.	155	....	....	....	....	....
Total, Expenditure charged to Revenue.	1,208	959	978	976	1,081	1,071

appropriations from revenue, is charged under the head "Irrigation—Revenue Account,"

charged as interest to commercial undertakings such as irrigation. Where the latter amount, owing figure may result under the head "Debt—Interest."

## GOVERNMENT

(Figures are in

*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Receipts</i>						
Revenue Surplus .. ..	....	26	35	58	39	....
Loans and Advances .. ..	49	10	12	13	8	8
Loans between Central and Provincial Governments.	168	51	....	....	24	7
Famine Insurance Fund ..	2	2	2	2	2	2
<b>Total, Capital Receipts ..</b>	<b>219</b>	<b>89</b>	<b>49</b>	<b>73</b>	<b>73</b>	<b>17</b>
Opening Balance .. ..	120	68	91	130	194	238
<b>Total ..</b>	<b>339</b>	<b>157</b>	<b>140</b>	<b>203</b>	<b>267</b>	<b>255</b>

## OF BENGAL

lakhs of rupees)

*and Expenditure*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Expenditure</i>						
Revenue Deficit .. .. .	215	....	....	....	....	21
Construction of Irrigation Works	50	52	....	....	-2	3
Civil Works .. .. .	....	....	....	....	7	7
Loans and Advances .. .. .	6	12	6	4	19	7
Loans between Central and Provincial Government.	....	2	4	5	5	5
Payment of commuted value of pensions.	....	....	....	....	....	13
<b>Total, Capital Expenditure .. .. .</b>	<b>271</b>	<b>66</b>	<b>10</b>	<b>9</b>	<b>29</b>	<b>56</b>
Closing Balance .. .. .	68	91	130	194	238	199
<b>Total .. .. .</b>	<b>339</b>	<b>157</b>	<b>140</b>	<b>203</b>	<b>267</b>	<b>255</b>

### 3. REVENUE ADMINISTRATION AND LAND RECORDS.

The presidency is divided into five administrative divisions \* each under a Commissioner. These divisions are made up of 27 districts (excluding Calcutta) each under a Collector or Deputy Commissioner. The unit of revenue administration is the district. Revenue questions which cannot be settled finally by the officer in charge of the district go up (except in respect of Excise and Salt for which there is a special Commissioner) to the Divisional Commissioner and from him, if necessary, to the Revenue Department of Government or the Board of Revenue.

The main sources of revenue in Bengal are land revenue, excise and stamps. There is also the public works cess which is the mainstay of finance required for local self-government.

The outstanding feature of the land revenue assessment in Bengal is that by far the greatest portion of it is fixed under the permanent settlement concluded by Lord Cornwallis in 1793. In this permanently settled area, the feature from an agricultural point of view is the absence of a subordinate revenue staff such as is maintained in temporarily settled areas. The consequence is that much less is known about the state of cultivation and the condition of crops, as reliance has to be placed on district officers and their subordinates who are relatively few in number and, moreover, do not need to obtain such information for the performance of their ordinary duties.

The conditions of this permanent settlement (which confirmed a "decennial" settlement completed in 1791—the first comprehensive settlement undertaken after the succession of the East India Company in 1765 to the Dewani of Bengal, Bihar and Orissa †), were embodied on a proclamation issued on 22nd March, and now known as Regulation I of 1793. It declared that the zamindars, independent talukdars, and other actual proprietors of land with whom the "decennial" settlement had been concluded would be allowed to hold their estates at the same assessment for ever, but that "no claims for remission or suspension of rent were to be admitted on any account and lands of proprietors were to be invariably sold for arrears." The question of the precise effect of this declaration on liability to new general taxation has never been finally settled. The latest judicial pronouncement on the subject is a judgment by the Calcutta High Court, delivered in 1927. By a majority of three to two, the full bench of Judges held that income derived from land in permanently settled estates is liable to income-tax. In the same proclamation, proprietors were declared to have the privilege of transferring their lands without the sanction of Government and partition of estates was freely allowed. Thus, the creation of a landlord class and the privileges conferred on them gave rise to a series of agrarian complications which Government sought to regulate by subsequent tenancy laws. The amount of revenue derived by Government from

\* Burdwan (West), Rajshahi (North), Dacca (East), Chittagong (East) and Presidency (Central)

† At that time "Orissa" comprised only a small tract of country now included in the Midnapur district of Bengal.

the permanent settlement, which included areas in what are now the provinces of Bihar and Orissa and Assam, was 286 lakhs of rupees per annum (or at the rate of 1s. 6d. to the rupee, £2,145,000), and the only increase which has since occurred \* has been due to the resumption and assessment during the first half of the nineteenth century of a large number of estates which had been claimed as free of revenue. According to the Report of the Land Revenue Administration for 1918-19, the gross rentals amounted to 1,285 lakhs of rupees and the land revenue to 279 lakhs of rupees, leaving as the balance intercepted by the landholders (including tenure holders) Rs. 1,006 lakhs. The value of the produce of the permanently settled estates has, on the other hand, risen enormously, and the whole of this increase *plus* the produce from new cultivation within the areas of these estates has been shared between the zamindars and their tenants.

Calculations made in the course of the settlement of the district of Mymensingh in eastern Bengal showed that Government received about 0·4 per cent, the landlords not more than 5 per cent, and the tenants the balance of the money value of the crops.

The loss of revenue resulting from the permanent settlement may be gauged from the figures of increase of government revenue from the temporarily settled estates and from *khas mahals* † for the last two decades. As these latter are interspersed among the permanently settled areas, conditions may be regarded as comparable.

	1900-01	1912-13	1923-24
	Rs.	Rs.	Rs.
Revenue from temporarily settled estates ..	13,20,193	15,30,822	20,11,187
Revenue from <i>khas mahals</i> ..	27,38,420	39,48,416	51,59,331

With regard to the system of rent, the chief point of interest is that competition or economic rents hardly exist in Bengal.

The Board of Revenue in a letter which the Indian Taxation Enquiry Committee published with its Report stated "that the contention that competitive cash rents do not exist in Bengal is borne out by the fact that, proportionate to the value of the produce, the rents in eastern Bengal are lower than in western Bengal, although the incidence of population is much higher and hence the competition for land is much keener in eastern than in western Bengal. Nor can the rents be said to be economic rents for the rents payable bear no apparent relation to the value of the produce. Again, where waste lands or *khas* lands of the landlords are newly settled, the rent fixed is not a competitive or an economic rent, but settlement is made at the customary or local

\* Excluding revenue from certain areas included in the permanent settlement but which have since reverted to Government at revenue sales and become part of the temporarily settled area.

† Government Estates.

rates, and the landlord exacts a *salami*\* on settlement in addition to the rent."

The financial effect of the permanent settlement in Bengal is also clearly exhibited by the following figures of total land revenue assessment, total population and incidence per head of the assessment in all the major provinces. The figures are taken from the "Agricultural Statistics of India" for 1924-25.

	Total land revenue assessment	Total population	Incidence per head
	Ra. (in 000's)	(in 000's)	Rs. a.
Madras .. .. .	7,28,39	42,319	1 11
United Provinces .. .. .	6,99,58	45,376	1 9
Burma .. .. .	5,73,13	13,212	4 15
Punjab .. .. .	5,17,07	20,662	2 8
Bombay .. .. .	4,38,38	18,116	2 7
Bengal .. .. .	2,88,74	45,788	0 10
Central Provinces .. .. .	2,19,85	13,913	1 9
Bihar and Orissa .. .. .	1,56,60	34,002	0 7
Assam .. .. .	1,05,35	7,469	1 2

It has already been noted that Regulation I of 1793 fixed the land revenue of Bengal for ever with the idea that the zamindars could devote themselves to the improvement of their estates with the knowledge that they would reap the full benefit. The same Regulation stipulated that, in return for this concession, they should show the same consideration to their dependent talukdars and tenants. Government specifically reserved to itself the right to protect all classes of people and to enact such regulations as it might think necessary to ensure that the zamindars fulfilled their obligations. Art. VII (1) of the Regulation declared that this was the duty of the Ruling Power.

At the time there was more land than the people could cultivate, and the zamindars were anxious to attract cultivators and to keep their tenants. As the pressure of population on the soil increased, the situation was reversed and many abuses came to the notice of Government. The attempts on the part of Government to fulfil their obligations to the tenants have a long history.

In 1859, legislation was passed with the object of giving the ryot some measure of protection; this failed, however, of its purpose and the relations between the zamindar and his tenant are now regulated by the Bengal Tenancy Act of 1885. The objects of this Act are: (1) to give the settled ryot the same security in his holding as he enjoyed under the old customary law, (2) to ensure the landlord a fair share of the increased value of the soil and (3) to lay down rules by which all questions in dispute between landlord and tenant can be reduced to simple issues

\* The *salami* is a lump sum payment which is in effect a commutation of the competitive element in the rent.



and decided upon equitable principles. It should, however, be noted that the Bengal Tenancy Act did not make any distinction between tenants who paid their rents in cash and those who paid in kind. There have been various amendments of the Act, of which the most important are those effected by Act III of 1898 in regard to the preparation of records of rights and the enhancement and reduction of rent and by Act I of 1907 conferring greater authority on the records of rights when duly prepared and published, but the principles of the Act of 1885 remain unaltered and with the amending legislation the Act provides a complete code governing the most important relations between landlord and tenant.

It should be mentioned that the tenures and sub-tenures regulated by this legislation and constituting intermediate interests between the zamindar and the cultivating ryot are often extremely numerous. In the district of Backerganj, for example, there may be as many as eighteen such intermediate interests, all of which are heritable, transferable and permanent, while the cultivating ryot will eke out his income by himself sub-letting part of his land to under-ryots.

It should also be mentioned that the status of *bargadars* (that is, those cultivators who pay the owners of the land a fixed share of the produce) is still undecided. In most parts of Bengal, they are regarded as labourers and not as tenants. A Committee appointed in 1923, to consider the amendment of the Bengal Tenancy Act, recommended that "all cultivators paying a fixed quantity of produce should be treated as tenants, and also those *bargadars* who employed their own cattle and implements of agriculture; in other cases, where the landlord supplied the plough and cattle, the cultivators should be treated as labourers." No action on the Committee's recommendations has yet been taken.

Temporarily settled tracts comprise an area of 8,000 square miles as compared with the 59,000 square miles permanently settled, but they bring in a revenue to Government of 75 lakhs as compared with 214 lakhs from the permanently settled area. The temporarily settled tracts which are found in nearly all districts are made up of estates which have become the property of Government by purchase at revenue sales, the district of Darjeeling, the Western Duars in Jalpaiguri, the Noabad area in the Chittagong district, the Chittagong Hill tracts, the islands and more recently deforested areas in the Sundarbans, and finally the lands which have come into existence as the result of the ever recurring changes in the courses of the rivers.

#### *Land Records and Survey.*

A primary object of the framers of the permanent settlement of 1793 was to record all rights in land, but up to the passing of the Land Registration Act in 1876, the law as to registration was not strictly enforced. The object of the Act of 1876 was not to make an inquisition into titles, but to identify all individuals on whom might be imposed certain duties and obligations in virtue of their being in possession of land as proprietors.

Consequently, every person in possession of land, whether revenue paying or revenue free, is required to register full particulars. But such registration does not deal with subordinate rights and interests. For several years after the permanent settlement, endeavours were made to maintain a record of these, but without success. The record of rights prepared under the Tenancy Act of 1885 provides a full account of all subordinate tenancies then existing. The possibility of keeping this record up to date has been frequently canvassed since (on the last occasion in 1914 by the District Administration Committee), but the great cost involved has always prevented action. The general result is, therefore, that, except in the temporarily settled areas, information as to subordinate interests is very defective.

As regards survey, the position is as follows. A general revenue survey was begun in 1835 and concluded in 1878. The only parts of the presidency which were not covered were the Sundarbans, Hill Tippera and the Chittagong Hill tracts. Most of the excluded tracts were topographically surveyed during this period. This revenue survey is still the authoritative survey of the province, but its use for practical purposes is now greatly impaired owing to the fact that no provision was made at the time for permanently recording the village and estate boundaries then existing.

In 1888, the first district settlement under the Tenancy Act of 1885 began and in connection therewith cadastral maps were prepared and for many purposes take the place of the older revenue survey maps. By 1921-22 the area for which cadastral maps were available amounted to 56,180 square miles or 84 per cent of the area of the presidency to which the Tenancy Act applies. It is expected that this cadastral survey, which includes the main river beds and foreshores, will be complete by 1936.

#### 4. THE CULTIVATOR.

The census of 1921 showed a population of 47,592,462 for the presidency as a whole giving a density of 579 per square mile. The variation in density ranges from 34 per square mile in the Chittagong Hill tracts to 1,148 in the Dacca district. The census of 1921 showed an increase in population over the presidency as a whole of 2·8 per cent as compared with the census of 1911, but that increase gives no true picture of the presidency in detail, for, in western and central Bengal, the population seriously declined during the decade, except in the immediate neighbourhood of Calcutta, while it increased by 2 per cent in the north and by no less than 8 per cent in the east.

Only a very small percentage of this population of 47½ million is urban; the proportion so returned in the census of 1921 was 6½ per cent. The people of Bengal do not take kindly to town life and the urban population contains a large proportion of immigrants from other provinces. Agriculture is the direct means of support of no less than 77½ per cent of the total population of Bengal. Pressure of population on the land is great and it was calculated in the census of 1921 that each worker on the land had only 2·215 acres to cultivate. Like most averages this

is misleading to the extent that in parts of western and northern Bengal, where "dry" conditions prevail, holdings are often of considerable size, while, in the delta, they are frequently below the average. In western and northern Bengal, the holdings would benefit from consolidation. A Committee reported in 1925 on the possibility of taking action on the lines of the Punjab schemes. The Committee came to no decisive conclusion and suggested further enquiry as to practicability of consolidation generally, but recommended that, in the temporarily settled government estates, a start might be made at once and the Co-operative Department strengthened for the purpose. An officer in that department has now been placed on special duty with a view to organising consolidation societies on these estates.

There are two systems which govern the law of succession to property under Hindu law, namely the Mitakshara and the Dayabhaga. The home of the latter system is Bengal, while the former prevails over the greater part of India. Under the Mitakshara system, property is divided up into joint-family property and self-acquired or separate property. According to the Dayabhaga law, there is no right by birth in ancestral property, two or more persons inheriting property together become tenants in common, and not joint tenants. The Muhammadan law recognises the principle of the individual inheritance by the children of a certain proportion of the father's movable property and discards that of joint ownership or survivorship.

Where the holdings are of average, or below average, size it is not surprising to find that hired labourers (as distinct from casual hiring among the cultivators themselves) are few—there being in fact only one hired labourer to every five who cultivate land of their own—or that the standard of living is low. But the lot of the cultivator is not on that account necessarily wretched. Nature is bountiful throughout the deltaic area which is the typical Bengal. The cultivator can produce unaided and with a very moderate degree of work sufficient food to support himself and a surplus which will enable him to purchase the few articles not produced at home. If, as is often the case, his sole crop is rice, he has three months' hard work in March, April and May followed by nine months' leisure; if his land is suitable for jute as well as rice, he will have an additional six weeks' work in July and August. He will grow fruit and vegetables and a little tobacco for his own consumption without much trouble round his house and he and his family, especially during the period of the rains from July to September, spend a good deal of their time fishing.

The Bengal Census Report for 1921 remarks that the word 'village' in the sense in which it is ordinarily understood in India should not be used without qualification in respect of rural Bengal. Except in certain districts, the homesteads of rural folks are not crowded into some conveniently situated site. Each cultivator builds his homestead on his own land. Commenting on the absence of villages in Bengal in the ordinary sense, the Report points out how difficult it is to develop

corporate village life in such circumstances. It is significant that for administrative purposes in Bengal, a survey unit (*mauza*) takes the place of the village unit elsewhere.

The following extracts from the "Economic Life of a Bengal District" by the late Mr. J. C. Jack, I.C.S., give a vivid account of a 'village' in the delta. "There is no village street....indeed, in the English sense of the word, there is rarely a village at all....in the older north the houses usually straggle at irregular intervals along the banks of the stream and are surrounded by orchards or at least by some garden and a few trees; in the south-western swamps the long line of homesteads is rarer..... giving place to the circular formation round a tank and the houses are fewer and very close together and the trees are very few....in the alluvial south east the land is too recently formed and too liable to be swept away to encourage the planting of a slow growing orchard. In all these villages, there is rarely a village road, usually a footpath leads from house to house, but often there is no path at all."

The cultivator invariably builds his own dwelling. To continue quoting from Mr. Jack's book "The homesteads do not display as much variety in construction or arrangement as might be expected on this account....on the average, they cover a quarter of an acre of ground.... although in the swamps where a plinth, sometimes 15 or 20 feet high, has to be raised, the space is very much smaller. Within this quarter acre will usually be found a pond, an orchard and a court yard, round which several huts with mat walls are constructed....a prosperous family builds larger huts and more of them; thus most cultivators in comfortable circumstances have five or six separate huts in their homesteads."

Chapter XII of Part I of the Bengal Census Report for 1921 refers the reader interested in the domestic economy of the cultivating classes to Mr. Jack's book, as containing "more reliable information of this character regarding a Bengal district than can be obtained anywhere else." In the next two paragraphs which describe that economy, Mr. Jack's analysis of the Faridpur district will, therefore, be closely followed. Faridpur is situated on the west side of the Dacca division and, so far as any one district can be, is typical of the conditions prevailing throughout deltaic Bengal.

About one-half of the cultivators can be considered to be living "in comfort"—which means that they are well fed, well housed and well clothed. Relatively very few are living "in want"—not, perhaps, more than 4 per cent of the total agricultural class—that is to say they are thin and ill-developed with old and worn clothing and live in tumbled down and ill-thatched huts. Of the remaining 46 per cent about 28 per cent can be regarded as below "comfort" and 18 per cent as above "want." In terms of money, this classification is based on an average annual income of Rs. 300 for a family of five\* members living 'in comfort' and of Rs. 135 for a similar family living 'in want.' A similar estimate for the district of Mymensingh shows a

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\* 2 adult males, 1 adult female, 1 boy and 1 girl,

somewhat uneven distribution of annual income. About 4 per cent of the families annually obtain a net profit of Rs. 800 or more, 36 per cent Rs. 240 or more, and 60 per cent are considered to be on the subsistence level with no surplus of income over expenditure. The "in comfort" family, as classified by Mr. Jack, is estimated to consume a *maund* (82 lbs.) of unhusked rice per head per month—20 per cent above the standard calculated by the Famine Commission of 1880 for physical fitness—and will have in addition, partly by cash purchase and partly by home production, an adequate supply of salt, oil, spices, fish, vegetables, *ghi* and milk, tobacco, *gur*, betel nut, kerosene oil, clothes, household utensils and furniture. Utensils and furniture will be of a simple kind: close woven mats with a polished surface as covers for the floor, jars great and small for food, clothes and stores of all kinds (wooden receptacles are useless owing to the hot and damp climate and the ravages of insects), some brass plates and pots and a lamp or two, perhaps a few pictures. Rent and local taxation will have to be paid and money will from time to time have to be spent on miscellaneous items such as medical treatment or the purchase of cattle or a boat. There will also be house repairs to carry out and an occasional "voluntary" expenditure on domestic festivals and events. On all these objects, food and other necessaries (including "voluntary" expenditure which custom makes "necessary") the "comfortable" family of five will, perhaps, spend about Rs. 250 out of its total income of Rs. 300. Any surplus cash the cultivator will probably spend on jewellery for his wife.

The family "in want" will have much the same range of expenditure but it will have to cut down its rice consumption by one-half, omit fish, and almost omit vegetables from its dietary; it will keep no boat and no cattle and will spend very little on clothes. It will still spend, and must spend in the present state of social opinion, an amount absolutely small but relatively quite beyond its means on domestic festivals and entertainment.

The main dependence of the cultivator is naturally upon agriculture, but many cultivators, owing to the small size of their holdings, must have some additional means of livelihood. There is consequently a great deal of subsidiary employment, much of which is, however, of a trivial kind bringing only a very small addition to the annual incomes estimated above. The most common of them are menial and domestic service, weaving everywhere, and fishing in the deep water paddy tracts of eastern Bengal and the keeping of poultry in the Chittagong district. The Fisheries Department has been closed down as a measure of economy, though there is useful work to be done especially in eastern Bengal. Fishery rights are usually vested in landlords who lease them out to the middlemen. The fishermen are entirely dependent on these middlemen who absorb the main profits of the trade. Sericulture is also an important industry in some localities; the possibility of fruit farming and lac culture also deserve attention. There is great scope in Bengal as elsewhere for a thorough survey of the economic and social possibilities of

these and other subsidiary occupations. There is a good deal of agricultural labour for hire at harvest time; much of this labour is performed by owner cultivators who prefer to do it outside their own districts. There is, therefore, where different times of harvesting the principal crops make the arrangement possible, a mutual exchange of labour between owner cultivators. The entirely landless labourer is still the exception throughout Bengal. While the proportion of those who engage in subsidiary occupations, especially of those who hire themselves out from time to time as labourers, is naturally higher among the poorer cultivators, it is by no means confined to them. The fact that it is not, is an instance of the homogeneity of the cultivators in Bengal.

Indebtedness is a problem among the cultivators of Bengal just as it is among their brethren all over India. The burden weighs most heavily on the classes intermediate between comfort and positive want. The cultivators who live "in comfort" are by no means free from debt, but as a class the amount of their indebtedness probably does not exceed what might be regarded as a justifiable overdraft, if only it were borrowed for productive purposes and at reasonable rates. Much of it is, however, borrowed to meet expenditure on domestic ceremonies and in particular on the occasion of marriages. A marriage in a family may often necessitate the entertaining of several hundred guests. Practically all of it is borrowed at high rates ranging from 36 to 48 per cent. The security is often jewellery. This domestic expenditure is not the kind that co-operative credit societies exist to finance. The loans so often contracted by the cultivator in kind, either for the purchase of seed or cattle or to buy food just before the harvest when his own food supply has run short, are of a different category. The provision of co-operative credit is the solution here, but, though much progress has been made in the last twenty years or so, a candid investigator is forced to acknowledge that, in Bengal as elsewhere, only the fringe of the problem of indebtedness has so far been touched in this way.

The cultivator is hampered to an unusual extent in Bengal by the poor quality of his cattle and the small size of his holding. Deltaic Bengal will probably always be a cattle importing region and, therefore, the main hope of improved cattle is an improvement of the supply imported from the north-west. Efforts are however being made to improve the local supply. The matter is further discussed in the section on the Agricultural Department.

The number of literates is everywhere low, varying from 5 to 15 per cent in the different districts (excluding Calcutta). In the principal cultivating castes the rate varies: among the Pods and Chasi Kaibarttas of central Bengal and the western delta it is as high as 13 per cent, but among the Namasudras, Rajbansis and the Muhammadan Sheikhs who are the cultivators of eastern and northern Bengal, it falls to 8, 6 and 5 per cent. This question is dealt with more fully under "Education" below.

If cultivation only occupies three to five months of the year, it may well be asked: How does the cultivator spend his time? The annual repair of his house, fishing and visits to relatives (for the Bengali cultivator is fond of travelling) occupy some part of it, but his most constant resource, when in need of diversion during the day time, is attendance at the neighbouring *hats* (weekly markets), of which there will often be as many as ten or twelve within walking or boating distance of his homestead. When he has no work to do, he may go to as many as 4 or 5 different markets in a week. The ordinary village in Bengal boasts no village shop, but the cultivator does not on that account ordinarily go to market to buy or sell. He makes it a social occasion where he meets his friends and learns the news. His boys, who will take a full share of any work to be done on the homestead after the age of 14 at latest, go to market with him and have additional resources for recreation in playing country games and, to an increasing extent, football and even cricket. In the neighbourhood of towns, where roads exist, the use of the motor bus is spreading, but, over much of the deltaic area, communication must be by boat for several months in the year and roads cannot be built.

##### 5. THE AGRICULTURAL DEPARTMENT.

Although as a result of the recommendations of the Famine Commission of 1880 the nucleus of the Agricultural Department was started in Bengal in the year 1885, the department in its present form originated in the year 1906, when a Director of Agriculture with a staff of experts was appointed. A provincial agricultural college was opened at Sabour in Bihar in 1910. In addition to providing agricultural education for the sons of a limited number of landholders, this college was intended to provide trained men to supply the staff of the agricultural institutions in the province. The general policy in 1906 was, in the first place, to establish experimental farms at selected centres which would also be depôts for seeds, implements and manures, and then to bring home to the cultivators the results obtained on these experimental farms by means of demonstration farms which would be both smaller and more numerous than the experimental farms and would be temporary in nature as they would be opened at such places and for such periods as occasions would require. It was also proposed to foster the development of agricultural associations among cultivators.

The history of the expansion of the Agricultural Department in Bengal is complicated by the territorial changes referred to in the introductory section.

The position to-day as regards the strength and composition of the Agricultural Department is that, in addition to the post of Director of Agriculture, there are, in the superior service, five posts of deputy directors of agriculture, two of which have been left unfilled as a measure of retrenchment, one post of assistant director of agriculture with which is merged the post of fibre expert, one post of agricultural chemist, two posts of economic botanists and one post of deputy director of

sericulture. It should be noted that the Director of Agriculture is responsible for the preparation and issue of the forecasts relating to the jute crop and that the work entailed is considerable.

Receipts and expenditure in India of the Government of Bengal under 'Agriculture' for the ten years 1917-18 to 1926-27 are shown in the following Table :—

Year	Receipts		Expenditure	
		Rs.		Rs.
1917-18	..	75,833		7,95,212
1918-19	..	1,08,280		9,47,088
1919-20	..	1,45,045		10,39,113
1920-21	..	1,36,308		10,84,440
1921-22	..	1,46,366		12,11,019
1922-23	..	1,20,486		12,44,596
1923-24	..	1,35,204		10,45,230
1924-25	..	1,26,969		10,18,709
1925-26	..	1,36,767		10,70,742
1926-27	..	1,56,237		11,97,222

For purposes of agricultural administration, Bengal is divided into three circles, eastern, western and northern. Each circle constitutes a deputy director's charge.

An outstanding feature of the present organisation for agricultural development in the province is the fact that there is no agricultural college around which the training in research and educational work can centre. The Sabour College which had continued to train staff for the Bengal Agricultural Department after the formation, in 1912, of the separate province of Bihar and Orissa, was closed in 1922 and so far no similar institution has been established in Bengal. Government have accepted in principle the establishment of an agricultural institute at Dacca with the object of training practical agriculturists with the necessary scientific equipment to enable them to take up the industry of agriculture on modern lines and of providing trained officers for the subordinate agricultural services. The scheme is an expensive one, involving an initial expenditure of some ten lakhs of rupees, and, in the present state of the provincial finances, it has not proved possible to proceed with it.

In consequence of the acceptance of the recommendations of the Lee Commission, recruitment for the Indian Agricultural Service has ceased. Other arrangements will, therefore, have to be made by the provincial Government for filling the superior posts in the future, but no decision as to the nature of these arrangements has yet been reached.

Below the superior posts mentioned above are (1) the Bengal Agricultural Service, (2) the Subordinate Agricultural Service and (3) the Lower Subordinate Agricultural Service for demonstrators.

The Bengal Agricultural Service consists of thirteen appointments on a scale of Rs. 200 to Rs. 750 per month, in which are included three special posts of superintendents of sericulture. These officers are



directly subordinate to the deputy directors of agriculture. The first assistants to the three experts, namely, the assistant fibre expert, assistant agricultural chemist and assistant economic botanist are also included in this service.

The Subordinate Agricultural Service is divided into two classes. In the first class are the laboratory assistants to the three expert officers mentioned in the preceding paragraph, the entomological, mycological and bacteriological assistants, and the district agricultural officers. These district agricultural officers have almost all received training at an agricultural college, supplemented by a practical course at the Dacca farm. Their duties are of an administrative nature. The scale of pay for this class is Rs. 125 to Rs. 300 per month, but the laboratory assistants and other assistants start on Rs. 160. In the second class are included the assistant farm superintendents, overseers and assistant masters of the secondary agricultural school at Dacca. Their scale of pay runs from Rs. 50 to Rs. 135.

The demonstrators in the Lower Subordinate Service are drawn either from the cultivating or the *bhadralog* class. Their training in the past has been defective, but, for the future, attendance at the Dacca Agricultural School will be a necessary qualification for entrance and men already in the service are now being put through a course of special training on the Dacca farm at the rate of ten to twelve a year.

The district agricultural officers and demonstrators, who are the channels through whom the Agricultural Department spreads its information, number at present 33 and 80 respectively. Administrative sanction has recently been obtained to increase the number of agricultural officers to 40. Before the Bengal Retrenchment Committee's recommendations were acted on, there were 63 agricultural officers and 160 demonstrators. The new superior appointment of assistant director of agriculture is meant specially to enable control to be exercised over these propagandist officers.

In the absence of an agricultural college, the research and experimental work of the department centres round the Dacca farm where also the training of subordinate agricultural officers is being carried out. The farm comprises an area of about 350 acres with an adjacent area of 300 acres acquired for the projected agricultural institute. The site of the farm is typical "old alluvium", a type of red soil, and is split up into alternate high land and paddy land. The farm is the headquarters of the Department of Agriculture and the chemical, botanical and fibre sections are housed there. Important work is being done on jute, rice and fodder crops. In Japanese millet, which is ready for cutting six weeks after sowing and matures seed within two months the department hopes that a valuable catch crop has been secured and it is on such catch crops that reliance must be placed for the better feeding of cattle, until irrigation on a large scale is provided. Artificial farm yard manure is made on a large scale. In 1926-27, three thousand *maunds* of this material were prepared from refuse straw,

sugarcane trash and weedings, with the addition of cattle urine, byre washings and a little bonemeal. Experiments in connection with silk worm rearing are also being carried out, especially in regard to the method of cultivation calculated to produce the maximum amount of food from mulberry.

A tube well is about to be sunk on the farm which, if successful, will enable investigations into the value of irrigation to be carried out.

In addition to the Dacca farm there are a number of other farms at which experimental and demonstration work is being conducted. In particular, important work is being done on the farms in the districts of Birbhum and Bankura with special reference to the problems relating to western Bengal. It is being demonstrated on both these farms that by terracing and drainage the upper slopes can be made to grow crops of cotton, millet, maize, etc., where before only precarious crops of rice were attempted. At the Burihat tobacco farm important experiments are being conducted in regard to the production of better grades of tobacco.

In addition to farms on which experimental work is carried out, there are a number of district agricultural farms opened subsequent to 1919-20 when the Government indicated that it was their policy to establish a demonstration and seed farm in each of the districts for the double purpose of testing the suitability to local conditions of the results of scientific experiments at the central research stations and of taking up the study of purely local problems. These farms are quite small in area. One interesting feature is that some portion of each farm is set aside to be run on economic lines with a view to bringing home to the public that agriculture on the lines recommended by the department can be made to pay. It was also the declared intention of the policy adopted in 1919-20 to interest the district boards in these district agricultural farms. The number of district farms so far established is nineteen. In addition to the farms managed by the Agricultural Department an interesting experiment has been made in the Mymensingh district by the setting up of two small farms in 1923 and 1924 at Kishoreganj and Jamalpur where the actual cultivation is carried on by cultivators under the direction of a farm superintendent, the cultivators being supplied with departmental seed for paddy, jute and sugarcane on condition that an equal quantity is returned after harvest in addition to the departmental share of the produce. The Kishoreganj farm, which has now been running for 3 years, is said to be a conspicuous success. The area of the farm is 83 acres. The multiplication of such inexpensive farms is being considered. The Agricultural Department regards it as probable that, in the near future, many *khas mahal* and Court of Wards estates and also some private estates will establish similar small demonstration farms.

Since 1922, the propaganda work of the department has mainly been carried out through the district farms. In 1923, it was decided to make the district farm the centre round which not only agricultural officers but also district and co-operative officers as well as non-official workers could gather for demonstrating agricultural improvements.

It is recognised, however, that the cultivator himself will seldom come to the farm in search of information and that the information which the department is ready to give out must be taken to him. This is the work of the district agricultural officers who, in the past, have been posted only to districts with departmental farms in order that their work in carrying out demonstrations at various fixed centres, of which there are a considerable number, might be properly extended. It has recently been decided to extend the postings of these officers to progressive districts which are without farms, as they will be now under the efficient control of the Assistant Director of Agriculture.

The work of the Agricultural Department is much assisted by the existence of forty private farms in the Presidency and Burdwan divisions and sixty farms in the Rajshahi division. These farms all grow strains of seed selected by the Agricultural Department; they do so because these strains are more profitable and each farm becomes, therefore, a demonstration centre, all the more effective because it is non-official.

In addition to these 100 private farms, there are 200 paddy seed farms under private management which have grown up as a result of the practical experience of departmental recommendations.

The special arrangements made by the department for the sale of the seed of improved varieties of jute are of interest. In 1925 the burden had become too heavy for the limited staff of the department and a government agent was appointed for the sale of jute seed. The department continues to control the amount of seed produced and tests its purity. The price at which the seed is to be sold is also fixed by Government. The arrangements are said to be working well. In 1926-27 a contribution of Rs. 20,000 was received from the London Jute Association for promoting the extension of the area sown with improved varieties of seed produced by the department.

Reference was made in the beginning of this section to the intention, as part of the agricultural organisation of 1906, to foster the development of agricultural associations among the cultivators. The part, however, that they have played over the last twenty years in agricultural development has, on the whole, been disappointing. Both the Presidency and Burdwan divisions have divisional agricultural associations to each of which the Government contribute Rs. 1,000 per annum and there are sub-divisional and district associations below them. But some good observers doubt whether this organisation of associations has any real vitality. It is certain that, where it achieves success, success is found to depend almost entirely on the driving force of one or two members and does not spring from corporate action. A suggestion has been made that organisation should come from below rather than above and that the union board and the circle officer, who supervises a group of union boards, should be invited to assist in such activities as distributing seed of improved crops. The policy is to work from both above and below, to keep divisional and district organisations alive, whenever possible, and to see that smaller units are also organised which may tend,

by revealing local needs, to keep the larger organisations in touch with realities. If the organisation of smaller units is successful, whether it is accomplished through union boards and circle officers, co-operative associations, or in some other manner, the larger organisations would have their part to play in bringing these local needs to the attention of Government and of urban sympathisers.

Among a population so large and an area so great as Bengal, it is not easy to estimate the precise extent of the influence exercised by the Agricultural Department. If many problems, including those of the dry lands of western Bengal, have had for want of men and money to be left temporarily on one side, substantial results in the deltaic area have undoubtedly been achieved. Improved varieties introduced by the department are now grown on a commercial scale over a wide area and were estimated in 1925-26 to bring in to the cultivator an increased return of two crores. Such figures are always open to challenge and ought never to be accepted as more than a rough estimate. But it is certain that in large tracts of Dacca, Faridpur, Rajshahi and Rangpur practically none but improved departmental jute is now grown, that the *tanna* sugarcane recommended by the department has almost entirely superseded local cane in the Burdwan district and that the department's improved strains of *aus* rice are now well known. The value of bonemeal for transplanted paddy and the benefits to be derived from the judicious use of phosphate, lime, potash and sulphate of ammonia on certain crops in certain soils are now also becoming known, thanks, in part at least, to departmental efforts.

In Bengal there is no tract in which the cattle can be described as being essentially different from those of any other tract, except that there is a difference in size between the cattle of the eastern and those of the western districts. The cattle of the former tract approximate in character to the cattle of Assam, while those of the western Bengal districts are more like the cattle of Bihar. In addition to their diminutive size, Bengal cattle can be easily distinguished from up-country breeds by the smallness of the dewlap and the sheath. To a large extent the needs of the province are met by importation of cattle from outside. The proportion of imported bullocks is usually highest in the largest jute growing areas. Fewer milch cows are imported than bullocks. The imported animals nearly all come from Bihar and the United Provinces to the principal cattle fairs which are generally held during the winter months. The price of a local bullock varies from Rs. 15 to Rs. 60 and of an imported bullock from Rs. 50 to Rs. 150. The price of cows is usually expressed in terms of their milk yield *per diem*; thus a cow is said to sell at Rs. 20 to the *seer*. Rinderpest is a great scourge and accounted, in 1926-27, for 93 per cent of the total mortality. Inoculation by the serum-alone method was carried out on a large scale, over 206,000 head of cattle being treated.

The reports of the Bengal Agricultural Department show that the question as to the steps to be taken for the improvement of the cattle of the province have been under discussion for many years.

According to the Bengal Cattle Survey of 1915, the average yield *per diem* of a Bengal cow is not more than one *seer*. The deficiency of fodder is considered to be one of the principal reasons for the degeneration of cattle, but improvement in feeding cannot be brought about until the cultivator realises that without better feeding he cannot hope to have better cattle.

There are two cattle breeding stations, one at Rangpur established in 1914 and the other at Dacca established in 1920. At Rangpur, there are two herds, one raised by selection from Bengal stock and the other a cross between Haryana and Bengal cattle. The animals on the Rangpur farm had been inoculated by the serum-simultaneous method prior to the outbreak of 1925-26 and remained altogether immune to rinderpest. At Dacca there is a herd of pure Sindhis. The standard of rejection for cows in all the herds is 2,500 lbs. per lactation of 300 days and it is hoped to raise it still further to 3,000 lbs. Dairying is a subsidiary activity of the Rangpur farm. A livestock officer under the Agricultural Department has now been appointed and it is hoped that a more vigorous and connected policy in cattle breeding may begin. The Sindhi herd is considered most promising and Government have sanctioned its expansion. Government have also approved the distribution of stud bulls through the agency of co-operative breeding societies and recognised bull keepers.

The interest of the Government in the subject of sericulture dates from 1886, and in 1896, *i.e.*, ten years before the Agricultural Department in its present form came into being, the local Government were opening centres conducted on scientific principles for the improvement of silkworm strains and the training of rearers. In 1898, the Bengal Silk Committee was established and Government allocated to the Committee the subsidy which they had hitherto given to the silk factories of Murshidabad. Progress was somewhat disappointing and a special Committee was appointed in 1906 to enquire into the condition of the silk industry in Bengal and, as a result of its recommendations, the Agricultural Department took up sericultural operations from April 1908 and has since continued the work. A new Bengal Silk Committee was formed and now consists of six official members and ten non-official members with the Director of Agriculture as *ex-officio* president of the Committee; the non-official members represent the silk trade both European and Indian and the cocoon rearers and silk weavers. The work of the Sericulture Department is carried on under the administrative control of the Director of Agriculture with the assistance of a deputy director of sericulture who has under him three superintendents between whom the silk districts of Bengal are divided. There are six central and six small nurseries engaged in the production of pure seed cocoons for sale to rearers and in pure line selection of indigenous races of silk worms. The present programme is to raise improved seed for distribution to the extent, it is hoped, of about 25 per cent of the total demand, to supervise the work of raising seed by private agency, to carry out demonstration and propaganda work and to give practical training to the sons of silk rearers.

## 6. THE VETERINARY DEPARTMENT.

Turning to veterinary work in the province, we find that veterinary education in Bengal started so long ago as 1893 with the establishment of a school which was subsequently raised to the status of a college in 1899. This college, which is situated in Calcutta, is in a flourishing condition. In 1926-27 it had 125 students of whom only 32, however, came from Bengal. Of the remainder, no less than sixty-six came from Bihar and Orissa, nine came from Assam, eight from Mesopotamia and the remaining ten from various parts of India. The number of students from Bengal proper showed recently a marked falling off, occasioned by the absence of prospects of appointments under district boards and by the stoppage of stipends granted by Government in pursuance of the recommendations of the Bengal Retrenchment Committee. The new veterinary college which is being established in Bihar and Orissa must have a very marked effect on the fortunes of this college unless an increased number of students is obtained from the presidency. This may happen, as stipends have been re-introduced from the 1927 session and an increased entry of students has already resulted.

The Veterinary Department, which is independent of the Agricultural Department, is organised as follows. There are three superior appointments, *viz.*, that of Director, Civil Veterinary Department, Bengal, and Veterinary Adviser to the Government of Bengal (one appointment), the Principal and the vice-Principal of the Veterinary College. These are filled by officers of the Indian Veterinary Service, recruitment for which ceased in 1924 in consequence of the recommendation of the Royal Commission on the Superior Civil Services in India. Its place will be taken by a Superior Provincial Veterinary Service. Below these officers are the assistant directors, and the assistant principal and lecturers at the Veterinary College who are members of the existing Provincial Service on the same scale of pay as the Provincial Agricultural Service, *viz.*, Rs. 200-750 per month. At present there are eight posts in the Provincial Veterinary Service and all of them are filled. Finally, there is the Subordinate Service consisting of 8 inspectors and 123 veterinary assistant surgeons. The inspectorate is filled by the promotion of senior and efficient veterinary assistant surgeons.

There is no Animal Diseases Act in Bengal nor is there at present any clear-cut separation of the contagious diseases staff from that for ordinary veterinary work. Both sets of duties are carried out by the veterinary assistant surgeons. The control of contagious disease is a direct responsibility of the Director, Civil Veterinary Department, except in Calcutta and its neighbourhood where the working of the Glanders and Farcy Act is in the hands of the Principal of the Veterinary College. His staff in the main consists of the veterinary assistant surgeons who in respect of their ordinary work are employed by district boards under an arrangement whereby the district board pays two-thirds of the officers' costs. These veterinary assistant surgeons are for disciplinary purposes under the ultimate supervision and control of the Director.

In addition to the hospital attached to the Veterinary College in Calcutta, where 2,562 cases were treated in 1926-27, there were in that year 45 dispensaries maintained in the districts which treated 56,184 cases. There are no itinerating dispensaries, but there are a certain number of itinerant veterinary assistant surgeons in connection with the supervision of contagious disease and these officers treat any cases of ordinary illness which may come to their notice, carrying a small box of medicines with them and, for any additional requirements, prescribing drugs which they know to be available in the local bazaar. When the veterinary assistant surgeon is energetic and resourceful, he undoubtedly does much good in treating cases which would never be brought to the infrequent district dispensaries.

### 7. IRRIGATION.

The problems presented by water in Bengal are now acknowledged to be of great importance alike to the welfare of the people and the development of agriculture. It is admitted also that little has as yet been done to seek for solutions. It might be thought that, in a province where the rainfall averages from 50 inches to 120 inches and more, annually, irrigation would not be required. But this is by no means the case. An increase of the fodder supply is, for example, most important and this must be obtained without any corresponding diminution of the present human food supply. This can only be secured by cultivation of fodder crops during the dry months and for this irrigation is required. Moreover, the cultivator on his small holding needs subsidiary occupations if his standard of comfort is to be raised; there can be no better way of achieving this than by turning areas of once-cropped into areas of twice-cropped land.

The present Irrigation Department, which was separated from the Public Works Department in 1921, is charged with the following multifarious duties: irrigation proper, flood disposal, regulation and training of tidal and non-tidal rivers, anti-malarial and sanitary drainage, and navigation. Only the agricultural aspect of irrigation will be dealt with here.

There are two canals in use at present for irrigation purposes, the Midnapore and Eden canals. The Midnapore Canal is 69 miles long and irrigates, through 287 miles of distributary channels, an area of 75,000 acres. The Eden Canal is a small work irrigating 23,000 acres.

There is only one scheme of any importance at present under construction, that for taking off water from the Damodar river in the Burdwan district. This new canal will irrigate nearly 200,000 acres of paddy in the Burdwan and Hooghly districts, including about 22,000 acres now irrigated from the Eden Canal. A small scheme, the Bakreswar Canal, is under construction in the Birbhum district. In a few districts, attention is being given to the improvement of existing water-channels; but, in the absence of comprehensive surveys of the large rivers and other water courses, progress is difficult.

Important changes affecting the distribution of the available water supply have taken place in western Bengal within comparatively recent

times. The unfavourable nature of these changes is reflected in a decline of the population due in part at least to the drying up of tanks and reduction in the subsoil water level making impossible over large areas the intensive cultivation of forty to eighty years ago. There is undoubtedly scope for conserving the waters of small streams and the natural rainfall by constructing flow irrigation channels and increasing the number of tanks. The situation is specially serious in the districts of Burdwan, Birbhum, Bankura and Midnapore.

In two out of these four districts, Bankura and Birbhum, the people have begun to help themselves and marked progress is being made in co-operative irrigation, chiefly in the direction of the excavation of new, and the re-excavation of old, tanks and the building of irrigation embankments for the storage of water. The first society was started in the Midnapore district in 1916, and in 1926 the societies numbered 350 with a total membership of 12,092. In Bankura, in 1926 they controlled a total irrigable area of 16,870 acres and had a working capital of Rs. 1,69,326. In Birbhum, the corresponding figures were 6,687 acres and Rs. 54,765.

A special officer was posted by Government for some time to the Bankura and Birbhum districts to advise co-operative societies and other agencies undertaking schemes under the Agricultural and Sanitary Drainage Act of 1920. Recently, special irrigation subdivisions have been created in both these districts to deal with minor irrigation schemes whether they are carried out departmentally or under the Act of 1920.

Wells are a responsibility of the Agricultural Department and provision has been made for the appointment of an agricultural engineer whose special duty it will be to investigate possibilities of well irrigation and of water-lift. There is scope for well irrigation in the districts round about Calcutta for the cultivation of the potato and also in some parts of west and north Bengal, for the cultivation of tobacco. In west and north Bengal the fragmentation of holdings is an obstacle to well sinking. Very few wells have so far been sunk and practically all of them have been of the open type. The few tube wells which exist have been installed in order to obtain uncontaminated drinking water, and so to prevent cholera.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

The forests of Bengal lie mainly along the Himalayas in the north, the Sundarbans in the south, and in the Chittagong district and Chittagong Hill tracts in the south-east. They exercise, therefore, but little influence on the agriculture of the province generally. The total area of forest under the administration of the Forest Department is 10,600 square miles. 6,283 square miles are returned as closed to grazing and grass cutting, 877 square miles are open to both, and over 1,837 square miles grass cutting only is allowed.

From the point of view of agriculture, it is the *zamindari* forest tracts of western Bengal in the Bankura and Midnapore districts which most claim attention. Here there is a steady recession of *sal* (*Shorea robusta*) forest due to over-cutting and the evil results in the violent flooding of streams and the consequent deterioration of adjacent land owing to



burial under hill detritus are already much in evidence. Re-afforestation is urgently required in a few areas; and conservation of still existing forest by lengthening the period of rotation for cutting (at present only three to four years) is everywhere desirable. But it is not easy to convince the villager who needs fuel and the proprietor who needs cash that temporary self-denial will be more than repaid later on. An officer of the Forest Department has recently been placed on special duty to investigate these problems of deforestation and erosion. It is possible that regeneration of scrub jungles in the neighbourhood of villages may be effected through village co-operative societies and such societies have been started as an experiment in the district of Bankura.

Although not under the Forest Department, it is relevant to notice here that some 3,153 acres are under cinchona. Considerable difficulty is being experienced in securing suitable soil for further extension.

### 9. GENERAL EDUCATION.

The first attempt to reorganise the indigenous primary schools known as *patsalas* was made in Bengal in the early part of the nineteenth century largely through the initiative taken by some of the Christian missionaries. In 1814, one Mr. May started a primary school in Chinsurah and four years later at the time of his death there were 36 such schools attended by about 3,000 pupils both Hindus and Muhammadans. This pioneering work in primary education in Bengal attracted the attention of the East India Company who granted a monthly sum of Rs. 600 towards the maintenance of the primary schools. Although, in various despatches of the Government of India, great emphasis was laid from time to time on the need for primary education in rural areas, the demand for higher education became so great that from the middle of the nineteenth century onwards the growth of higher education has been out of all proportion to that of primary education in the presidency. During the past six years, for example, government expenditure on university education has increased by fourteen lakhs while its expenditure on primary education over the same period has increased by four lakhs only.

The total expenditure on public instruction in 1926-27 was Rs. 397 lakhs as compared with Rs. 309 lakhs in 1920-21. This total expenditure was met from the following sources:—

—		Provincial revenues	District funds	Municipal funds	Fees	Private sources
		Rs. (lakhs)	Rs. (lakhs)	Rs. (lakhs)	Rs. (lakhs)	Rs. (lakhs)
1926-27	.. ..	148	16	6	162	65
1920-21	.. ..	109	14	2	135	49

Of the expenditure in 1925-26, 37·28 per cent came from government funds, 4·03 from board funds, 40·81 from fees and 16·37 from other sources.

In 1927, the proportion of boys of school-going age in primary schools was 37·1 per cent and of girls 11·7 per cent. The percentages of literacy for persons of 20 years of age and over returned at the censuses of 1911 and 1921 are as follows:—

		Male	Female
1911	..	19·9	1·3
1921	..	22·5	2·1

In the following Table are given particulars of the institutions, scholars in attendance and cost per head of each pupil:—

Kind and number of institutions	Number of pupils	Percentage at each institution	Cost per pupil per annum	
			Rs.	a. p.
2 Universities .. ..	.....	.....	.....	.....
41 Arts Colleges .. ..	22,131	1·15	152	12 5
14 Professional Colleges .. ..	6,281	0·33	355	0 0
1,003 High Schools .. ..	238,461	12·38	38	2 10
1,690 Middle Schools .. ..	147,486	7·65	16	4 6
38,197 Primary Schools .. ..	1,399,535	72·64	4	0 9
3,166 Special Schools .. ..	112,720	5·85	26	12 11

Of the two universities, Calcutta is still mainly an examining body, but it has now made itself responsible for advanced teaching for which purpose it has a staff which is in the main distinct from the staff of the affiliated colleges. The Calcutta University Commission advocated a Faculty of Agriculture and a university course in agriculture. The university has not yet seen its way to adopting these measures, but it now possesses a Chair of Agriculture. The Matriculation Regulations Committee which reported in 1925 recommended, *inter alia*, that candidates should produce a certificate that they had received training for a specified period according to a prescribed syllabus and under an approved teacher in at least one of a number of 'practical life' subjects of which agriculture and gardening was one. The University at Dacca is of the residential type but has so far made no provision for higher agricultural education. It should be mentioned, however, that the late Kumar Basanta Kumar Roy bequeathed Rs. 2½ lakhs to Government for the benefit of Rajshahi College, a college maintained by the Government and affiliated to the Calcutta University. Subject to the creation of one small scholarship, the whole of this munificent donation is to be used for the promotion of advanced instruction at the college in zoology, botany and other scientific subjects and, if possible, a higher course of instruction in agricultural subjects, including dairy farming and cattle breeding, is also to be given. A scheme for utilising this endowment is now under consideration.

The arts colleges prepare students for university examinations. Intermediate colleges of the type recommended by the Calcutta

University Commission in 1919, *viz.*, an institution which shall bridge the period between high school and university studies, have as yet only been established at Dacca where there are three, two for men and one for women.

The Commission also recommended the introduction of agricultural courses and an improvement of the facilities for the study of the sciences which underlie agriculture. But these measures must no doubt await the general establishment of intermediate colleges. At present, in the words of the Director of Public Instruction : "The higher educational system of Bengal still remains almost unrelated to the rural economy." In so far as measures establishing relationship must involve expenditure, it is, indeed, arguable that to take them before improvements are effected in primary and secondary education would be to put the cart before the horse.

Passing over the professional colleges which have, at present, no direct interest for the rural population, we reach, in descending the educational ladder, middle and primary schools, the efficiency of which is of such critical importance to the cultivator.

As regards primary schools, unfortunately all the witnesses are agreed that efficiency is at present far to seek. The average number attending each school is only 30 to 40, the vast majority of the schools have only one teacher, and 78 per cent of the numbers enrolled never get beyond the first two classes and never achieve literacy. This is not the time and place to discuss remedies for a state of affairs which is not by any means peculiar to Bengal. The Resolution on Primary Education published by the Government of Bengal on 25th September 1926 and the evidence offered by the Director of Public Instruction and the Principal of the Teachers' Training College at Dacca may be consulted by those who wish to make a closer study of the present state of primary education in Bengal and of the measures that must be taken, if the policy admirably expressed in the Government of India Resolution of 11th March 1904 is to be attained : "the aim of rural schools should be not to impart definite agricultural teaching but to give the children a preliminary training which would make them intelligent cultivators, would train them to be observers, thinking and experimenting in however humble a manner and would protect them in their business transactions with the landlords to whom they pay rent and the grain dealer to whom they dispose of their crops."

Some reference should, however, be made here, on account of its critical importance, to one of the measures for improving primary education, *viz.*, the introduction of the compulsory principle.

Although free and compulsory education has long been a subject of considerable discussion, no sustained efforts have been directed to realise the ideal. In May, 1919, the Bengal Legislature passed an Act endorsing the principle of compulsory education but, partly through the fact that the Act was permissive in character and largely on account of financial reasons, only one local authority, the Municipality of Chittagong, has so far availed itself of the provisions of the Act. The scheme of free and

compulsory education submitted by this municipality was sanctioned in September 1927.

As it was realised that the introduction of self-government without giving the people the benefits of a free primary education in rural areas may result in failure, a Primary Education Bill for rural areas was prepared in 1925-26 and a Government Resolution issued endorsing its principles.

The text of the Bill has now been circulated for the information of the public. The sanction of the Governor General has been obtained and it will be introduced in the Bengal Council at the first favourable opportunity. The Bill provides for the constitution of district school boards to which management of schools in each district will be entrusted. The powers conferred upon the school board are very wide and its constitution is designed to make it a most important local body.

Finance has been the chief obstacle to the spread of primary education in Bengal. Provision, therefore, has had to be made in this Bill to raise money by a special cess for education. It is proposed to levy the cess at the rate of five pies on each rupee of annual rental value of land and of annual net profits from mines, quarries, tramways, railways and other immovable property. It is interesting to note that Lord Stanley, Secretary of State for India, in his Education Despatch of 1859 first mentioned and approved of a cess on land for education. In addition to the proceeds from this cess, the school boards will receive grants-in-aid.

Notwithstanding many discouraging factors there is a growing desire for education among the people themselves, the most striking indication of which is, perhaps, to be found among the Namasudras of Bengal. They represent a "depressed" section of the population numbering about two millions. Many of their schools are organised by their own efforts. The Seventh Quinquennial Review states that in the Dacca division, where they are specially numerous, one in twenty of the total population of Namasudras is at school. There are other backward communities in Bengal among whom the desire of education is no less conspicuous.

Coming to secondary education there are, as has been seen, 1003 high schools attended by 238,471 pupils and 1,690 middle schools with a membership of over 147,000. It is at this stage that educational opinion in Bengal, as elsewhere in India, has been most exercised as to the proper course to pursue. The Director of Public Instruction voiced that opinion when he stated in his evidence that the present system of secondary education in rural areas, if it had done little harm to agriculture, had certainly done little good. Its tendency up to the present has admittedly been to draw the best of the rural population areas away from the country instead of equipping them for life in it. Granted, however, that the system certainly needs modification to bring it into some relationship with the life of the country, there has been considerable hesitation in Bengal, as elsewhere, in the last ten years as to what form this modification should take.

The first definite step taken was to accept for Bengal the recommendation of the Conference on Agricultural Education held in Simla in 1917 that one or two vernacular agricultural schools should be established in each province with the object of providing instruction for the sons of cultivators without arousing in them a distaste for rural life. A school of this type was accordingly opened at Dacca in 1920 and a second school was opened at Chinsura in 1921. Such purely agricultural schools had the defect, nowhere more serious than in Bengal, of depriving the boy of his chance of a high school and university career. No parent would risk the career of a promising boy in this way. But time was hardly given to enable this defect to disclose itself in the case of Dacca and Chinsura, for it was decided, as the result of discussion of the whole subject of agricultural education at the meeting of the provincial Board of Agriculture in August 1921, to convert these schools, as part of a bigger scheme for agricultural education, into agricultural high schools with a view to training (1) departmental demonstrators, (2) agricultural teachers and (3) sons of zamindars to farm their own lands on modern lines.

Financial stringency, however, caused the bigger scheme to be held in abeyance and, on the advice of the Bengal Retrenchment Committee, Chinsura School was closed in 1924 as, owing to the absence of immediate prospects of government employment, the number of pupils had declined. It is intended, however, to maintain the agricultural school at Dacca and to make attendance at it a necessary qualification for appointment as a demonstrator in the Lower Subordinate Agricultural Service. The school is also to be used for the training of teachers of the new agricultural classes which are to be started in the middle English and high schools to which reference is made below. The course at the school lasts for two years.

Informed popular opinion, however, continued to press for the introduction of some vocational element in education above the primary level and, in 1922, the Bengal Unemployment Committee stressed in their Report the importance of introducing agriculture into education with a view to popularising it as a profession among the educated middle classes. Accordingly, in 1924, a Conference of official and non-official agriculturists and educationists was convened. This conference passed two resolutions supporting the teaching of elementary agriculture combined with practical work in the field. Reference has already been made to the recommendation of the Matriculation Regulations Committee which is yet another expression of informed opinion that education in Bengal must be brought into touch with economic realities.

One important outcome of the resolutions of the Conference of 1924 was the appointment of a Committee to investigate the possibilities of introducing agricultural classes in middle schools in Bengal on the lines so successfully started in the Punjab and subsequently adopted by Bombay and the United Provinces. Bengal had already, indeed, two schools with agricultural classes of the Punjab type, one of which at Amarpur

had been, and is, a great success; the Committee, after seeing the schools in the Punjab and having regard to the success of the school at Amarpur had no hesitation in recommending the initiation of a regular programme of opening agricultural classes with small farms attached to them in middle English and high schools (vernacular middle schools hardly exist in Bengal). The Committee's recommendation has been sanctioned and the training of teachers has just started. There are already eight schools with such classes in Bengal, but they were started independently of this scheme.

It has also been decided recently to start, as an experimental measure, three purely vocational elementary schools in selected rural areas to provide practical instruction in agriculture after the completion of the primary course and when the boys have already acquired some experience of work on the land.

Any reference to education in India would be incomplete, if it did not draw attention to the importance of female education. The spread of literacy among the women of rural Bengal is the essential preliminary to the solution of many problems. It is from the growth of higher education among women, with the consequential social enlightenment and freedom in all directions which will accompany it, that aid must be looked for in staffing the greatly increased number of primary schools which will be required if the campaign against general illiteracy is to achieve success. The figures in the Table below indicate how much has still to be done before the state of female education can be regarded as satisfactory.

Female population (male population in brackets)	Percentage of scholars to total population (percentage of male scholars in brackets)	Percentage of literacy (20 years and over) (percentage of male literacy in brackets)	Percentage of expenditure from all sources to expenditure on male education	Distribution of female scholars among educational institutions		
				Higher	Secondary	Primary
22,500,000 (24,151,000)	1.88(7.94)	2.1(22.5)	12.7	384	19,206	396,410

These figures show very clearly that the typical girls' school is the primary school. Moreover, it is estimated that over 73 per cent of the total number of the girls at school are withdrawn before they achieve literacy. Only in a few of the larger centres of population does secondary and collegiate education exist for girls at all.

It has been the experience of Europe and the United States that the success of a system of primary education is largely dependent on a supply of women teachers. Unfortunately, it is not only lack of education which makes it impossible to draw on women as teachers. A recent Report of an unofficial Commission of Enquiry on Village Education in India stated:—

“The social difficulties which so militate against an adequate supply of women teachers are well-known, and are immensely serious for the welfare of the country. All the primary school work in the villages is pre-eminently women’s work, and yet the social conditions are such that no single woman can undertake it. The lack of women teachers seems to be all but insuperable except as the result of a great social change.”\*

But it would not be right to close on a note of despair. While the problem is vast and the forces of social inertia still very strong, the subject of female education attracts year by year greater attention. The Bengal Women’s Educational Conference of 1927 is a bright omen of future possibilities. All those interested in the subject should consult the Report of that Conference which passed resolutions condemning the present state of the primary education of girls in Bengal as “acutely unsatisfactory” and commenting on the inadequacy in regard to number, equipment and staff of the present institutions for women teachers.

#### 10. CO-OPERATION.

As elsewhere in India, co-operation took definite form in Bengal with the passage of the first Co-operative Credit Societies Act in 1904. The first Registrar of Co-operative Societies was appointed in that year and, by the end of 1904-05, sixty-seven societies had been instituted.

By the end of June 1926, these 67 primary societies had grown to 12,819 with a membership of 453,031. Of these societies no less than 11,672 were agricultural, consisting of 11,136 credit and 536 non-credit societies.

The working capital of these 12,819 societies amounted to Rs. 7·52 crores. Excluding the amount which is counted more than once owing to the separate treatment of the funds of the Provincial Bank, the central banks, and primary societies, the actual cash employed in the movement amounted to Rs. 4·23 crores during the year. Of these resources, the agricultural credit societies held Rs. 2½ crores as working capital. To this sum, share capital contributed Rs. 20 lakhs, members’ deposits Rs. 9½ lakhs and reserve fund Rs. 33½ lakhs, the balance being made up mainly by loans from central banks, which amounted to Rs. 1½ crores.

It is of interest to note that the societies have spread throughout the presidency, but that the movement is exceptionally weak in the districts of Bankura, Howrah and Hooghly. In the hill districts of Darjeeling and Jalpaiguri and to a lesser extent in Chittagong district, the movement has not yet made much progress.

In addition to these 12,819 primary societies, there are 98 central banks to which 11,152 of the primary societies are affiliated, and at the apex there is a provincial bank with a working capital of over Rs. 75 lakhs.

The government staff now assisting the movement consists of one registrar, his personal assistant, five assistant registrars (one for each of the five commissioners’ divisions), one chief auditor, four divisional

\* Village Education in India, 1922, published by the Oxford University Press.

auditors and 98 auditors, and 76 inspectors (including ten temporary inspectors of irrigation societies and one temporary inspector for the organisation of societies for the consolidation of holdings). The chief duties of the department are registration, supervision and audit, enquiry and inspection under Sections 35 and 36 of the Co-operative Societies Act of 1912, arbitration of disputes and liquidation of societies.

The officers of the department with the greatest responsibility for the success of the primary credit societies are the inspectors and auditors. The inspectors have hitherto been recruited by nomination by the Registrar, with the approval of Government, from among university graduates or by promotion from the rank of auditors. They will, in future, be recruited on the results of a competitive examination subject to the reservation of one-third of the vacancies to be filled by promotion from the rank of auditors. The duties of the inspectors are to assist the central societies in maintaining supervision over the field staff. They also have to satisfy themselves that the primary societies under each central society are receiving proper attention in regard to inspection and audit, and they have to carry out personal super-audits of a certain percentage of the societies and test the work of the auditors. They also act as arbitrators in disputes and as liquidators of useless and insolvent societies. The pay of the inspecting staff commences at Rs. 125 a month and goes up to Rs. 300 per month.

Auditors have similarly been recruited in the past by nomination by the Registrar from among candidates who have passed the university intermediate examination and by the promotion of a certain number of supervisors. They will in future, like the inspectors, be recruited by competitive examination with a reservation of 20 per cent of the vacancies in favour of the supervisors. The intention is to have one auditor for every 100 societies with a view to completing the statutory audit within the year without resort to the employment of central bank supervisors who are officers employed by the co-operative societies themselves. Such resort is obviously incompatible with the aim of having the audit conducted by an outside and independent agency. The expenditure on account of the audit staff is ultimately a charge on the audit fees levied on the co-operative societies, except that the salaries of ten auditors are met from provincial revenues in consideration of the exemption from payment of audit fees granted by Government to societies of less than eighteen months' standing.

Propaganda, organisation and internal discipline are being more and more taken over by the societies themselves and their federations; and departmental activities in these respects are confined to developing special types of societies and to organising credit societies in areas which still remain outside the influence of the co-operative movement.

The credit movement in the province is now regarded as having gained such strength as to advance by its own momentum and it is said to have already effected a marked reduction in the prevailing rates of interest in the districts where it is strongest, such as Mymensingh, Tippera



and Midnapore, and to have taught a large section of the people, who never used their surplus monies themselves, the habit of investment. But in Bengal, as elsewhere, it must be admitted that the co-operative movement is as yet only carrying a tiny fraction of the total finance required annually by the cultivators.

Co-operative credit forms by far the most important feature of the co-operative movement in Bengal, as elsewhere in India. There were, however, at the end of June 1926, 53 agricultural purchase and sale societies, 350 irrigation societies, 74 milk societies, 21 co-operative agricultural associations, and one *ganja* society at Naogaon.

The problems of the successful joint sale of agricultural produce are found everywhere to be far more serious than those attending the organisation of credit, owing, largely, to the difficulty of obtaining skilled business advice at a remuneration which the societies can afford to pay. It is, therefore, particularly interesting to note that several societies for the sale of jute have been started and that the Co-operative Department is making every effort to overcome these difficulties, which are specially marked in the case of a product such as jute where there is a strong speculative element in the trade and great fluctuation of prices. Further particulars regarding these will be found in the section dealing with Communications and Marketing. Paddy sale societies have also been started and to enable them to make the most effective disposal of the members' stock a central godown has been started in Calcutta with the help of a subsidy from Government.

Reference has already been made to the work of the 350 irrigation societies and a description of a further activity not yet mentioned, namely that of the Central Co-operative Anti-malarial Society and its many daughter societies, will be found in the section dealing with Public Health and Sanitation.

Some reference to the work of the Milk Union, Calcutta, and its dependent societies may be of interest in view of the importance of obtaining for Calcutta an adequate and pure milk supply. The operations of each of the 71 milk societies constituting the union is generally confined to one village, the members of which are *bona fide* milk producers whose primary occupation is agriculture with milk production taking a secondary place. The societies are arranged in groups for the purpose of collecting milk by paid milkers and carriers. Each group consists of six or more societies. The milk obtained from the societies in a group is collected at a depôt, which is under the charge of a depôt manager whose duty it is to receive the milk in properly sterilised cans, measure it, note the general condition by lactometer and give a receipt to the carrier. The work of the depôt is looked after by a depôt supervisor who is maintained by the union. The milk when received by the union is distributed by their staff, either salaried or paid on commission, or by traders who purchase their supply outright. The union has established distributing centres at convenient places all over the city. Government assists the movement by lending a veterinary assistant surgeon who examines

and treats the cattle belonging to the societies, supervises the market arrangements and looks after the sanitary condition of the cow sheds. The operations of the union are at present on a very small scale; its sales on the average throughout the year are only about 70 *maunds* of milk as against an estimated daily consumption of 3,000 *maunds* in the city of Calcutta. The experiment is, nevertheless, an important and hopeful one. The financial position of the union is sound. Every year, except in the year of its foundation (1919-20), it has made a profit; the profits have steadily risen and out of a total working capital of Rs. 75,368, only Rs. 15,834 or about 20 per cent has been obtained from outside sources. The way in which the union spends part of its profits is of striking interest. Rs. 800 goes towards the education of sons of the members of the societies by means of assistance given to five primary schools and one secondary school in the area in which the union operates. In addition, it has given a donation of Rs. 600 towards the construction of two primary school buildings. The union has also arranged for the delivery of lantern lectures on sanitation, anti-malarial and anti-*kala-azar* work, and has made provision for treating any of its members who may be suffering from malaria and *kala-azar*. Finally, as a work more strictly relevant to its object, the milk union has distributed fifteen stud bulls to the primary milk societies and has made provision for replacing them when necessary.

The Naogaon Ganja Cultivators' Co-operative Society, Limited, also deserves notice. This is a successful instance of the routing of oppressive middlemen. The cultivators have been given a monopoly of the cultivation of this drug which is sold under license from Government. With a membership of 3,694 it sold over Rs. 9½ lakhs of products; its total management costs were under one lakh of rupees although it has to contribute towards the cost of the excise preventive staff; and it made a profit of over Rs. 2¼ lakhs, paying a dividend of 12½ per cent on its shares. It maintains a reserve fund of Rs. 2½ lakhs. The most interesting thing about the society is, however, the considerable sums which it spends on schemes of public utility in its vicinity. It spent, in 1925-26, Rs. 9,300 on maintaining three medical dispensaries and one veterinary dispensary in addition to defraying the cost of the buildings; Rs. 10,000 towards the cost of primary and secondary schools; Rs. 4,000 on improving communications and also gave a donation of Rs. 5,000 to the Naogaon Agricultural Association. In addition to spending no less than Rs. 28,300 *plus* the cost of buildings in these excellent ways in the course of one year, it also maintains night schools and girls' schools which are reported to be doing very good work.

With the assistance of Sir Rabindra Nath Tagore, six rural reconstruction co-operative societies have recently been started in the Birbhūm district. These societies have, as their aim, general social improvement on the widest basis. Their activities include the provision of better seeds and implements, the promotion of cottage industries, the stocking of tanks with fish, as well as the more directly social services of education and sanitation.

## 11. COMMUNICATIONS AND MARKETING.

Prior to 1850, there were no railways in Bengal. The Eastern Bengal and East Indian railways which are State railways, and the Assam Bengal and Bengal Nagpur railways, which are managed by companies, now serve the province. The East Indian and Bengal Nagpur railways serve the west of the province, the Eastern Bengal Railway serves the north-central and central-eastern areas, while the Assam Bengal traverses the eastern marches of the province. Of these railways, the Eastern Bengal is by far the most important to the province, its milage amounting to one-half of the total provincial railway milage. There are also 237 miles of light railway. The total milage open to traffic in 1926 was 3,281 miles. As in 1921 the open milage was 3,270, railway facilities have not improved during the quinquennium. This stagnation has been due to financial stringency which is now passing away. While no big construction is in contemplation, some 80 miles of new line, in addition to the construction of the Calcutta Chord Railway, mainly an urban interest, were sanctioned in 1925-26 and in the same year the Railway Board approved of surveys being undertaken for another 140 miles of line. The Railway Board are also undertaking for the local Government a traffic survey for the proposed railway linking Dacca with Aricha on the Padma, a distance of about forty miles, on condition that the local Government pay the cost of the survey if its result is to prove the unremunerative character of the line. If built, this line will open up the whole tract of country between the Padma and Dharleswari rivers. Another project, the Faridpur-Bhanga Railway, has had to be dropped for the present as the Railway Board did not succeed in obtaining from the Government of Bengal or the District Board of Faridpur any guarantee against loss.

The total length of metalled roads in the province is estimated to be about 3,410 miles and that of unmetalled roads about 34,273 miles. These figures include 2,496 miles of metalled, and 33,557 miles of unmetalled, roads maintained by district and local funds, but exclude roads maintained by municipalities. Thus, three-fourths of the metalled roads and practically all the unmetalled roads are maintained by district and local authorities. The evidence indicates some apprehension that local authorities are scarcely sufficiently alive to the great responsibility thus laid on them for promoting the economic welfare of the cultivator and of the province generally. The provision of finance is the stumbling block as in the case of so many other measures in Bengal the need for which is generally admitted. The total expenditure on communications during the year 1924-25 was about Rs. 28½ lakhs out of which about Rs. 90,000 came from the Government of India as a grant towards the upkeep of trunk roads.

In the deltaic region of central and eastern Bengal, roads are to a very large extent replaced by waterways. As these serve the jute districts, the maintenance of navigation through them is of great economic importance and the steamers plying on them take the place of railways as targets of public criticism. The responsibility for such maintenance

lies with the Irrigation Department which maintains a fleet of dredgers. On small waterways, the encroachment of the water hyacinth (*Eichhornia crassipes*) is causing anxiety; in some instances, channels of communication have been choked up entirely, while, in others, the movement of agricultural produce has been appreciably hampered. The Narayanganj Chamber of Commerce brought the danger of the pest to the notice of Government in 1914. No practicable scheme for dealing with this pest has yet been evolved.

It has been decided not to proceed further with the Grand Trunk Canal project. This project, which was estimated to cost about three crores of rupees, was to reduce by 136 miles the distance from Calcutta to the east by offering an alternative waterway to that of the outer steamer route by the Sundarbans. Doubt was, however, expressed by the Bengal Chamber of Commerce and the steamer companies whether the opening of this new waterway would enable the present outer steamer route, which has to be kept open by dredging, to be dispensed with, and Government decided that it was impossible, for financial reasons, to incur expenditure on keeping two routes open.

While there is still abundant opportunity for development, Bengal, in comparison is made with systems of communication in other provinces, is well served by her system of roads, railways and waterways.

#### *Marketing.*

The features of Bengal marketing are the number of *hats* or weekly markets, often of a proprietary character, and the number of middlemen between the cultivator and the consumer. Excluding the Chittagong Hill tracts and the Darjeeling district, the number of *hats* returned at the census of 1921 was 6787, and of these 1398 had bazaars which were open every day. Whether there is a daily bazaar or not, each *hat* usually has two market days a week. The average distance between *hat* and *hat* is only four miles and there is a sufficient number of them to provide one for every thousand males of fifteen years and over. But the average attendance is far more numerous than this, which indicates that, as a rule, a cultivator regularly attends more than one *hat*. Many of these *hats* are more occasions for social intercourse than centres of trade. Much of the trade done is small retail trade as these *hats* take the place of the village shop which, in rural Bengal, is conspicuous by its absence.

Of the commercial crops, tea is in quite a special position as a highly organised industry. No middlemen participate in the marketing of tea. In the case of the other commercial crops, the number of middlemen is larger than in the case of ordinary food crops. Their organisation and the length of the chain differ somewhat with each variety of crop. Broadly speaking, however, for the three principal commercial crops, namely, jute, rice and tobacco, the procedure is for primary collectors to go from cultivator to cultivator or to visit the small primary markets, purchasing the crop surplus to the needs of the cultivator and his immediate vicinity. Purchase is usually outright. The primary collectors take their purchases to the big centres of trade. There it is purchased by or on behalf of traders and financiers who may either export it to Calcutta, or, more usually, sell it to a third party who has storage

accommodation, and will wait his time to sell to the exporter. This succession of middlemen is not, of course, invariable—a cultivator in the case of jute, for instance, may deal with the baling firm direct and thus share between them as principals what would otherwise have gone to the middlemen as commission. The amount of that commission varies from crop to crop and is differently computed by different observers but is not, perhaps, far short of 20 to 25 per cent of the current value of the crop 'on the ground', where the normal chain of these middlemen links the producer to the exporter.

The marketing problem in Bengal is, in essentials, the same from the agricultural standpoint as elsewhere in India: it is to obtain for the cultivator a greater share of the price of his produce. One solution is to develop co-operative marketing. In spite of the difficulties at the present stage of the co-operative movement, a start has been made in the case of both jute and paddy. The jute societies in particular merit notice. Five societies are already working, possess godowns and baling machinery of their own, and are regarded by an independent though interested witness as possessing great possibilities provided the up-country administration is good. The Registrar of Co-operative Societies states that the societies have engaged competent managers. They have, moreover, in his opinion, been successful within the short time (about two years) that they have been in existence in establishing so good a reputation in the Calcutta market as to obtain for their bales the same price as for bales packed by European firms. These societies are to act as supply societies to the cultivators during the off season for jute sales.

The operations of the milk union and its constituent societies, which are interesting as a successful instance of highly organised co-operative marketing, have already received mention in the section dealing with Co-operation.

## 12. LOCAL SELF-GOVERNMENT.

The frame work of local self-government in Bengal is a central directing authority, controlling a net work of local authorities charged with responsibility for local executive action.

The central authority is the Local Self-Government Department of the Government of Bengal, consisting of a Minister for Local Self-Government, a Secretary and a Secretariat. Two separate technical sub-departments are attached to the Local Self-Government Department, one under the Director of Public Health and the other under a Chief Engineer for Public Health. The Public Works, Medical, Education, Veterinary and to some extent, the Agricultural departments also have relations with the local authorities.

The following local authorities at present function in the rural areas of Bengal:—

- (a) District boards.
- (b) Local boards.
- (c) Union boards.
- (d) Union committees.
- (e) *Chaukidar panchayats*.

Of these it is not proposed to refer further to local boards,\* union committees and *chaukidar panchayats* as the first named have in general very little power and the union committees and *chaukidar panchayats* † are being steadily replaced by union boards.

The district boards function under the Bengal Local Self-Government Act of 1885. There is one board for each of the 27 districts in Bengal and each board is reconstituted once every three years. The number of members varies from 15 to 33. In 23 of the districts, two-thirds of the members are elected and one-third nominated; in one district one-half only are elected and in two districts all the members are nominated. The nominated members are selected by the Divisional Commissioner on the recommendation of the District Magistrate subject to the approval of Government.

The powers of these district boards which more particularly affect rural agricultural questions are as follows. They are instructed under the Act to maintain and manage primary and middle schools, dispensaries and hospitals, roads, bridges and channels of communication and to construct new roads, to provide and improve the supply of drinking water, to provide new drainage and improve existing drainage and generally to arrange for the proper sanitation of the district. District boards may hold fairs and agricultural and veterinary exhibitions, provide veterinary dispensaries for treatment and prevention of cattle diseases, and veterinary training; also may provide for the improvement of cattle breeding. They may make grants in aid of measures for agricultural and veterinary improvement, though they are not enabled to employ a staff for agricultural demonstration work nor can they establish farms of their own. They may also carry out any local work likely to promote the health, comfort and convenience of the public. The average income of each board for the year ending 31st March 1926 amounted to nearly five lakhs of rupees. About three-fifths of the total income of the boards is derived from the road and public works cess. This cess is a local rate levied now at the maximum rate of 6½ per cent (one anna in the rupee) of the annual value of the land, including mines. The cultivating ryot pays at half an anna per rupee of his rent and the remaining half is payable by the landlords of all grades. Re-valuation of land for the purpose of the cess cannot take place more often than at five year intervals and in practice re-valuations are made at intervals of ten or fifteen years. In the last decade the amount of cess leviable has risen by about 20 per cent from 68 to 82 lakhs.

The remaining two-fifths of the boards' income is derived from government contributions for the Education and Medical services, from an "augmentation grant" by Government of 25 per cent of the total amount of the road cess, and from miscellaneous sources such as income from the Cattle Trespass Act and from tolls. Under the present

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\* Local boards, of which there is usually one in each subdivision of a district, occupy a position intermediate between district boards and the local unit of self-government (union boards and committees and *panchayats*).

† Village committees whose primary duty is to maintain a policeman.

system, the boards have no responsibility for the provision of finance as their revenue is collected for them.

In 1925-26, the boards spent about one-half of their income on communications and public works and one-third on education.

The union boards have been brought into existence under the Bengal Village Self-Government Act of 1919. The average area served by a union board is ten to fifteen square miles and it is intended that these boards shall become the primary unit of local administration. At present, eight districts\* are entirely covered by union boards ; eleven other districts are partially covered and seven districts are without any boards. In the nineteen districts in which the boards function they number in all 2,443. When the whole presidency is supplied with union boards, they will number about 5,000. The change, therefore, from union committees and *chaukidar panchayats* to union boards is just about half accomplished. Each union board consists of nine members of whom six are usually elected and three are nominated. Elections take place once every three years and every one who pays a cess or a union rate of Re. 1 is entitled both to vote and to be a candidate in these elections. The three members not elected are nominated by the District Magistrate on the recommendation of the circle officer. Each union board elects a president and also a vice-president, if necessary. The president and vice-president are unpaid. The circle officers who recommend nominations and who also conduct the elections are sub-deputy collectors of the Bengal Junior Civil Service. Each circle officer is under the control of the local District Magistrate and each officer's circle comprises 25 to 30 union boards. They audit the union boards' accounts and generally supervise the boards' activities. It has been found that, so far, the efficiency of a union board depends very largely upon the personality of the president and the driving power of the local circle officer.

The powers of the union boards which in particular affect agricultural interests are the provision of sanitation and conservancy (particularly of fairs), the execution of works required for the preservation of public health, including all other works likely to promote the health, comfort and convenience of the public, provision of water supply for public and private purposes, provision and control of public roads, bridges and water ways, provision and control of primary education and dispensaries, and, generally, the performance of duties which may be made over to them, with the necessary finance, by the district boards. Union boards are not empowered to undertake purely agricultural work but there are many schemes of agricultural improvement such as agricultural drainage which could be classed as schemes of communication (waterways) or of sanitary drainage, and such schemes come within the scope of their powers. The responsibilities and opportunities of union boards are, therefore, great. Each board is obliged to raise a sum sufficient to maintain the village police and has also power under the Village Self-Government Act to impose a rate of such an amount as shall meet the

\* Bankura, Birbhum, Hooghly, Howrah, Nadia, Faridpur, Bogra and Tippera.

other expenses of the board in carrying out the duties laid upon it. Unfortunately, the rates which the boards have so far seen fit to levy for the latter object do not provide an income which is by any means commensurate with their responsibilities. After deducting the minimum amount necessary to keep up the village police and to pay the rate collector and clerk, if one is required, their income for works of public utility does not exceed on the average Rs. 1,050 a year (including district board grants) and in practice more than two-thirds of this sum is spent on village roads and drainage. The inadequacy of this income for the development of a rural area of ten to fifteen square miles, with an average population of 10,000 people, is patent.

### 13. PUBLIC HEALTH AND SANITATION.

The menaces to public health in Bengal are well known—malaria, cholera and malnutrition. Cholera is easily controllable, given a good water supply and the most ordinary sanitary precautions, but in the present conditions it reappears year after year and accounts on the average for rather over five per cent of the total mortality. Malaria, unlike cholera, is not a swiftly killing disease, but no disease is more disastrous to the well-being and efficiency of the population. For some three months in every year, the capacity for labour of a large proportion of the inhabitants of rural Bengal, especially of west Bengal, is much impaired by attacks of malaria. The development of irrigation, which is, as we have seen, desirable on other grounds, may do much, by making possible a greater intensity of cultivation, to improve malarious tracts. There can be no doubt, too, that malaria, in lowering the vitality of the mothers, is one of the principal causes of the high rate of infant mortality from which Bengal suffers. *Kala-azar* is another fever which inflicts much loss on the population, though a specific is now known which reduces the rate of mortality from it.

Malaria is much more difficult to control in rural than urban areas, but it is in the Bengal villages that epidemic malaria most frequently breaks out. While it cannot be successfully combated merely by the distribution of quinine, experience has shown that epidemic malaria can be greatly diminished by its use. In Bengal, government quinine is sold to the general public through the agency of about 3,225 post offices, but the total amount sold is very small. In 1913 the Bengal post offices sold 7,636 lbs. of quinine. In 1926, 8,406 lbs. were sold. The sale price per box of tablets has been continuously reduced since 1918 and now stands at Rs. 2-7 or six annas more than the price in 1913. It is noteworthy that more boxes were sold in 1918 (102,000) when the price stood at Rs. 4-6 per box than in 1927 (90,000) when the price was Rs. 2-7.

The following Table showing the number of pounds of quinine sold through the post offices in each of the natural divisions in Bengal during the year 1920 is of interest. For purposes of comparison, Dr. Bentley's



calculations of Italian and Greek consumption of quinine are included in the statement :—

		Quinine sold, 1920	Grains per head of population	Quinine required on Italian scale	Quinine required on Greek scale
		lbs.	Grains	lbs.	lbs.
Western Bengal	.. ..	1,227	1·11	20,000	80,000
Central Bengal	.. ..	1,741	1·42	20,000	80,000
Northern Bengal	.. ..	1,009	0·69	23,000	92,000
Eastern Bengal	.. ..	4,924	1·99	40,000	160,000

In addition to sale through post offices, quinine and cinchona derivatives are distributed by Government through local authorities, anti-malarial societies and other institutions. The following amounts have been distributed during the past four years :—

1923-24	.. ..	.. ..	.. ..	.. ..	lbs. 4,511
1924-25	.. ..	.. ..	.. ..	.. ..	8,369
1925-26	.. ..	.. ..	.. ..	.. ..	9,607
1926-27	.. ..	.. ..	.. ..	.. ..	11,930

It should, however, be added that a considerable, though unknown, amount of quinine, is annually distributed to the poor by charitable dispensaries all over the presidency.

Very little land is available for planting cinchona at the higher elevations required by such species as *Cinchona officinalis* and *Cinchona ledgeriana*, but *Cinchona succirubra* can be grown on relatively low elevations and yields the red bark which, though not so rich in quinine, yet produces a large supply of other cinchona alkaloids. It is proposed to plant 2,000 acres in Samsingh with *Cinchona succirubra* in 1928.

From the existing cinchona plantations in Bengal about 400,000 lbs. of quinine can be obtained or about 25 years' supply if the present scale of demand continues. But it is urgently necessary that consumption of quinine and other preparations of cinchona bark should be greatly increased. The problems of supply and increased use are common to all India and have been dealt with in the Report. It is consequently unnecessary to say more here than that, whatever policy may be adopted, no province stands in more urgent need of expanding its supplies and annual rate of consumption than Bengal.

The third menace—malnutrition—is the most insidious because the least recognised. It is the condition precedent to disease of all kinds attaining epidemic proportions. The importance of diet in relation to health is only just beginning to be recognised, thanks to the research now being conducted in Europe, America and India. It is certain that the knowledge which is now being gained as to the elements which an optimum diet must possess will eventually prove the most efficient of all weapons in the fight against disease and misery. So far, it has proved impracticable to pass a Public Health Act for Bengal owing to

the widespread dislike of giving new powers of taxation which must accompany such legislation, if it is to be fruitful.

The existing public health organisation is both central and local. The central organisation consists of a Sanitary Board of officials and non-officials over which the Secretary to Government in the Local Self-Government Department presides and of a Department of Public Health (including a Publicity Branch) administered by a Director, to which is attached a Sanitary Engineering Branch administered by a Chief Engineer; a special Malaria Officer is maintained at headquarters. There are also public health laboratories in Calcutta and Dacca and a municipal laboratory at Darjeeling. These laboratories have important work to do under the Bengal Food Adulteration Act.

The local organisation in rural areas consists of health officers who hold a diploma in public health, a staff of doctors to cope with epidemics and a number of sanitary inspectors, all in the employ of district boards. Only one district board is now without a health officer. The central Public Health Department also keeps a small staff of sub-assistant surgeons for loan to local authorities in connection with epidemic outbreaks of disease. All that is lacking to set this organisation on a vigorous forward policy is finance.

In the meantime, Government are doing what they can. They already pay half the salary of the health officers employed by district boards and they have now decided to provide boards with funds to enable them to maintain assistant health officers with the necessary staff and equipment for work in the interior of districts. Government also make an annual grant of Rs. 2½ lakhs for the improvement of rural supplies of drinking water. The grant is disbursed, under the orders of the Divisional Commissioner, by district officers, who use it to supplement the funds raised by union boards or by co-operative societies and other voluntary organisations where there are no union boards. The grant thus serves as a stimulus to local effort.

Government also make certain annual payments for a term of years to enable local authorities to carry on prescribed forms of medical or sanitary work, including grants-in-aid to co-operative anti-malarial societies.\* The Publicity Officer attached to the Public Health Department also helps in the organisation of these societies and gives lantern lectures at various local exhibitions, etc.

Of the various private efforts to improve public health in Bengal, the anti-malarial societies deserve special notice. Started by Rai Bahadur G. C. Chatterji in 1917, the organisation of the Central Co-operative Anti-Malaria Society, Ltd., included by the end of 1926 some 300 registered societies besides some 700 "live" unregistered societies. From the point of view of stability, there is the serious defect that, so far, it has not proved possible to link up effectively this central society with the numerous village societies. It is also unfortunate that there does not exist, at

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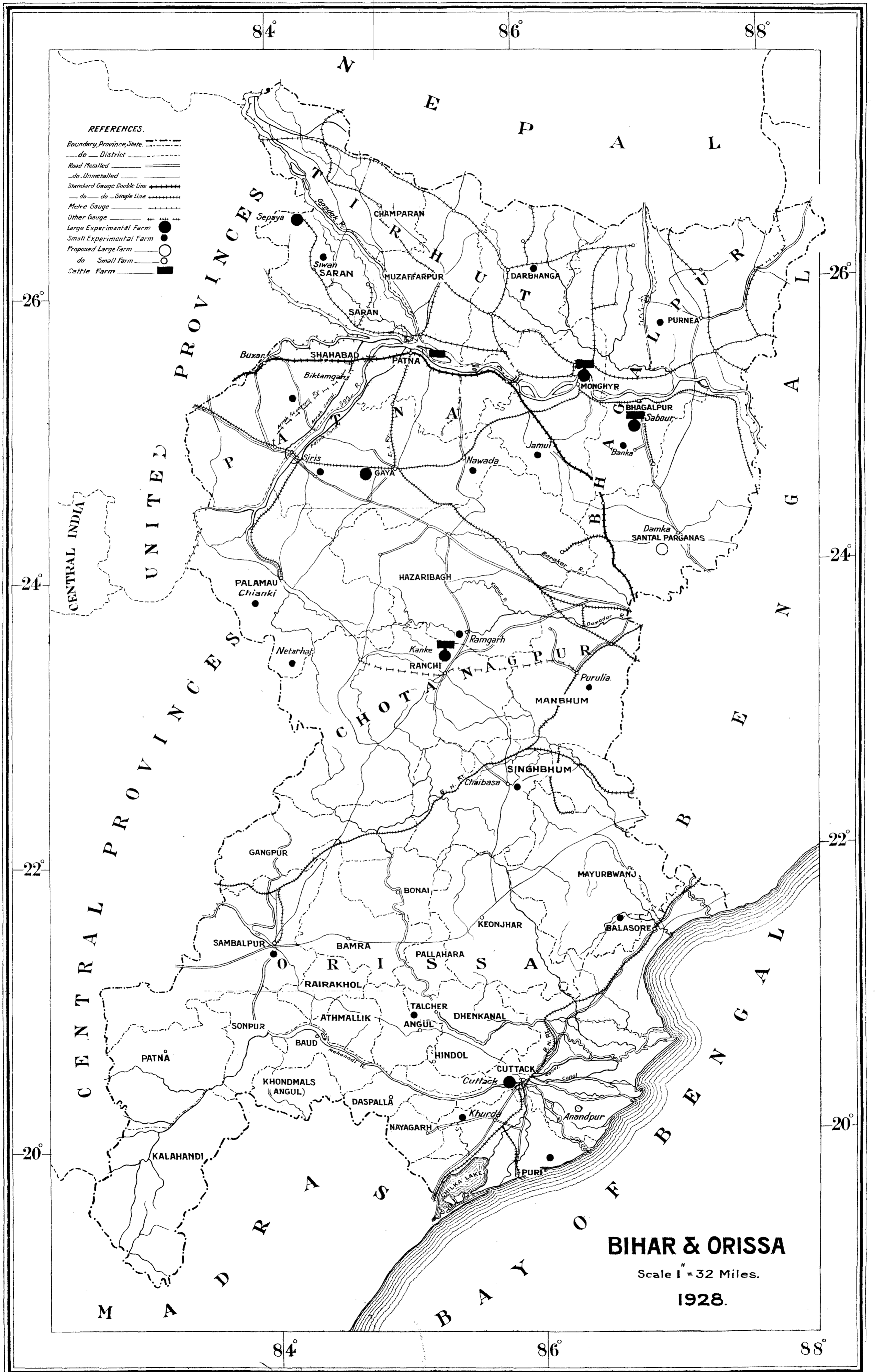
\* The Central Co-operative Anti-Malaria Society has received so far about Rs. 70,000 from Government in this way.

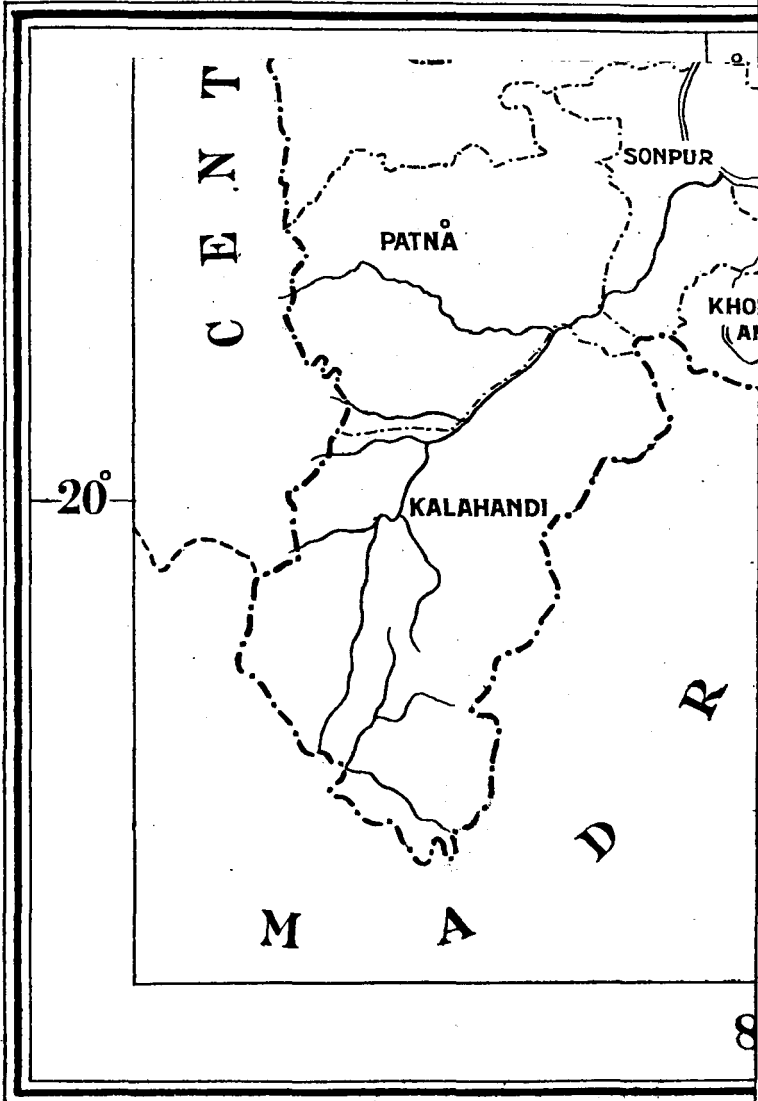
the present time, a closer affiliation of the movement with local bodies. The movement (which seeks to combat *kala-azar* and general insanitary conditions in villages as well as malaria) received a warm tribute of praise from the Director of Public Health in the course of his written evidence : " . . . there are now many hundred branch co-operative public health societies in Bengal to-day . . . . In my opinion, a very large proportion of the societies . . . have in the main achieved their aim, *viz.*, the awakening of Bengal villagers to the necessity and the possibility of improving the health of their villages by their own efforts." These societies believe in practical work : they undertake to kerosene ditches and tanks, excavate drains and track out malaria " carriers " for remedial treatment. The central society also maintains a cholera brigade.

Another private movement which merits notice, as an effort to reduce the high rate of infantile mortality, is the establishment of " Baby " clinics and welfare centres which has resulted from Bengal's participation in the all-India Baby Week movement ; as also the steps taken by many district boards to train *dais* (midwives)—a much needed work which is, as the last Bengal Public Health Report states, admirably suited for private enterprise on the lines of the co-operative anti-malarial societies noticed above. Good work is also being done by the Bengal Social Service League in regard to cholera prevention, in which inoculation is playing an increasingly important part.

As regards medical aid, dispensaries are maintained and aided in rural districts by the district boards which also contribute to the upkeep of hospitals at the headquarters of districts and subdivisions. The hospitals (excluding those in Calcutta) have over 3,000 beds but the nursing arrangements are stated to be unsatisfactory. An average of about 7,000,000 persons a year receive treatment as out-patients at these dispensaries ; some 40,000 in-patients annually pass through the mofussil hospitals. The problem of bringing medical aid to rural districts is still in the main unsolved. It is interesting to note that a feature of the Medical Relief Association founded in 1921 for the village of Behala close to Calcutta was a contribution by the people themselves. A development of the principle of voluntary medical insurance upon which this contribution was based might prove of great assistance in solving the problem on its financial side.

A Pasteur Institute in Calcutta provides anti-rabic treatment for Bengal and Bihar and Orissa. Calcutta has also a School of Tropical Medicine and Hygiene, believed to be the first institution of its kind in the East, which conducts a number of enquiries for the Indian Research Fund Association.





Govt Photozinc: Office, Bona. 1928.

## BIHAR AND ORISSA

### 1. GENERAL FEATURES AND NATURAL DIVISIONS.

The Province of Bihar and Orissa, which was formed in 1912 from the Patna, Tirhut, Bhagalpur, Chota Nagpur and Orissa divisions of the Bengal Presidency, has an area of 71,552,000 acres or nearly twice that of England and Wales. This area, according to the census of 1921, carried a population of 37,961,858, and some of the agricultural land in North Bihar carries a greater number of people than any other agricultural area in India. Of this area, however, no less than 18,335,000 acres are occupied by Feudatory States.

The physical conditions of the province are diverse; within the oblong of some 450 miles from north to south and 250 miles east to west, which is the general shape of the province, a traveller entering from the State of Nepal, which bounds the province to the north, would traverse the rich alluvial plain of Bihar for the first 150 miles, crossing the Ganges about half way. This plain is succeeded by the thinly peopled areas of Chota Nagpur, also about 150 miles in length, which contains rich deposits of coal, iron, mica and copper, the first three of which are extensively worked. This tract of gneissic rocks forming high undulating plateaux fringed by hills, rocks and jungle is very distinctive in appearance from the alluvial areas which lie to the north and south of it. Jamshedpur, where the Tata Iron and Steel Company, as well as other companies, have their works, is the great iron and steel producing centre of India. A third journey of nearly equal length to the first two, through the Feudatory States, where the hills of Chota Nagpur sink towards the Mahanadi delta and the Orissa coast, would bring the traveller to the southern boundary of the province and the Madras Presidency.

There are valuable forests in the Chota Nagpur tract and parts of Orissa are well wooded. *Jhils* or shallow sheets of water are of frequent occurrence throughout the province, and in Orissa there is the extensive, though very shallow, Chilka Lake.

The rainfall increases from north to south; in Bihar, it averages 50 inches, in Chota Nagpur, 53 and in Orissa, 58 inches. The most regular rainfall is in Chota Nagpur. Severe droughts are experienced from time to time in both the Bihar and Orissa divisions. The famine of 1866 in the latter area was one of the worst famines of which we have record. About ninety per cent of the rain throughout the province falls in the monsoon between June and October, the remaining ten per cent falling as light rain in December, January and February, and in isolated thunderstorms which occur in May. During the monsoon, the littoral districts of Orissa are subject to floods which cause great damage.

The warmest weather occurs in May with a mean temperature ranging between 85° and 94° and a maximum day temperature of 91° to 107°. In some districts, the temperature rises as high as 115°. There is a decided period of cold weather throughout the province, with day temperatures in December and January nowhere exceeding 71° and

falling at night in Bihar and Chota Nagpur to about 51° and in Orissa to 57°. The cold weather in Orissa is very short and less marked than elsewhere. Frost occurs occasionally in the Chota Nagpur plateau of sufficient severity to do considerable damage to plantations of *sal*, etc., but is rare elsewhere in the province.

In regard to the character of the soil, the province has two well defined types: the alluvial tracts, covering practically the whole of Bihar and the coast fringe of Orissa, and the gneissic tracts. Laterite soils are also met with in patches sloping upwards from the alluvium of Orissa towards the interior of the province and forming patches overlying the general gneissic soils of the Chota Nagpur plateau. Except in the Mahanadi delta and the great river beds, practically all the alluvium is of the older type which, generally speaking, consists of alternating beds of sand and clay and, north of the Ganges, frequently contains large quantities of *kankar*, that is, nodules of carbonate of lime. From the agricultural point of view, the chief interest is the extraordinary range of differences in the surface quality of this older alluvium due partly to differences in level but partly also to general differences in chemical and physical composition. In the district of Tirhut, in which the Pusa Research Station is situated, the texture of the soil and its retentiveness of moisture is, so far as is known, unique. The general characteristic of the new alluvium is that it is richer than the older alluvia in plant food, particularly in nitrogen. Most crops do well on the alluvial soils; rice is grown extensively whenever the supply of water is adequate and, where it is not, fruits and vegetables are extensively grown with the assistance of well irrigation; sugarcane does well on the alluvium when the surface is either clay or loam; tobacco and maize are crops especially suited for the lighter loam; and members of the gourd family are extensively grown along the sandy beds of the rivers.

In the gneissic area of the Chota Nagpur plateau with its extension into southern Bihar, the soil has been formed *in situ* from the break down of the crystalline rock composed of quartz, felspar and mica. Terracing has resulted in the formation of much valuable rice land and, in the depressions between the ridges, a good deal of rice is grown. Other crops are maize, millets, oil-seeds and pulses.

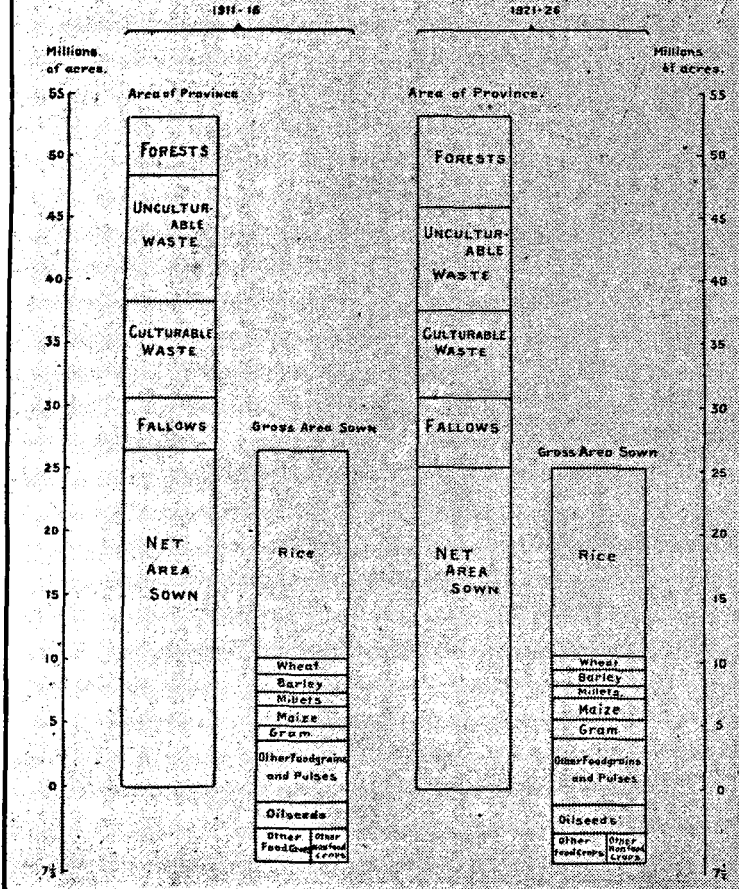
The laterite soils, varying from a conglomerate mass of haematite nodules and coarse quartz sand to loose gravel and sandy clay, are agriculturally of no importance.

The importance of rice as a crop has already been referred to and the place which it takes among the other principal crops of the province is shown by the accompanying diagram; it is grown throughout the province. Of the cereals, maize, barley, wheat and *marua* (*Eleusine coracana*) are next in importance to rice in regard to the area which they occupy (which is, however, only some 5,000,000 acres as compared with about 14,000,000 acres under rice). The maize, barley and wheat are grown chiefly in Bihar and in the low hills in the south and east. *Marua* is also grown in Bihar but its especial area is the Chota Nagpur plateau where it is the next most important crop to rice. The pulses and other

# BIHAR AND ORISSA

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 YEARS AVERAGES)

*Note: The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.*





food grains occupy about 7,000,000 acres. Oil-seeds are also important not only as a crop, but because half of the harvest keeps 35 oil mills going in the province throughout the year. The balance is exported. The total area under oil-seeds (excluding niger) is about 2,000,000 acres, of which linseed occupies forty per cent. Although sugarcane, jute and tobacco occupy only about 700,000 acres they are, with fruits and vegetables which are cultivated on some 600,000 acres, extremely important in the agricultural economy; condiments, chillies, turmeric and ginger are also grown in Bihar and, in the case of chillies, a valuable export trade is done. The oil-seeds, sugarcane, tobacco, jute (practically confined to the Purnea district) and fruits and vegetables are all grown, chiefly in Bihar and very largely in North Bihar. The major part of the cereals, even of rice, is similarly grown in Bihar. The overwhelming importance of Bihar in the agriculture of the province will thus be evident. Coconuts and cashewnuts are important local crops in Orissa.

A periodical census of livestock is taken. The last census was taken in 1925 and did not, except in regard to sheep and goats which are dealt with separately, show any appreciable increase over the census taken in 1920. The figures, excluding sheep and goats, were: 1920, 20·0 millions; 1925, 20·9 millions. In the last census, there were 6·9 million bulls and bullocks, 5·7 million cows, 2·4 million buffaloes and 5·7 million young stock, including young buffaloes. There is particular difficulty in securing accuracy in a cattle census in Bihar and Orissa owing to the continual movement of cattle down into Bengal for sale and across the borders into Nepal for grazing, but at any rate the figures of the last two censuses should be strictly comparable as they were both taken at the same time of year (January).

In 1913, the number of sheep and goats was estimated at 6½ millions; in 1920, the number had fallen to a little over 4 millions owing to the high prices obtainable during the war for meat and hides, and also to the scarcity prevailing in 1919 in the breeding areas; by 1925, these losses had been rather more than made good and sheep and goats were returned at 7 millions. Goats are bred throughout Bihar and there is a constant demand for them from the Calcutta market. Sheep breeding is carried on mainly in Bihar towards the United Provinces side. Sheep are also kept in Chota Nagpur.

## 2. PROVINCIAL INCOME AND EXPENDITURE.

The permanent settlement of land revenue in 1793, if it is not quite so dominating a feature in the income derived from land revenue as is the case in Bengal, is yet the most important factor in the provincial finances. The incidence per head of land revenue assessment is the lowest of any province in India, lower even than in Bengal. Owing to the fact that the greater part of the Orissa division is temporarily settled, some power of expansion exists as the following figures indicate:—

	1901-02	1911-12	1926-27
	Rs. (lakhs)	Rs. (lakhs)	Rs. (lakhs)
Land Revenue.. ..	143	157	169

But the growing needs of the province obviously cannot be met from this source. Excise revenue shows a marked elasticity, having risen from Rs. 124 lakhs in 1921-22 to Rs. 197 lakhs in 1926-27 and the revenue derived from stamps also shows a satisfactory increase in the same period. Still, the revenue of the province compares very poorly with that of a province like Bombay, which raises three times as much revenue from a population about two-thirds that of Bihar and Orissa. Of any new expenditure permitted by these somewhat meagre resources, the transferred side of Government, which includes the nation building departments of Agriculture, Education, and the Medical and Public Health services, takes an overwhelming proportion. Indeed, in the three years ending 1926-27, the proportion averaged ninety-three per cent.

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**REVENUE AND EXPENDITURE CHARGED  
TO REVENUE**

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## GOVERNMENT OF

(Figures are in

*Revenue and Expenditure*

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue .. ..	164	165	166	168	167	169
Excise .. ..	124	154	183	176	197	197
Stamps .. ..	87	95	96	100	108	107
Forests .. ..	9	9	10	11	10	8½
Other heads .. ..	19	16	17	16	17	19½
Irrigation .. ..	18	17	18	18	23	24
Debt—Interest .. ..	3	3	4	5	7	9½
<b>Civil Administration—</b>						
Administration of Justice ..	3	4	4	5	5	5
Jails and Convict Settlements..	5	6	6	5	5	5
Police .. ..	1	3	2	2	2	1½
Education .. ..	4	4	5	6	6	6
Medical .. ..	1	1	3	5	8	5
Public Health .. ..	..	..	..	1	..	..
Agriculture (including Veteri- nary and Co-operation) ..	1	1	1	2	2	2
Other heads .. ..	..	1	1	1	1	1
Civil Works .. ..	7	6	6	8	7	6½
Miscellaneous .. ..	7	9	7	6	14	7
Miscellaneous adjustments between Central and Provincial Governments .. ..	..	..	..	1	..	½
<b>Total, Revenue Receipts ..</b>	<b>453</b>	<b>494</b>	<b>529</b>	<b>536</b>	<b>579</b>	<b>574</b>

## BIHAR AND ORISSA

lakhs of rupees)

*charged to Revenue*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
Direct Demands on the Revenue—						
Land Revenue .. ..	15	16	19	21	21	21½
Forests .. ..	10	7	8	8	7	9
Other heads .. ..	18	17	17½	19	32	29½
Capital outlay on Forests charged to Revenue .. ..	..	..	..	..	1	1
Irrigation—Revenue account ..	24	23	24	26	26	28
Irrigation—Capital Account charged to Revenue .. ..	1	1	½	..	..	..
Debt Services—Interest .. ..	2½	2	3	3½	3½	2½
Civil Administration —						
General Administration .. ..	69	72	71	69	70	72
Administration of Justice .. ..	35½	35	35	36½	38	40
Jails and Convict Settlements ..	14½	18	16	17	17	18
Police .. ..	81	80	79	81	82	82½
Education .. ..	54	54	62	68	77	94
Medical .. ..	17	16	19	26	23	34
Public Health .. ..	3	5	8	9	13	14
Agriculture (including Veterinary and Co-operation) .. ..	9	9	9	11	11	14
Industries .. ..	3	5	6	7	9	8
Other departments .. ..	2	1	3	1	½	1
Civil Works .. ..	61	69	65	67	74	89
Miscellaneous .. ..	38½	43	40	43	45	47
Provincial contribution .. ..	10	..	..	..	..	..
Miscellaneous adjustments between Central and Provincial Governments .. ..	..	..	..	..	..	..
Total, Expenditure charged to Revenue .. ..	468	463	485	513	555	605

## GOVERNMENT OF

(Figures are in

*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Receipts</i>						
Revenue Surplus .. ..	..	31	44	23	24	..
Famine Insurance Fund ..	12	14	12	16	19	16
Appropriation for Reduction or Avoidance of Debt .. ..	..	..	..	..	..	..
Suspense .. ..	..	4	4	5	1	..
Loans and Advances by Provincial Governments .. ..	17	16	7	8	10	5½
Loans between Central and Provincial Governments .. ..	..	20	7	5	..	..
Advances from Provincial Loans Fund .. ..	..	..	..	..	..	..
<b>Total, Capital Receipts ..</b>	<b>29</b>	<b>85</b>	<b>74</b>	<b>57</b>	<b>54</b>	<b>21½</b>
<b>Opening Balance ..</b>	<b>100</b>	<b>93</b>	<b>143</b>	<b>176</b>	<b>202</b>	<b>224½</b>
<b>Total ..</b>	<b>129</b>	<b>178</b>	<b>217</b>	<b>233</b>	<b>256</b>	<b>246</b>

## BIHAR AND ORISSA

lakhs of rupees)

*and Expenditure*

Expenditure heads-	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Expenditure</i>						
Revenue Deficit . . . . .	15	..	..	..	..	31
Payment of commuted value of Pensions . . . . .	..	..	..	..	..	2½
Construction of Irrigation Works . . . . .	..	..	—½	..	..	..
Civil Works not charged to Revenue . . . . .	..	..	..	..	..	..
Other Works not charged to Revenue . . . . .	..	..	..	..	..	..
Famine Insurance Fund . . . . .	3	..	1	8	3	7
Appropriation for Reduction or Avoidance of Debt . . . . .	..	..	..	..	..	..
Suspense . . . . .	..	4	4½	5	..	1
Loans and Advances by Provincial Governments . . . . .	13	20	31½	13	3	4½
Loans between Central and Provincial Governments . . . . .	5	5	5	5	..	..
Provincial Loans Fund . . . . .	..	..	..	..	25½	7
<b>Total, Capital Expenditure . . . . .</b>	<b>36</b>	<b>35</b>	<b>41</b>	<b>31</b>	<b>31½</b>	<b>53</b>
<b>Closing Balance . . . . .</b>	<b>93</b>	<b>143</b>	<b>176</b>	<b>202</b>	<b>224½</b>	<b>193</b>
<b>Total . . . . .</b>	<b>129</b>	<b>178</b>	<b>217</b>	<b>233</b>	<b>256</b>	<b>246</b>

### 3. REVENUE ADMINISTRATION AND LAND RECORDS.

For purposes of revenue administration, the province is divided into five divisions, Patna, Tirhut, Bhagalpur, Chota Nagpur and Orissa, with a Commissioner at the head of each, and 21 districts in charge of a Magistrate and Collector or Deputy Commissioner. The unit of revenue administration is the district, and revenue questions which cannot be settled finally by the officer in charge of the district go up (except in respect of Excise and Salt for which there is a special Commissioner) to the Divisional Commissioner and from him, if necessary, to the Board of Revenue, which consists of one member. The Board not only deals with revenue questions, but has, *inter alia*, the very important duty of managing estates under the Court of Wards Act.

For the Orissa Feudatory States there is a special administrative officer designated the Political Agent and Commissioner, who has special revenue and judicial powers.

The main sources of provincial revenue in Bihar and Orissa are land revenue, excise and stamps. The main source of revenue for local self-government is a local cess on the land and on profits from mines, forests, etc.; this is not included in the Table of Provincial Income and Expenditure.

For the present purpose, only land revenue will be referred to. The marked feature in the land revenue system of Bihar and Orissa is the fact that the revenue is fixed in the divisions of Patna, Tirhut, Bhagalpur and Chota Nagpur under the permanent settlement concluded by Lord Cornwallis in 1793. The incidence of land revenue per head of population ( $7\frac{1}{2}$  annas) is lower than that of any other province in India—Bengal being next with  $10\frac{1}{2}$  annas.

In the permanently settled area of Bihar and Orissa, the feature from an agricultural point of view is the absence of a subordinate revenue staff such as is maintained in temporarily settled areas. The consequence is that much less is known about the state of cultivation and the condition of crops, as reliance has to be placed on district officers and their subordinates who are relatively few in number and, moreover, do not need to obtain such information for the performance of their ordinary duties.

The conditions of this permanent settlement (which confirmed a "decennial" settlement completed in 1791—the first comprehensive settlement undertaken after the succession of the East India Company in 1765 to the Dewani of Bengal, Bihar and Orissa\*) were embodied in a proclamation issued on 22nd March, and now known as Regulation I of 1793. It declared that the zamindars, independent talukdars, and other actual proprietors of land with whom the "decennial" settlement had been concluded would be allowed to hold their estates at the same assessment for ever but that "no claims for remission or suspension of rent were to be admitted on any account and lands of proprietors were to be invariably sold for arrears." Proprietors were also declared to have the privilege of transferring their lands without the sanction of Government and partition of estates was freely allowed.

\*At that time "Orissa" comprised only a small tract of country now included in the Midnapore district of Bengal.



There has been a long history of attempts on the part of Government to regulate equitably the relations between the zamindars and their tenants. The intention at the time of the permanent settlement was to confer an immunity on the ryots against the enhancement of their rents similar to that which had been granted to the zamindars in respect of their assessment. But this intention was soon lost sight of and, on the contrary, with a view to assisting the zamindars to pay their own fixed land revenue to Government, certain powers over the person and crops of a defaulting ryot were given to them in 1799. In 1859, legislation was passed with the object of giving the ryot some measure of protection; this failed, however, of its purpose and the relations between the zamindar and his tenant in the divisions of Patna, Tirhut and Bhagalpur are now regulated by the Bengal Tenancy Act of 1885. The objects of this Act are: (1) to give the settled ryot the same security in his holding as he enjoyed under the old customary law, (2) to ensure to the landlord a fair share of the increased value of the soil and (3) to lay down rules by which all disputed questions between landlord and tenant can be reduced to simple issues and decided upon equitable principles. Of the various amendments of the Act, the most important are those effected by Act III of 1898 in regard to the preparation of the record of rights and the enhancement and reduction of rent, and by Act I of 1907, which conferred greater authority on the record of rights when duly prepared and published, but the principles of the Act of 1885 remain unaltered and, with the amending legislation, it provides a code governing the most important relations between landlord and tenant. It is in force in ten districts of Bihar. The three districts of Angul, Sambalpur and the Santal Parganas have special Tenancy Acts, as have also Chota Nagpur and the three coastal districts of Orissa. All these Acts provide for a record of rights.

It would be impossible and unprofitable within the limits of the present introduction to enumerate the tenures and sub-tenures intervening between the zamindar and the cultivating ryot which are regulated by this legislation. Suffice it to say that while the majority of the bigger estates remain in the possession of the old zamindari families, the landlords have freely used their powers of alienation not only to create subordinate tenures but also to transfer their estates, and that a considerable part of the area which was permanently settled in 1793 is no longer in the direct possession of the descendants of the original owners.

The temporarily settled tracts consist chiefly of territories acquired subsequent to the permanent settlement. Much the most important of them is the tract which constitutes the Orissa division but there are a number of estates held direct by Government in other divisions, of which the Khurda, Palamau, Banki and Angul estates are the principal ones. In 1925-26, 329 estates out of 118,907 were held direct by Government\* and contributed thirteen per cent of the total land revenue.

\* These estates directly held by Government constitute only a small fraction of the total number of estates subject to periodical settlement. In Orissa alone, the number of such estates runs into several thousands and there are several hundreds scattered about the permanently settled tracts of Bihar.

Purchases at revenue sales have gradually extended the temporarily settled areas.

The Orissa Tenancy Act of 1913 replaced for the three districts of Cuttack, Puri and Balasore, the Bengal Tenancy Act which had previously been in force. The object of the Act was identical with that of the Act it superseded, *viz.*, to regulate the relations between landlord and tenant.

Chota Nagpur also has a special Tenancy Act of its own (Act VI of 1908 and subsequent amendments). This Act not merely superseded the previous Acts in force in Chota Nagpur but introduced a number of principles adopted from the Bengal Tenancy Act and set the substantive law regarding the customary rights and usages of the aboriginal ryots on a firm basis. It has been successful in allaying the discontent which, as recently as 1900, manifested itself in an armed rising and has protected the rights of the aboriginal population where these have been endangered by the passage of the estates of indigenous landholders into the hands of ryots, often of the moneylender class.

There is another Act peculiar to this part of the province (The Chota Nagpur Encumbered Estates Act VI of 1876 and subsequent amendments) which was enacted to protect the ancestral estates of the aboriginal landlords who have fallen into debt and to prevent them from being put up to sale.

#### *Land Records and Survey.*

A primary object of the framers of the permanent settlement of 1793 was to record all rights in land, but, up to the passing of the Land Registration Act in 1876, the law as to registration was not strictly enforced. The object of the Act of 1876 was not to make an inquisition into titles, but to identify all individuals on whom might be imposed certain duties and obligations in virtue of their being in possession of land as proprietors. Consequently, every person in possession of land, whether revenue-paying or revenue-free, is required to register full particulars. But such registration does not deal with subordinate rights and interests. For several years after the permanent settlement, endeavours were made to maintain a record of these through subordinate officials but without success. At length, however, a procedure was devised under the Bengal Tenancy Act of 1885 for obtaining in a complete form a record of rights of all interests in the land. 1925-26 marked the completion of the record of rights for the whole of Bihar and Orissa, except for a few small isolated areas. The Administration Report of the province for that year observes that "It is difficult to exaggerate the benefit which these operations have brought to landlord and tenant alike, to say nothing of the general public and the administration of the province. . . . District officers report, year by year, that the record is freely used. . . ." The continued value of such a record is dependent on its being kept up to date by successive revisional operations.

#### 4. THE CULTIVATOR.

Bihar and Orissa supports a population slightly larger than the population of England and Wales on an area nearly twice as large.

The total population of Bihar and Orissa, including the Feudatory States, as recorded at the census of 1921, was about 38 millions, of whom some four per cent only lived in towns. At this census, 81 centres of population were classified as towns, but six of these contained a population of under 5,000 and of the remainder no less than 35 have a population of between 5,000 and 10,000 only. The proportion of the urban to the rural population has remained practically stationary since 1891.

How predominantly rural Bihar and Orissa is, notwithstanding the existence of the industrial areas in Dhanbad and Singhbhum, is well illustrated by comparing the percentage of the urban population (3·7) with corresponding percentages for the neighbouring provinces. In the Central Provinces, the percentage is 9·0, in the United Provinces 10·6 and in Madras 12·4. There are, in fact, only six centres in Bihar and Orissa with a population of over 50,000, *viz.*, Patna, Gaya, Bhagalpur, Jamshedpur, Darbhanga and Cuttack.

The total population in 1921 showed a slight decrease over the total returned in the census of 1911, which is accounted for mainly by the terrible visitation of influenza in 1918 which was aggravated by severe scarcity.

The population presses heavily on the land in North Bihar, where the mean density rises as high as 907, 872 and 870 per square mile in the Muzaffarpur, Saran and Darbhanga districts, respectively. In the Patna district of South Bihar and the Cuttack district of Orissa also, the population is very dense, 763 and 565 per square mile. On the other hand, the Chota Nagpur plateau is thinly peopled, the mean density being 221 per square mile, and, in the Angul district, there are only 109 persons to the square mile. These figures are for British territory only. The sparsity of the population in the Chota Nagpur division brings Bihar and Orissa as a whole down to the third place among the provinces, below Bengal and the United Provinces.

The rural population of the province lives in 104,239 villages and not in isolated houses on their holdings. The villages vary considerably in population. In Bihar, for example, where, as has been mentioned, the concentration of population is greater than anywhere else in India, 14,160 villages in the Tirhut division accommodate 9,688,892 people or an average population of 680 for a village, whereas in Chota Nagpur the average population of a village falls to 280. Village administration varies in the different parts of the province. In the permanently settled tracts of Bihar, there is no village organisation, the real unit being the family, and the landlord and his agent take little interest in the general welfare of the village. In the aboriginal villages of the Chota Nagpur plateau, in the Santal Parganas and in the government estates in Orissa, on the other hand, the village headman is an official of real authority in the village, and manages all its relations with the outside world. In the Santal Parganas, this office is usually, but not necessarily, hereditary. But whatever the organisation of the village may be, it is generally true to say that there is usually no sanitation. Information regarding the health of the population will be found in the last section of this

introduction under Public Health and Sanitation, and information in regard to village roads under Communications and Marketing.

Holdings are small, but exhibit a good deal of variation in gross area. Thus, in the two most thickly populated districts of North Bihar, where the population is nearly 900 to the square mile, the average amount of cultivable land per household is estimated to be 5 acres, whereas in Chota Nagpur the average rises to  $11\frac{1}{2}$  acres and, in Orissa, is 9 acres. If, however, account is taken of the fact that double cropping is the rule rather than the exception in North Bihar, that in Chota Nagpur a large, and in Orissa a smaller but still substantial, proportion of the holding is not sown every year, the net or effective holding throughout Bihar and Orissa is uniform at something between six and seven acres. Fragmentation of these holdings is almost universal. It is worst in the Patna, Saran and Darbhanga districts of Bihar and in Orissa, where the average size of the 'fragments' into which the holdings are divided is no more than two-fifths of an acre and it will commonly take a cultivator an hour merely to go the round of all the fragments which comprise his holding. The waste of time and labour which is the most obvious evil of fragmentation is mitigated by the very general practice of combination among neighbouring cultivators to grow their crops in comparatively large blocks on a basis of payment in shares of the produce.

The actual cultivators of the land were estimated in the census of 1921 to number nearly ten millions and, of these, about one million were returned as having subsidiary occupations not obviously agricultural. These occupations include peddling, coal, iron and mica mining, weaving, smithy-work, carpentry and pottery, leather work, fishing and employment as general labourers.

The cultivation in the province varies greatly with the different races, climates and soils of the districts. The best cultivators are to be found in the Saran district of Bihar where the climate is good and the people intelligent, hardy and energetic. Pre-eminent among these are the *koeris* (vegetable gardeners).

The cultivation in Chota Nagpur is, throughout, very inferior to that in Bihar, although there are marked differences within the division itself. But the soil is generally too poor, the population too sparse and the attraction to the industrial centres in the division too great to make practicable even an approximation to the close and careful cultivation which prevails in North Bihar.

The cultivation in the Orissa division falls into two well marked areas. In the west, in the Sambalpur district, conditions are similar to those in the Central Provinces. The cultivators are fairly prosperous, but the standard of cultivation does not reach so high a level as in Bihar, though it is greatly superior to the average cultivation in Chota Nagpur. In the east of the Orissa division, that is, in Orissa proper, the soil in the inland tracts is rich, the climate favourable and the cultivator intelligent. Excellent crops of rice are accordingly obtained in many parts of the district, and the evidence of good cultivation is seen in the ability of this part of the

province to sustain a large population ; in the district of Cuttack, the population reaches a density of 565 to the square mile.

This brief description takes no account of certain parts of the province where special conditions prevail, such as the Santal Parganas and the district round Ranchi where there are a fair number of aboriginals. The cultivation in these special districts varies considerably. In some parts, it is extremely good and, in others, it is little more than occasional cultivation of the jungle type.

Below the peasant cultivators come the landless labourers who number some 2½ millions apart from their dependants. Wages are still moderate, though they have risen very considerably since the war, and the landless labourer is in consequence better off and more independent than he used to be.

In the reports on the last settlements of the Hazaribagh and Palamau districts of Chota Nagpur, unfavourable comment is made on the tendency for these landless labourers to become permanently attached to a master. In return for a loan received, such men bind themselves to perform whatever menial services may be required of them in lieu of paying interest on the loan and in consequence lose their status as free labourers.

Seasonal migration is a striking feature in North Bihar. It begins in November and is at its height after the winter rice crop has been reaped in December ; the return begins about March-April. The migrants are often accompanied by their families. Crop cutting in northern Bengal is a special attraction for the family party, as the labour of the women and children is a useful asset. But trade, domestic and factory service, and day labouring and carting absorb many into Calcutta. Many others scatter all over Bengal, often plying the business proper to their caste, as cobblers, boatmen, earthworkers, etc. Most of the coolies at the bigger railway stations of western Bengal come from Bihar and Orissa. South Bihar shares in this periodic migration as does also Orissa, migrants from these two areas going mostly to Calcutta. Chota Nagpur also sends large numbers to the coal fields and to the tea gardens in the Duars for periods of from two to six months.

Emigration of a more permanent nature takes place from all three divisions of the province—Bihar, Chota Nagpur and Orissa—largely to the tea gardens in the Duars and in Assam. Emigration from Chota Nagpur to Assam is specially marked, but it is not as a rule permanent, men and their families going for periods of from two to five years.

In the census of 1921, nearly 2,000,000 were enumerated in other parts of India as having been born in the province or equivalent to five per cent of the population of Bihar and Orissa. The census is taken at a time of year (March) when the seasonal migrants are just beginning to return. The census returns do not distinguish between seasonal migration and the longer periods of emigration. As compared with the census of 1911, emigration (which includes seasonal migration) in 1921 showed a decline in both North and South Bihar, but a very great increase in the case of Orissa which was doubtless a reflexion of the

scarcity which occurred in the Puri district in 1920. Emigration from the Chota Nagpur plateau had also greatly increased for similar reasons.

The factors which most affect the well-being of the rural population of Bihar and Orissa are, however, after all neither migration nor access to industrial employment. Those employed in the iron and steel trade, in the 35 oil mills, the 22 tobacco factories and the 15 large sugar mills which the province maintains and the workers in the lac industry are an insignificant fraction of the total population. Agriculture remains the sole means of livelihood for the greater part of the inhabitants of the province.

Factors of real importance to the cultivator are the sources from which he obtains the finance indispensable for carrying out his cultivation, and his ability intelligently to use that finance. At present, these sources of finance are the *mahajan* and the co-operative credit society. Government also provide facilities for borrowing under the Land Improvement Loans Act of 1883, but little use is made of these facilities. No estimate of the finance annually required to carry on cultivation in the province has, as yet, been made, but it is certain that it must amount to many crores of rupees. It is, therefore, equally clear that land improvement loans which amount on an average to Rs. 40,000 a year and loans from co-operative sources, which in 1926 amounted to Rs. 66 lakhs, do not, between them, make any effective impression on the *mahajan's* monopoly.

If the spread of primary education is the essential preliminary to the wide extension of a sound co-operative credit system, as it is now in fact universally admitted to be, it is certain that education and a sound system of financing the growing and the harvesting of crops are both essential preliminaries to the improvement of marketing on any large scale. Unfortunately, there is still almost everything to do in spreading a knowledge of reading, writing and simple arithmetic among the people. In the census of 1921, only 12·6 of the men and 0·7 per cent of the women of twenty years of age and over were returned as literate and, although literacy had increased to some extent since the census of 1911\*, the rate of increase clearly allows no hope whatever of any early, general attainment of literacy. The position in regard to literacy is further dealt with in the section on Education below.

##### 5. THE AGRICULTURAL DEPARTMENT.

Since the closing of the Agricultural College at Sabour in 1923, there has been no educational centre in Bihar and Orissa at which the research and experimental work of the Agricultural Department could be prosecuted. The Director of Agriculture has his headquarters at Sabour where one of the five central experimental farms of the province is situated. Here also the botanical and chemical work of the department is carried out under the supervision of the Director and the agricultural engineer is stationed.

*Literate (aged 20 and over)	1911		1921	
	Males	Females	Males	Females
	11·4	0·4	12·6	0·7

The general agricultural policy in the province since 1923 has been one of decentralisation and, for administrative purposes, the province is divided into four ranges, North Bihar, South Bihar, Chota Nagpur and Orissa, each under a deputy director. North Bihar and South Bihar have, however, been found to be too big for a single deputy director's charge and the eastern sections of each of these two ranges have, therefore, been placed under an assistant director responsible to the Director. It is contemplated ultimately to have seven ranges and the administrative approval of Government has already been obtained to the establishment of a fifth range for the Santal Parganas in south-east Bihar.

These arrangements are the outcome of the report of an agricultural committee in 1922 which was chiefly composed of members of the Legislative Council and included the Agricultural Adviser to the Government of India. The committee was convened in consequence of the attitude of the legislature towards a scheme for reorganising the department which included the retention of the Agricultural College at Sabour, the development of farms and the establishment of a sugarcane station in North Bihar.

The organisation within each range is based on a central experimental farm. These farms are at Sepaya (379 acres) for North Bihar, Sabour (190 acres) and Gaya (193 acres) for South Bihar, Ranchi (340 acres) for Chota Nagpur and Cuttack (150 acres) for Orissa. Of these, the Cuttack farm, which was started in 1904, is the oldest; the farm at Sabour dates from 1906, the Sepaya and Ranchi farms from 1913-14 and the Gaya farm from 1924. The ranges are necessarily of very considerable extent. The Chota Nagpur range is, for example, 200 miles from north to south and east to west, and if the other ranges are less extensive, the population is far greater. An organisation confined to one farm could not, in such circumstances, distribute in an effective manner the results of its research work among the cultivators and the agricultural committee of 1922 accordingly recommended the establishment of a small farm in each of the sixty-four subdivisions as a centre for disseminating improvements in that area. Eight such farms already existed at the date of the committee's report, *viz.*: Jamui and Nawadah in South Bihar; Purulia, Ramgarh and Netarhat in Chota Nagpur; and Sambalpur, Balasore and Khurda in Orissa. Since that date, seven more subdivisional farms have been started: Sewan and Darbhanga in North Bihar; Bikramganj and Siris in South Bihar; Chaibasa in Chota Nagpur; and Anandpur and Angul in Orissa. With fifteen subdivisional farms started and three more under construction out of a programme for sixty-four, there is clearly much to be done. The proposed provision for five more farms had to be omitted from the budget of 1927-28 owing to lack of funds. The farms vary in size but, with the exception of Netarhat and Nawadah, all of them are under 50 acres. The area of the Netarhat farm is 193 acres and that of Nawadah 67 acres.

While the organisation of the department is thus based on these farms, the methods of work adopted in the different ranges are not quite uniform. In Bihar, where farms are still very few and the cultivation very close, experiments are made on cultivators' fields and there is widespread

propaganda, in which the co-operative movement takes its share, based on the results. In Orissa, the five subdivisional farms provide a surer basis for demonstration on a similar scale and by similar means. In Chota Nagpur, where the area is large, there has been as yet very little propaganda and the subdivisional farms are only four in number; a start has, however, now been made with propaganda in this area.

The staff of the department consists of officers of the Imperial Agricultural Service, recruitment for which has now ceased, officers of the Provincial Agricultural Service and the Subordinate Service. There are five Imperial Agricultural Service officers, the Director and four deputy directors in charge of the four ranges, and an agricultural engineer recruited on a temporary agreement. There are ten Provincial Service officers; of these, six are assistant directors, two of whom are in independent charge of the east-south and east-north Bihar ranges under the Director of Agriculture and four work as assistants to the deputy directors. Of the remaining four provincial officers, two are agricultural chemists, one is an assistant professor of mycology officiating as economic botanist and the fourth is superintendent of the Monghyr dairy farm. The Subordinate Service is divided into three grades, a small upper grade on Rs. 150—10—200, with two posts on Rs. 225 and one on Rs. 250, consisting of managers of the central farms and probationers for the Provincial Service, a middle grade on Rs. 60—5—150 and a lower grade on Rs. 30—2—60—4—100. Recruits who have passed the intermediate university standard start on Rs. 45 and ordinary matriculates start on Rs. 35. Staff is undoubtedly the greatest difficulty at present in the way of developing the activities of the Agricultural Department. There is now no agricultural chemist or economic botanist belonging to the Imperial Agricultural Service. The work of the agricultural chemist is now being done by the former assistant professor of chemistry and that of the economic botanist by the former assistant professor of mycology at the Sabour College. Both these officers work under the supervision of the Director. All entomological and mycological problems have to be referred to Pusa. The Government of Bihar and Orissa propose to make provision for an agricultural chemist and an economic botanist in the new Superior Provincial Service which is to replace the Imperial Agricultural Service, but it is intended to continue to rely on Pusa in the sphere of entomology and mycology. As regards provincial staff, the intention at present is to recruit men who have taken degrees with honours in science from the universities and to give them a practical agricultural training at the central farms at Sabour, Cuttack, Ranchi and Sepaya under the deputy directors. A graduate who took honours in science at the University of Patna was recruited in this way in 1924. The subordinate staff is trained on the agricultural farms, mainly at the four central farms, but training in agriculture is necessarily slow, and the work at the central and existing subdivisional farms is being carried on under serious disabilities, so much so that the Director in his report for 1925-26 stated that it had become "necessary to check the expansion of the work outside the central and existing subdivisional farms in order to give more



attention to the training of the subordinate staff on these farms and to the work in progress on them."

The work done on crops by the Agricultural Department for the cultivator may best be shown by a brief summary of the principal activities of the four central farms :

*Sabour*.—Here the crops under study are chiefly sugarcane, potatoes and vegetables. The farm is run by recruits on probation. The installation of two tube wells in addition to percolation wells enables the greater part of the farm to be irrigated.

*Cuttack*.—Although the work of the department has been longer established here than elsewhere in the province, the only considerable success so far attained has been with rice. The seed of two prolific and early yielding varieties and one prolific and late yielding variety is now in process of distribution. Ten thousand pounds of seed were distributed free by co-operative societies in 1925-26 for demonstration purposes. Green manuring has also spread in the Orissa delta. Of one important problem in the delta, *viz.*, the crops which can best be grown in the cold weather on land where rice has been destroyed by floods, no decisive solution has been found but the experiments with linseed and *juar* are hopeful.

*Ranchi*.—Apart from cattle breeding which will be described later, the work on this farm and the small subdivisional farms linked with it consists chiefly in varietal experiments with rice and the growing of groundnut for distribution and of sugarcane on drained rice land for experimental and demonstration purposes.

*Sepaya*.—Apart from the earlier activities in regard to cattle breeding, useful work is being done in popularising Coimbatore cane No. 210, while tobacco growing experiments have resulted in the rapid spread of the crop in the Saran district where it was almost unknown before.

The greatest success so far achieved with the introduction of an improved variety is not, however, connected with any one farm. It is the introduction of *dakia* rice, which is an early and heavy yielder, and, by 1924-25, had spread over about 23,000 acres in South Bhagalpur, South Monghyr and the Santal Parganas in South-East Bihar. Since that year, there has been a further increase in this area sown with this variety. The cultivation of groundnut has also been taken up on a considerable scale in the Patna division as the result of departmental demonstration.

Attention is being paid in all four ranges to manuring; in particular, the use of gypsum has been introduced on a considerable scale in South Bihar. Experiments are also being conducted on the farms to determine the value of different types of phosphatic manure and the possibility of a great demand in the near future for this and other kinds of fertilisers is foreseen as the result of the tests already made by the Agricultural Department and of the organised propaganda which has now been begun by sellers of artificial manures on the basis of these tests.

Important experiments have also begun at the Purnea\* farm in North-East Bihar into the relative values of different varieties of jute for local cropping.

*Agricultural engineering.*—The Agricultural Engineer has a workshop at Sabour which is also his headquarters. Research on water-lifts is conducted there and there is so great a demand for the *rahat* pump (iron Persian wheels) that arrangements are being made to have them manufactured by private firms, as the workshop cannot meet the demand and it is also hoped that manufacture by private agency will enable the pump to be sold cheaper. Repairs to farm implements, machinery and boring plant are also carried out at the workshop at which, as far as possible, all boring appliances are also manufactured. Experiments are also being made with *gur* furnaces and cane mills. But the main duty of the Agricultural Engineer is well boring. There is a considerable demand from cultivators for borings in ordinary wells and orders for tube wells with strainers are now being received. There were in all 20 such applications in 1926-27. The staff of the Agricultural Engineer has been strengthened by the appointment of an assistant engineer and three separate sections have been constituted for the three alluvial tracts each under a supervisor, *viz.*, one in North and one in South Bihar and a third in Orissa.

The Agricultural Engineer is also responsible for small *bunds* in South Bhagalpur division. A typical scheme is the one carried out at Koilwar in 1925-26 which will control 200 acres. These *bunds* combined with drainage are of especial importance in Chota Nagpur. It is, as the Report of the Agricultural Department for 1925-26 remarks, "the one direction in which a really great advance seems possible in Chota Nagpur—the retention of the monsoon rainfall at a high elevation above the paddy land and the drainage of the lowest paddy land for sugarcane and garden crops."

## 6. LIVESTOCK WORK AND THE VETERINARY DEPARTMENT,

Both oxen and buffaloes, especially the former, are a very important feature of agriculture in Bihar and Orissa, as not only are they required in large numbers for agricultural operations within the province but with the assistance derived from the neighbouring pastures of Nepal there is a large annual export to Bengal. A comparison of the census of 1920 with that of 1925 yields the following results:—

	1920	1925	Increase or decrease
Bullocks .. .. .	6,256,310	6,826,415	570,105
Cows .. .. .	5,617,449	5,751,480	134,031
Young stock .. .. .	4,482,405	4,653,065	170,660
Male buffaloes .. .. .	802,570	826,599	24,029
She buffaloes .. .. .	1,515,301	1,555,441	40,140
Young stock .. .. .	1,038,168	1,022,221	— 15,947
	19,712,203	20,635,221	923,018

\* This farm of 190 acres is privately owned by the Tournament Trust Committee, but is controlled by the department.

Various attempts have been made in the past, notably at the Sepaya farm, to improve the breeds of cattle, but so far, with little result. Continuity of policy has been lacking and as the distribution of bulls and male buffaloes has been made on no settled plan, any good that might have been effected has been dissipated. Although dairy herds have been maintained at the Sabour and Ranchi farms and a third herd has recently been established at the Monghyr farm on the advice of the Agricultural Committee of 1922, nothing has been done to improve draught cattle since the abolition of the breeding herd at Sepaya in 1922. A cattle committee was appointed in 1925 to consider the state of cattle breeding in the province generally. The committee reported in favour of breeding a dual purpose animal and their recommendations that a large breeding farm should be established at Patna under the Veterinary Department, that a breeding herd should be attached to the Cuttack farm in Orissa and that a herd of Murrah buffaloes should be maintained at Sepaya farm have all been approved. The Veterinary Department will, therefore, henceforward, have an interest in breeding. Hitherto, breeding operations have been entirely conducted by the Agricultural Department, but the local Government are now disposed to think that livestock and dairying work should be brought as far as possible under the control of the Veterinary Department and they have decided that the present Director, Civil Veterinary Department, should combine the duties of livestock officer with that of Director. Sheep and goats are both important elements in the livestock of the province, numbering, as they do, 1,239,000 and 5,765,000 respectively, but so far no attempt has been made to improve their breeds.

The Civil Veterinary Department was separated from the Agricultural Department in 1920. For the purpose of administration, the whole province is divided into three ranges, North, Central and South. The first is in charge of a deputy director, who, like the Director, is a member of the Imperial Veterinary Service, recruitment for which has now ceased. The third was also in charge of an officer of the Imperial Veterinary Service, but the vacancy which arose on his death has been filled by the appointment of an officer of the Provincial Veterinary Service. As the Director has now taken up the additional duty of livestock officer, it is necessary to relieve him of the Central range which is at present under his direct charge and to appoint a third deputy director. At present, there are only three officers in the Bihar and Orissa Provincial Veterinary Service, two assistant directors on Rs. 250—50—750 per month and an officer who, after obtaining a veterinary degree in England, is now taking a post-graduate course at Muktesar and has been appointed temporarily for a year on a special rate of pay of Rs. 300 per month pending a decision as to the formation of the new Superior Provincial Service to take the place of the Imperial Veterinary Service.

Owing to the comparatively recent origin of the department and the shortage of staff, its activities have in the past been chiefly concentrated on the control of contagious diseases. The charge of the new breeding centre at Patna and still more the decision to create a veterinary

college, with its opportunities for prosecuting research, will greatly widen its outlook. At present, any investigation beyond the resources of the three small laboratories, one for each range, has to be referred to Muktesar.

Hitherto, the subordinate veterinary officers have been trained at the Bengal Veterinary College. The new college, which will be at Patna, will be run in connection with the proposed cattle breeding and dairy farm there. The students will thus have an opportunity of getting an insight into animal husbandry and dairying which no other veterinary college in India provides. It is intended to start with a three years' course only, in view of present financial conditions, but the advantages of a four years' course and of affiliation to Patna University, which the extra year will make possible, will not be lost sight of. The college will not supply recruits for the new Superior Provincial Veterinary Service. The intention at present is to obtain these recruits from among students sent to England who return with a veterinary degree.

The subordinate staff consists of 124 veterinary assistant surgeons, 13 inspectors of the work of these assistants, 18 staff and reserve inspectors, 4 laboratory assistants and 1 cruelty inspector employed by the Patna Municipality. The veterinary assistant surgeons are on a scale of Rs. 50—10—125 with certain allowances; three of the laboratory assistants receive Rs. 100-125 per month and the fourth is on Rs. 60-80 per month. The cruelty inspector is on a special scale of Rs. 100 per month and is appointed temporarily for three years in the first instance.

The veterinary assistants are government servants but work under the district boards. They are paid by Government, the district boards making a contribution to Government in respect of their pay (five-sixths in the case of the stationary and one-half in the case of the touring assistants). The assistants are partly touring and partly stationary. The intention is to have one fixed hospital, in charge of an assistant, in each subdivision and two touring assistants. As there are 63 subdivisions and only 27 stationary and 97 touring assistants, the staff is by no means complete, but many district boards are reported to be genuinely unable to do more than they do at present. But undoubtedly the proportion of their expenditure on veterinary matters to their total receipts and to their expenditure on education and medicine is disappointingly low. Thus, no district board in 1925-26 spent more than two per cent of its total receipts on veterinary work (including the cost of sera and vaccine) and no fewer than nine out of the twenty boards which sent in returns spent less than one per cent. On education, on the other hand, no board spent less than ten per cent or on medicine less than four per cent of its total receipts.

Inoculation against rinderpest, hæmorrhagic septicæmia, anthrax and black quarter is carried out. In 1926-27, the total inoculations were 147,731 and in the preceding year, 170,153. The marked difference between the two years was due to the abnormally low incidence of rinderpest in 1926-27. Inoculation by the simultaneous method has

not so far been employed. In 1926-27, 3,915 in-cases and 42,421 out-patients were treated and 1,612 castrations were performed in the veterinary hospitals. In the same year, the travelling dispensaries performed 1,119 castrations and treated 38,821 animals for contagious, and 69,247 animals for non-contagious, diseases.

#### 7. IRRIGATION.

In 1926-27, the area irrigated from all sources amounted to 5,301,835 acres, or about eighteen per cent of the total area sown. Of this area, no less than 3,584,000 acres were under rice and practically all the remaining acreage irrigated was under food crops of one kind or another.

The sources of irrigation are various ; 1,832,576 acres are irrigated by canals, nearly half of which are privately owned, 1,591,171 acres and 620,197 acres are irrigated by tanks and wells respectively and 1,257,391 acres derive their water from various sources, the chief of which is the impounding of flood water by temporary *bunds*.

The major part of the large area irrigated by privately owned works is situated in the Gaya district and in the southern portion of the Patna district. These irrigation works are maintained by the landlords, and, as a rule, the rents are paid in kind and not in cash. This brings in a large return to the landlord on the capital which he expends on irrigation. The tenants as a class tend to apply for a commutation of their produce rents into cash rents. This commutation it is within the power of Government to grant. But Government have to consider that the tenants owing to their inability to combine among themselves are, as a class, unable to keep up the irrigation works, so that general commutation throughout the district would result in extensive deterioration in cultivation.

The government canals are in the north and south-east of the province. In the north are the Son, Tribeni, Dhaka and Teur canals ; in the south-east are the Orissa canals and the Orissa Coast Canal, the latter being for navigation only. There is a separate department for irrigation with a Secretary who is also Chief Engineer at the head of it. There are two local circles of administration—the Son and Orissa, each in charge of a superintending engineer.

The Son canals, which were opened in 1875, take off in two main branches from the river Son, one on the east and one on the west bank of the river. They irrigate an average area of 564,441 acres on the south bank of the Ganges at a capital outlay per acre irrigated of Rs. 48. The interest earned averaged 5·89 per cent for the three years ending 1925-26. The Tribeni, Teur and Dhaka canals all lie to the north of the Ganges and close to the Nepal boundary. The Tribeni Canal was completed in 1912 and irrigates 66,588 acres from the river Gandak at a capital outlay per acre irrigated of Rs. 122. The revenue earned averaged only 0·62 per cent on this outlay for the three years ending 1925-26. The Dhaka Canal was opened in 1907 and provides water for 14,345 acres at a capital outlay of Rs. 42 per acre irrigated and gave

a return of 1·01 per cent over the same period. The Teur Canal irrigates an average area of just over 2,000 acres. It was originally a private irrigation system. Both the Tribeni and the Dhaka canals were constructed as protective works.

The Orissa canals in the south-east date from 1865. Their main function is to protect portions of the Mahanadi delta against flooding. The area protected is 562,114 acres and the cost Rs. 48 per acre. The average area irrigated is only 247,224 acres. For the three years ending 1925-26, these canals returned only 0·48 per cent as interest on capital outlay.

On all these canals, the cultivator is charged for water on an acreage basis and he can enter into a long-term lease at reduced rates or pay for the water by the season and the crop. The details of the arrangements for long leases differ for the different canals, but in no case does the lease cover watering for the whole year. In the case of the Orissa and Son canals, it covers watering from June to March. Waterings required in April, May and part of June for such crops as sugarcane, cotton and indigo have to be paid for as extras. On the Orissa canals, only some 260 acres are not irrigated on the long lease system. Two-thirds of the acreage irrigated by the Son Canal and nearly one-half of the acreage irrigated by the Dhaka Canal are under this system. Long leases are less popular on the Tribeni Canal and cover only three-tenths of the area irrigated. The long lease system shows signs of falling into disfavour on the Son canals.

No schemes for new canals are under consideration and, as will have been observed, there has been no construction since 1912. Extensive additions could advantageously be made to the areas irrigated in Bihar north of the Ganges and such works would incidentally be of service in drainage, but there is little likelihood of development as the head waters of all available rivers lie within Nepal and the necessary control is, therefore, lacking.

The Son and Orissa main canals are open to navigation. Including the Orissa Coast Canal, there are 500 miles of navigable canals in the province.

Of the total area under tanks (1,591,000 acres) and wells (620,000 acres) more than one-half in each case is located in the Patna division.

Wells are a great feature in the cultivation of South Bihar. In this part of the province, the rainfall is too light to admit of rice cultivation on an important scale, but wells make it possible to grow vegetables (including potatoes and onions) and spices. Well irrigation is also utilised for sugarcane and even for wheat. It has been found that the supply from a percolation well can often be greatly increased by driving a 3" tube into lower water-bearing strata. There is a demand for these borings and an even greater demand from zamindars and others for tube wells proper. The engineering section of the Agricultural Department has recently acquired plant for making tube wells. Well irrigation is not as yet practised in Orissa, though a demand for tube wells is now arising and the Agricultural Department have posted a well boring

supervisor to this area. Well irrigation is practised in Chota Nagpur but is unimportant. Where well irrigation is practised on such an extensive scale as it already is in the Patna and Tirhut divisions, the efficiency of water-lift appliances becomes important and there is an increasing demand for iron Persian water wheels.

Outside the Patna division, the largest area irrigated by tanks lies within the Chota Nagpur plateau. The future expansion of irrigation in the province undoubtedly lies with small schemes and, more particularly, with wells, the responsibility for which rests with the Agricultural Department. The engineering section of that department has recently been reorganised and the field work distributed into three sections, North Bihar, South Bihar and Orissa. The iron Persian wheel is being adapted at Sabour to meet local requirements in the way of water-lift as motor water-lift is not considered economical where the capacity of the well is less than 12,000 gallons a day.

River conservancy is confined to the Ganges and is devoted to keeping the river open for navigation during the period of low water from October to May.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

7,514,743 acres are shown in the Season and Crop Report for 1926-27 as under forests. Of this area, only 2,373,533 acres are under the management of the Forest Department. The forest areas are situated chiefly in the Chota Nagpur division, in the Angul, Puri and Sambalpur districts of Orissa, in the Santal Parganas and in the Champaran district of the Tirhut division.

In 1926-27, grazing was provided in the forests under State management for 63,500 buffaloes, 287,000 cows and bullocks, 55,100 sheep and goats, 5 camels and 35 other animals.

This is, of course, the merest fraction of the total livestock of the province, since the total number of cattle alone in Bihar and Orissa is estimated at 21 millions. The value of free grazing or grazing at reduced rates was, in 1926-27, Rs. 1,17,597. In the same year persons with rights in the forests took away forest produce valued at Rs. 1,43,291. The total grazing and forest concessions in 1926-27 were, therefore, valued at Rs. 2,60,888.

#### 9. GENERAL EDUCATION.

The total expenditure on education at recognised institutions in the province in 1926-27 was 177 lakhs of rupees as compared with 114 lakhs in 1920-21 and 63 lakhs in 1912-13. Of the expenditure in 1926-27, 40·69 was contributed by Government, 27·95 came from funds of the local boards, 18·42 from fees, and 12·94 from other sources such as endowments and private subscriptions. The cost per scholar was Rs. 16-10-2. The average cost per pupil at different types of institutions is stated in the Table of figures given below.

In 1921, there was in Bihar and Orissa excluding the Feudatory States a population of some 16,765,000 males and 17,239,000 females. Of the former 989,464 or 5·9 per cent and of the latter 119,030 or 0·69 per cent were under instruction.

Of the male pupils, about 949,700 were attending institutions recognised by the Education Department. In the following Table are given particulars of the institutions for males, scholars in attendance and cost per head of each pupil :—

Kind and number of institutions	Number of pupils	Percentage at each institution	Cost per † pupil		
			Rs.	a.	p.
1 University .. ..	.....	.....	.....	.....	.....
10 Arts Colleges .. ..	3,467	0·35	281	4	8
5 Professional Colleges .. ..	1,021	0·10	521	5	0
135 High Schools .. ..	38,197	3·84	46	7	6
563 Middle Schools .. ..	59,114	5·95	20	5	8
27,457 Primary Schools* .. ..	875,666	88·07	5	13	4
476 Special Schools† .. ..	16,762	1·69	99	6	6

\*Includes 802 night schools.

†Includes 2 night schools.

†Calculated on direct expenditure only (i.e. excluding cost of direction, inspection, building, etc.)

The University of Patna, which was founded in 1917, is of the examining type. In Bihar and Orissa, as elsewhere; the recommendations of the Calcutta University Commission of 1917 attracted widespread interest in educational circles. The provision of facilities for education up to the intermediate standard before the student proceeds to the degree stage has taken the form of adding two additional classes to certain high schools in preference to that of establishing intermediate colleges.

An important step in the education of the Medical and Health services of the province was taken in July 1925, when the Prince of Wales Medical College was opened. The college teaches up to the M.B., B.S. standard and a Faculty of Medicine has been added to Patna University.

The policy of Government in regard to high schools is to maintain one such school in each district in order to set an example to high schools maintained by private agency. At present, Government have 24 such schools for boys. All government schools will teach elementary science and also manual training. Drawing is already compulsory.

In this policy and in other plans for improving secondary education, the Government receive assistance from the Board of Secondary Education, the chairman of which is the Director of Public Instruction. All educational interests, from the university downwards, are fully represented on the board which includes a representative of female education. The board meets three times a year.

English is taught in 321 of the 563 middle schools for boys. Almost all the 242 vernacular schools are now under the control of district boards and municipalities. There is a tendency for vernacular schools to develop into English schools. There is a distinct cleavage of opinion in regard to this tendency. The demand of public men and many experienced teachers is for education in the vernacular at least up to the matriculation stage, and, in response to this demand, experiments



are being made in using the vernacular as the medium of instruction in the upper classes of high schools. Parents, on the other hand, almost invariably desire their children to be taught English as soon as possible.

No specific instruction in agriculture has so far been given in secondary schools, but an experiment is about to be tried of attaching to certain schools a garden of about one-quarter of an acre. A teacher from each of the selected schools will be sent for a short course of training under the supervision of the Director of Agriculture at Sabour. Teachers will be encouraged to associate the work done in the garden with the teaching of other subjects.

Illiteracy is as great a problem in Bihar and Orissa as in other parts of India. The percentage of literates of 20 years of age and over returned in the census of 1921 was 12·6 for males and 0·7 for females. The steps that must be taken to improve the position in regard to males are known, *viz.*, improvement in the quality of teaching, the stoppage of wastage after the completion of the first year at the primary school and the bringing of the total boy population under instruction. As regards the quality of teaching, the pay of teachers in vernacular middle schools and in primary schools is very low, ranging as it does from Rs. 30 to Rs. 50 per mensem in a middle school for a certificated teacher to Rs. 5 rising to Rs. 10 per mensem for an untrained teacher in a primary school. As regards wastage, the fact that in 1926-27, seventy-five per cent of the pupils in all schools (primary and secondary) were in the two lowest classes of the primary schools speaks for itself. As regards the third point, there has, it is true, been a rapid increase under the present voluntary system in the number of boys attending school—some 284,000 in the six years 1921-22 to 1926-27 but the percentage of boys of school-going age actually at school is still only 39·1.

An exhaustive investigation into the whole situation in regard to primary education was made by Government in 1925. It was based on programmes for the education of eighty per cent of the male school-going population submitted by local authorities. Orders were issued separately on each programme in accordance with certain general principles as to the action to be taken, chief among which is the abolition as soon as possible of the single-teacher school and direct management by each district board of the primary schools in its area except where really satisfactory local committees can be formed. The extra expenditure in carrying out all the programmes was estimated to amount to Rs. 74 lakhs. Free education in the lower primary stage would cost another Rs. 19½ lakhs. Owing to the difficulty of finding funds for this heavy increase in expenditure, the Government had to decide in 1925 against the introduction of any comprehensive scheme of compulsion in rural areas although the necessary statutory provision for this already exists under the provisions of the Act passed in 1919. Certain local bodies are, however, anxious to try the experiment of compulsion in limited areas and the Government have stated that they will be prepared to consider sympathetically any proposals to this end, the more especially as such experiments should be valuable for future guidance. So far, one rural area only has introduced compulsion, the Banki Union in Cuttack. It

is too early yet to draw any conclusions from this experiment. Three more rural areas have begun recently to introduce compulsory primary education, but it is not yet effective.

In addition to the ordinary primary schools, there were, in 1926-27, 802 night schools for males with an attendance of 17,581 pupils. The co-operative organisation is not specially identified with the movement for adult education, but it is in a special way identified with a forward policy in education as it is expected of co-operative banks and unions that they shall foster primary education in the areas in which they operate. The attention of the local authorities has again been drawn by the Government, as part of their orders on the 1925 programmes referred to above, to the advantages to be derived from making block grants to these banks and unions in view of the opportunities which they possess through the local co-operative officials for supervising the proper expenditure of such grants.

Female education in Bihar and Orissa, as elsewhere, presents very special problems and, as the figure of literacy returned at the 1921 census all too clearly shows, the results so far have been meagre. Moreover, over ninety-five per cent of the 115,785 girls who, in 1926-27, attended recognised institutions were in primary school and with the wastage prevalent in these classes comparatively few of these pupils can be expected to become literate. There has been an unfortunate period of actual retrogression in the movement for female education in the province from which recovery is only now being made. A special enquiry was made into the cause of this but no more tangible reason could be discovered for the decline in the number of girls attending educational institutions which, at no time, has been large, than the complete indifference of both men and women to the education of their daughters. During the six years 1921-22 to 1926-27 the number of girls attending school increased by only 11,600. Expenditure by local boards on girls' schools is also showing an upward tendency and the supply of trained teachers, though still far short of the demand, is steadily increasing. These are encouraging signs, but with an attendance figure which still only amounts to 4·6 of the total number of girls of school-going age in the province, it is obvious that almost everything still remains to do.

#### 10. CO-OPERATION.

At the end of 1926, there were 7,614 agricultural societies, 93 of which were on a limited liability basis. The total membership of 205,825 gives an average of 27 only for each society. In 1912, there were 491 agricultural societies and 39 non-agricultural societies with a total membership of 27,207 or an average of 51 persons for each society.

The total working capital of the agricultural societies at the end of 1926 amounted to nearly two crores of rupees; to this amount share capital contributed 4·4 per cent and deposits six lakhs, or 3·1 per cent, of which over four lakhs represented deposits by members in their societies. The reserve fund amounted to nearly twenty lakhs or 10 per cent. The bulk of the working capital was borrowed from provincial or central banks, advances from which at the end of the year amounted to Rs. 164·6 lakhs

or eighty-two per cent of the total working capital of the societies. The amount borrowed from Government was practically negligible, the outstandings at the end of the year being only Rs. 10,743. Sixty-six lakhs were given out to members in loans during 1926. The average loan worked out to Rs. 31 a head. In 1925 thirty per cent of the loans were in relief of debt and only forty-three per cent could be described as given for productive purposes. As much as thirteen per cent was borrowed for payment of rent (three rent-paying societies having just been started) and four per cent was lent to defray the cost of marriage and other ceremonies. It was reported in 1926 that there was little change in these figures.

The movement is especially strong in South Bihar, around Ranchi and in the Cuttack and Puri districts of the Orissa division. It has gained no foothold in the Feudatory States. Elsewhere it is fairly well represented in every part of the province except in the south part of the Chota Nagpur division and the Santal Parganas where it is very weak.

Government exercise a general supervision over the movement through the Co-operative Department which consists of the Registrar, one deputy registrar, nine assistant registrars and one chief auditor. The actual audit is carried out by the Bihar and Orissa Co-operative Federation which is subsidised by Government and employs a staff of seven divisional auditors each in charge of a circle, and seventy-one local auditors. The aim is to audit each society once a year. Test audits are also carried out by the nine assistant registrars and the divisional auditors. The classification of the 6,133 societies audited in 1926 was as follows:—

A (model)	..	5	per cent.
B (good)	..	14·5	„
C (average)	..	68·5	„
D (bad)	..	10	„
E (hopeless)	..	2	„

At present there are 216 guarantee unions to which nearly 2,000 primary societies are affiliated.

In addition to audit, the federation makes itself responsible for training managers, local auditors, inspecting and bank clerks, etc. It employs a development officer who is responsible for propaganda and the production of the Federation Gazette. The federation draws its funds for these and other purposes mainly from the societies, but Government also makes a contribution. The federation holds an annual congress.

A divisional board has been set up in each of the five civil divisions to act as a centre of co-operative activity. On the average, two meetings a year are held for discussions, etc.

Of the sixty-three central banks, thirty-eight in 1926 assisted in promoting agricultural development. In addition to fostering the spread of groundnut and sugarcane cultivation, ploughs and sugarcane crushers are bought and it has recently been decided, on the advice of the Government Development Board,\* that these banks can

\*This Board advises Government on important questions concerning the departments in charge of the members of the Board, viz., the Agricultural, Industries, Civil Veterinary, Co-operative and Forest departments.

properly take up the purchase of manures. Grants are obtained from district boards for the development of agriculture and the promotion of primary education. In times of epidemics, the banks employ doctors and distribute medicines to primary societies.

At the apex of the credit side of the movement stands the Provincial Bank, which has a working capital of Rs. 51½ lakhs and made a profit of over Rs. 54,000 in 1926. It has an overdraft of Rs. 2,85,000 with the Imperial Bank against government securities.

Societies formed specifically for purchase and sale are unimportant. There are, however, ninety-three grain storage societies (*golas*) with a total membership of 27,564 which, together with the two central grain banks started at Sambalpur and Bargarh, made a net profit in 1926 of over Rs. 21,000. Their object is to give loans of paddy to their members at reasonable rates and to create a reserve stock of paddy for use in times of scarcity and famine.

There is only one dairy society—the Mayaganj Gowala Society. It is making a profit, but its operations are unimportant.

## 11. COMMUNICATIONS AND MARKETING.

Three main line railways pass through Bihar and Orissa—the Bengal and North-Western Railway in North Bihar, the East Indian in South Bihar and the Bengal Nagpur Railway in Chota Nagpur and Orissa. The mileage has increased from about 3,000 miles in 1911-12 to about 3,500 at the present time. Recently, lines of great importance to the coal fields of the province have been constructed or sanctioned for construction—notably the Central India Coal Fields Railway, the Chandil Barkakhana Chord, which will open up the Karanpura field, and a line linking the Talcher field to the Bengal Nagpur main line to Madras. Except in the south of the province, where the Feudatory States have yet to be opened up, the railway communications of the province are good, when due allowance is made for conditions in the hilly tract of Chota Nagpur.

There are over 28,000 miles of roads, of which 3,600 are metalled and 24,600 unmetalled. Local authorities are responsible for some 26,000 miles of these roads. The Grand Trunk Road and the Orissa Trunk Road and other arterial communications are in charge of the Public Works Department. The Grand Trunk Road is the great thoroughfare for cattle from up-country.

The district boards spend about one-third of their income on communications. The Government do not ordinarily make grants to the boards for public works, although such grants are freely given for the expansion of education and of the medical services and for the improvement of sanitation. A rough track which is apt to be under water during the monsoon if the village site is low lying, or a water course if it is not, connects the village with the nearest district board road. But during the dry season, from December to June, these tracks are, as a rule, quite passable for bullock transport.

A very large proportion of the foodstuffs grown, especially in the rice-growing tracts, is consumed locally. Bihar imports from Nepal, and, in

the Chota Nagpur division also, there is always a net import. The Orissa division alone has always a surplus. The net export of foodstuffs is therefore not large. Where it takes place, the cultivator usually disposes of the grain on the threshing floor to a middleman, if he is in a small way. If he is a bigger man or of the landlord class, he may both store and subsequently market his surplus but very often even the bigger men will have disposed of their grain direct to some big exporting agency which may be financing them. Each village will usually have one large cultivator who stores more grain than he requires and will lend it out if there is a shortage of seed at sowing time.

Among the regular exports, oil-seeds, sugar, tobacco, jute and other fibres and lac are the most important. Vegetables and fruit are exported to Bengal and the United Provinces and the trade in *ghi* is considerable.

For the disposal of these products (except fruit and vegetables which find their way direct to the railway) as well as for general local trade there are 432 principal and 2,464 minor markets which are maintained by the landlords or their lessees, the cost being met by tolls or a rent charge. The frequency of these markets (they are held once or twice a week) and the fact that the cultivator is seldom more than from five to six miles from a market and is usually much nearer are noteworthy. There is a brisk trade in cattle, especially in buffalo-bullocks, at the big cattle fairs. There is also a large trade in these buffalo bullocks between Bihar, where milch buffaloes are kept in great numbers, and Chota Nagpur, where the home-bred cattle tend to become too small for local cultivation requirements, owing partly to deficiencies of bone-growing material in the soil and partly to the pressure of the cattle population on the available grazing areas. There is also a considerable export, chiefly to Bengal, of bullocks and cows from Bihar.

## 12. LOCAL SELF-GOVERNMENT.

Provincial Government in Bihar and Orissa is on the same pattern as in other Indian provinces. The Governor acting with two Ministers administers the "transferred" departments, *viz.*, Education, Agriculture, Veterinary, Industries, Co-operative Societies, Registration, Local Self-Government, Medical, Public Health, Excise, and Roads and Buildings. The "reserved" subjects are dealt with by the Governor acting with two Members of his Executive Council.

Local self-government in rural areas within the province is regulated by the Bihar and Orissa Local Self-Government Act of 1885 with subsequent amendments and the Village Administration Act of 1922.\* The various local authorities are (1) District boards, (2) local boards and (3) union boards and *panchayats* under the new Village Administration Act which are rapidly superseding union committees.

\* Except in the Santal Parganas where the Bengal Cess Act is in force and Sambalpur where the Central Provinces Local Self-Government Act is in force. There are also special arrangements for the local self-government of the district of Angul.

Under the first-mentioned Act, a district board is set up in 18 out of each of the 21 districts of the province. These district boards have a maximum membership of 40 persons. Three-fourths of the members are elected and hold office for three years. Not less than one-third of the remainder are required to be persons who are not salaried servants of Government. The chairmen of all the district boards except those in the Chota Nagpur division are elected. Their main duties are in regard to education and the Act prescribes that every district board shall be responsible for the maintenance and management of all primary and middle schools under public management within the district and also of medical relief, roads and bridges, sanitation, water supply and vaccination. A district board may also, *inter alia*, incur expenditure on irrigation works for the relief of famine or scarcity, offer rewards for the destruction of noxious animals within the district, hold fairs and exhibitions of cattle, country produce and agricultural implements, establish and maintain veterinary dispensaries and veterinary staff, make provision for the improved breeding of animals, make grants-in-aid of measures for improving agriculture and undertake any other local work likely to promote the health, comfort or convenience of the public. The road cess, which is fixed annually by each district board, provides about fifty per cent of the finance required and Government grants-in-aid about twenty-nine per cent. A board may raise loans for the purpose of carrying out any of the provisions laid down in the Local Self-Government Act. The provincial Government exercise a certain amount of supervision over the finance, budget estimates and the auditing of accounts of the district boards, and its hands have been much strengthened in the last respect by the passing of the Local Fund Audit Act in 1925-26.

Apart from government grants, the income of the boards has remained almost stationary for several years and the increased expenditure on education and public health—the two subjects in which the boards take the keenest interest—has been met largely from government grants and partly by incurring less expenditure on communications.

The local boards are agents of the district board. There is one local board for each subdivision \* of which there are two to four in each district. The members of the local board are the members of the district board elected in the particular subdivision together with such number of additional persons not exceeding one-third of the elected members as the local Government may allow. The district boards appoint these additional members. The local boards seldom contain any officials. They are entirely dependent on the district board for funds.

Union committees are elected bodies charged with certain administrative duties in a village or group of villages. These committees are agents of the district board and are in charge of less important roads, wells, primary schools, local conservancy and sanitation and generally of

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\* Except in three districts in Chota Nagpur and in Angul and the Santal Parganas, where there are no local boards, and in Hazaribagh and Manbhum, where there is only one.

dispensaries. They have power to raise local taxation ; but in most cases their funds are derived mainly from grants. These committees are now being superseded by the union boards constituted by the Village Administration Act of 1922. Union boards are elected bodies, the members of which hold office for three years. The minimum number of members is fixed at three and the maximum at twenty. Each union board, subject to the control of the district board and to such rules as the local Government may prescribe, is ordinarily responsible for primary education, medical aid, conservancy, sanitation, pounds, water supply and village roads. The union board may also, with the sanction of Government, be made responsible for the maintenance of the village police. It may also undertake "any other local work of public utility likely to promote the health, comfort, convenience or material prosperity of the public, including the development of agriculture and village industries....." (Section 41 (i) of Village Administration Act.) So far this provision has proved of little practical importance.

The union board may impose a tax upon the owners and occupiers of buildings within the union provided that the amount assessed on any person in any one year shall not exceed Rs. 30 and any person who in the opinion of the union board is too poor to pay the tax may be exempted altogether from assessment. The proceeds of this tax, of fines, fees or costs levied by *panchayats* and contributions from the district board are paid into a union fund. In fact, however, union boards are largely financed by district boards. For the first two years after a union board has come into existence, its district board must make a suitable grant-in-aid and must also contribute not less than the amount of any tax imposed by the union board. By the end of 1925-26, 153 union boards had been created. But, on the whole, they have so far been a disappointment. The members of the union board are averse to imposing taxation and the creation of union boards is not popular with district boards which take the view that it is impracticable without crippling their own finances to divert to these small local areas more money than was previously being spent on them. As was truly remarked in the Bihar and Orissa Administration Report for 1925-26: "The progress of local self-government in every unit from the highest to the lowest will depend on the willingness of the people to tax themselves and to devote themselves to the service of the public without remuneration."

To complete this sketch of local self-government, it should be mentioned that a certain measure of judicial decentralisation has been attempted by the formation of *panchayats* with power to try petty criminal and civil cases. The area covered by a *panchayat* may be the whole of the area covered by a union board or it may be any number of 'circles' or subdivisions of the union board area. The members of such *panchayats* are elected by union boards from among their own members and their period of office is also limited to three years. The local Government has power to direct the establishment of *panchayats* in any area where no union board exists.

### 13. PUBLIC HEALTH AND SANITATION.

Of the epidemic diseases, cholera is the most dreaded especially in the densely populated division of Bihar. The mortality rate from cholera is 2·2 per thousand, the average (ten-year) mortality rate from all causes being 33·3 per thousand. The climatic conditions are favourable to the spread of the disease for many months in the year and the average mortality from this cause is nearly 90,000 annually. A special corps of ten medical officers is kept at headquarters for dispatch to epidemic centres and one hundred vaccinators are kept in reserve during the danger period which lasts from the beginning of April to the end of September.

As elsewhere, fever is the greatest single factor in the mortality rate, but it is certain that the proportion of deaths attributed to this cause—22·9 per thousand as against a general mortality rate of 33·3 per thousand—is much too high. Few of the deaths ascribed to fever are due to malaria, but should rather be put down to pneumonia, enteric fever, phthisis, *kala-azar* and other fevers. Nevertheless, throughout the province malarial outbreaks on a serious scale do occur, especially from March to the beginning of May and again from July to October. Quinine treatments are placed on sale chiefly through the agency of postmasters and, during the epidemic outbreak of 1925-26 in Orissa, 1,090 lbs. of cinchona febrifuge were distributed free.

In Orissa, diarrhoea and dysentery are very prevalent and filariasis (elephantiasis) is common. The treatment of the latter disease by injections of antimony has been found to be beneficial.

Hookworm is widespread throughout the province. Leprosy is also prevalent, but the work of Sir Leonard Rogers and others has resulted in definite hope of cure in cases taken early, and improvement in more advanced cases. Eight leper asylums are maintained and in spite of the prejudices of local authorities the treatment of lepers at hospitals and dispensaries is increasing—some 5,600 cases being treated in 1925-26 as compared with 3,700 in 1924-25. Plague is mildly endemic in certain parts of Bihar and the first quarter of each year shows a rise in mortality from it, with a more marked outbreak every four years or so, but, on the whole, there has been a steady decline in the mortality from this cause since 1905.

The average provincial death rate for the period 1916-1925 was 33·3 per thousand, but the figures for the last three years have been markedly below the average:—

1924	1925	1926
29·1	23·7	25·7

Up to March 1926, the Public Health Department consisted of four permanent officers only, the Director and three assistant directors in charge, respectively, of the North Bihar Circle, the South Bihar Circle and the Chota Nagpur and Orissa Circle. From March 1926, the department has been much strengthened by the inclusion in it of the following:—

Ten medical officers of health for special duties in cholera and other epidemics,



Three medical officers of health for the three important municipalities of Puri, Gaya and Patna,

Five school medical officers of health (assistant surgeons),

Five assistant medical officers of health (sub-assistant surgeons),

One lady school medical officer,

One officer in charge of the Public Health Bureau,

One chemical analyst,

One superintendent, Vaccine Lymph Depot.

The officer in charge of the Public Health Bureau is also personal assistant to the Director.

The duties which this central Public Health Department undertakes will be sufficiently indicated by the titles of the posts. The assistant directors are inspecting officers who spend much of their time touring.

There is also a central Public Health Engineering Branch which prepares schemes for water supply and drainage for both the provincial Government and local bodies. Particular attention has recently been devoted to the necessity of improving the supply of drinking water in rural areas. Capital grants of the following amounts have been allotted to district boards :

1923-24	1924-25	1925-26
Rs.	Rs.	Rs.
86,700	45,000	3,95,000

The grants are made on the basis of a percentage of the estimated cost of constructing a certain number of new wells in each police station of every district. A sanitary school of instruction is maintained at Gulzarbagh where sanitary and health inspectors are given elementary training.

In addition to this central organisation, five district boards have adopted the scale of local public health organisation suggested by Government, *viz.* : 1 medical officer of health, 4 sanitary or health inspectors and 12 sanitary gangs. Government defray half the cost of such an organisation up to Rs. 10,000 in each district.

But it is not easy to get district boards to realise their responsibilities and the percentage of the boards' expenditure on sanitation to their total income shows no tendency to increase. In 1925-26, their expenditure was Rs. 6·83 lakhs or 4·68 per cent of their total expenditure.

The provision of medical relief in rural areas has proved to be a matter of great difficulty, but appreciable progress has now been made by the district boards (on whom the duty of providing medical relief primarily falls) towards the aim set before them by Government, *viz.*, that there should be at least one out-door dispensary with a sub-assistant surgeon, or an officer of similar qualifications, in charge in each of the 539 *thanas* or police stations in the province. So far, 476 such dispensaries have been established at which treatment for the commoner illnesses and injuries is obtainable. But only 19 of these dispensaries are in

charge of Government sub-assistant surgeons. The rest are staffed by medical officers recruited by the district boards. For the year ending 31st December 1925, 3,442,894 patients were treated in these dispensaries. But only a comparatively small proportion of the rural population has as yet reasonable access to medical relief, as the fact that one dispensary has at present to serve an area of 194 square miles and 77,133 people only too clearly shows. Special medical facilities for women (in particular the provision of trained midwives) in rural districts are still, unfortunately, almost entirely absent.

There is some tendency for local bodies to establish dispensaries in which the indigenous systems of medicine are practised; at present, it is the policy of Government to earmark its grants-in-aid of dispensaries for those at which the western system of medicine (allopathic) is practised. These grants-in-aid have been on a considerable scale and are being continued. Up to March 1925, Rs. 3½ lakhs recurring and Rs. 12½ lakhs non-recurring had been distributed among the district boards and, in 1925-26, a further sum of Rs. 2½ lakhs recurring and Rs. 3½ lakhs non-recurring was distributed.

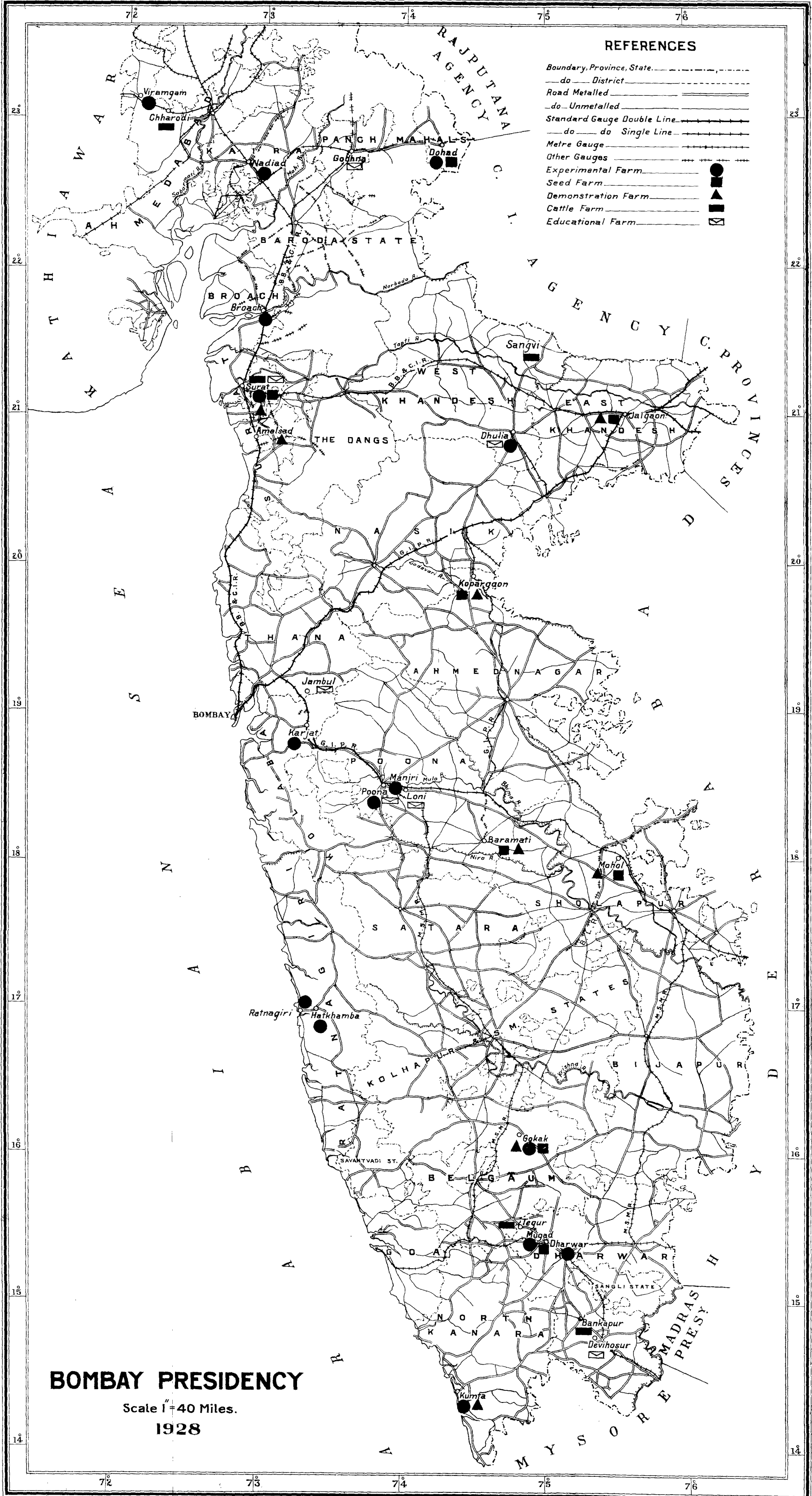
The higher forms of medical and surgical aid are provided by hospitals at district and subdivisional headquarters under the management either of the municipality or of the district board. These, unlike the dispensaries, contain wards for the reception of in-patients. They are chiefly staffed by government assistant surgeons whose pay is borne Rs. 3½ lakhs non-recurring by Government.

In urban areas, there are important hospitals including a large hospital for women at Patna. There are also special hospitals for women at Gaya and Bettiah in charge of doctors belonging to the Women's Medical Service. But these institutions can contribute but little to the medical relief of the rural population.

A great advance has recently been made in the facilities for medical education available in the province by the establishment of the Prince of Wales Medical College at the Patna General Hospital. The college is affiliated to the University of Patna and students can obtain the degree of M.B., B.S. The first year class was opened in July, 1925. This new college has first class equipment, and should be a most important factor in providing trained medical men for the country-side. In addition, the province maintains two medical schools for the training of sub-assistant surgeons. One of these is at Cuttack in Orissa and the second is now at Darbhanga in Bihar, where it was moved from Patna in 1925 in order to make room for the new Medical College.

REFERENCES

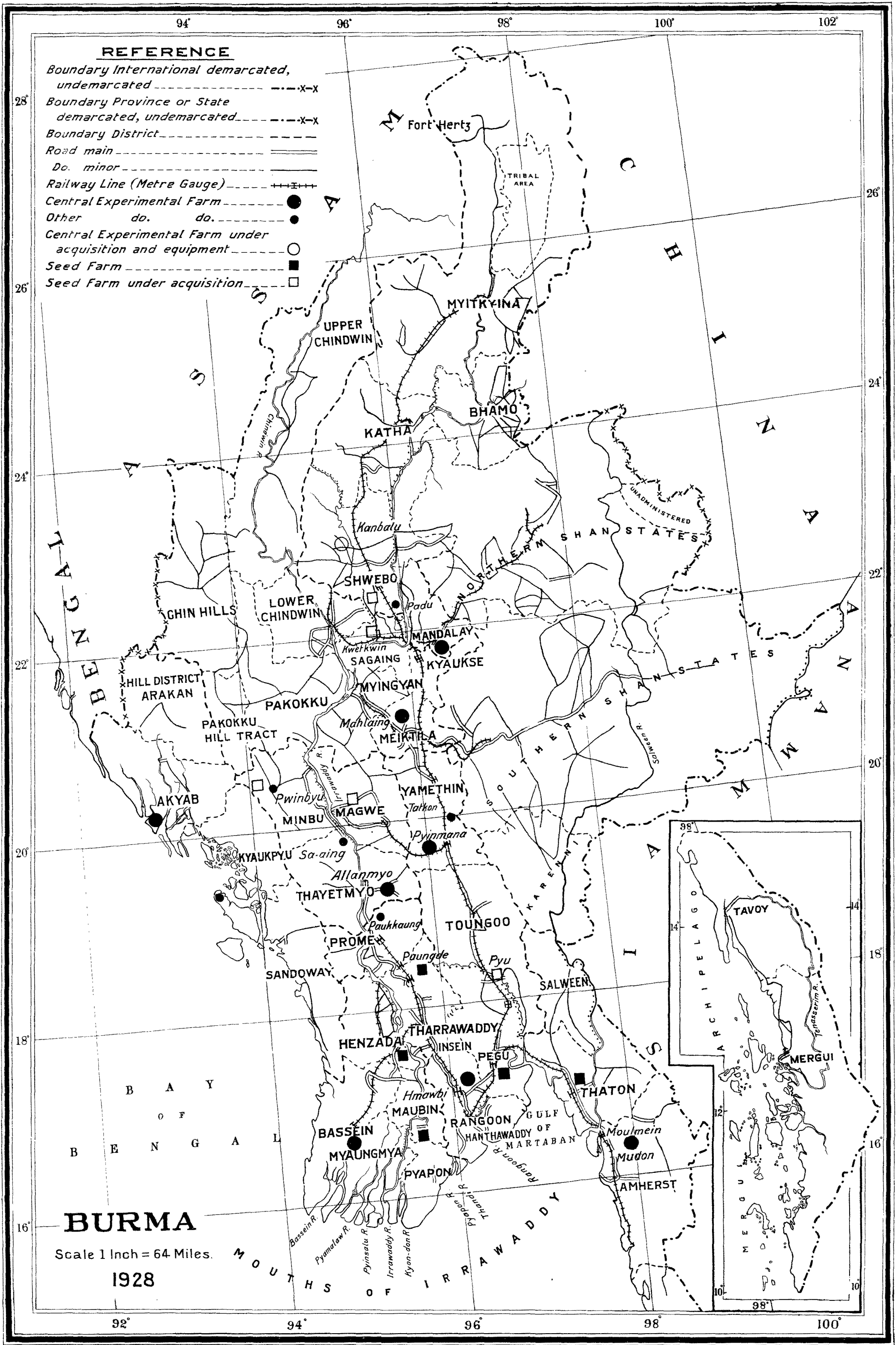
- Boundary, Province, State. -----
- do District -----
- Road Metalled =====
- do Unmetalled -----
- Standard Gauge Double Line =====
- do do Single Line -----
- Metre Gauge -----
- Other Gauges -----
- Experimental Farm ●
- Seed Farm ■
- Demonstration Farm ▲
- Cattle Farm ◼
- Educational Farm ◻

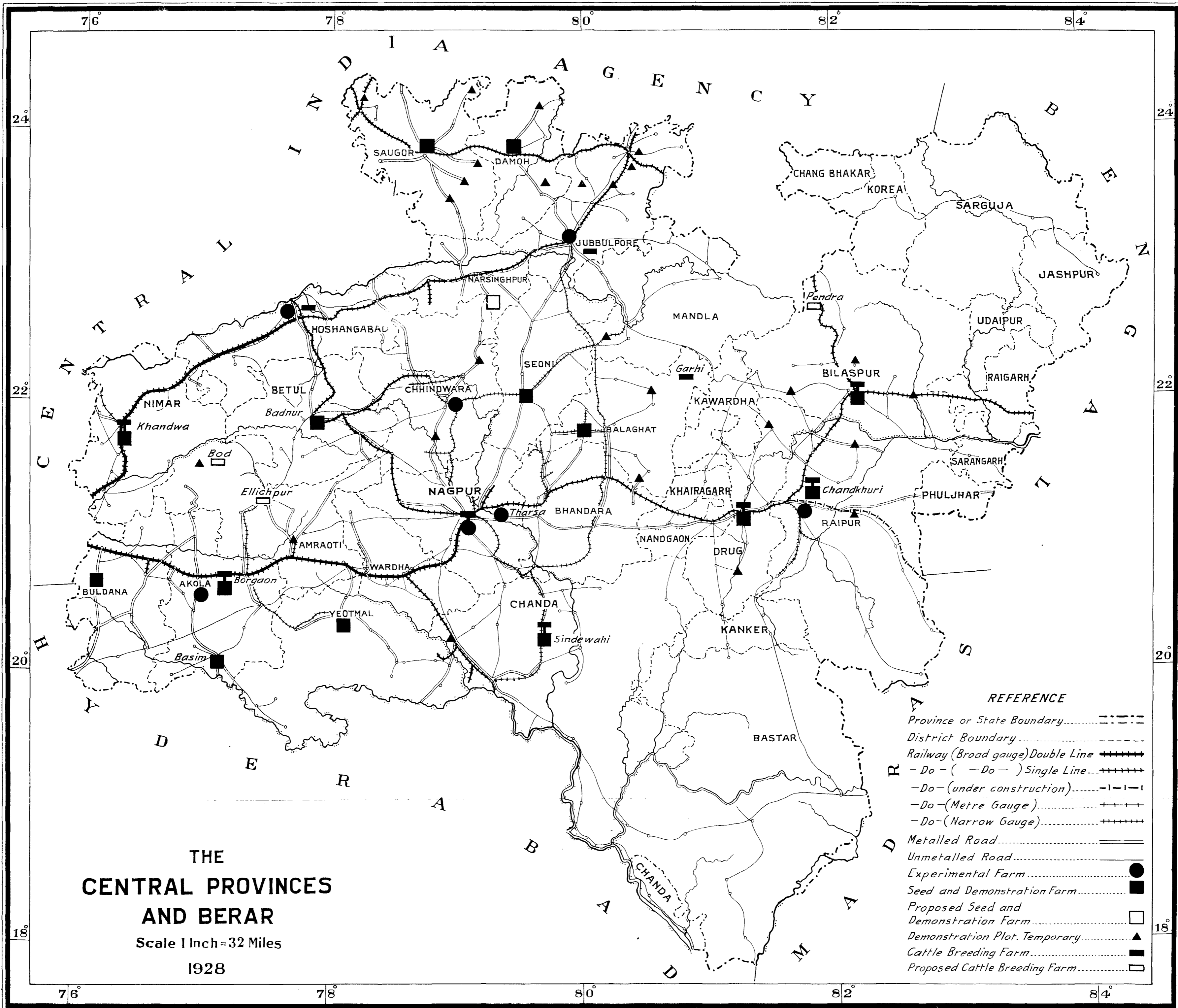


**BOMBAY PRESIDENCY**

Scale 1" = 40 Miles.

1928



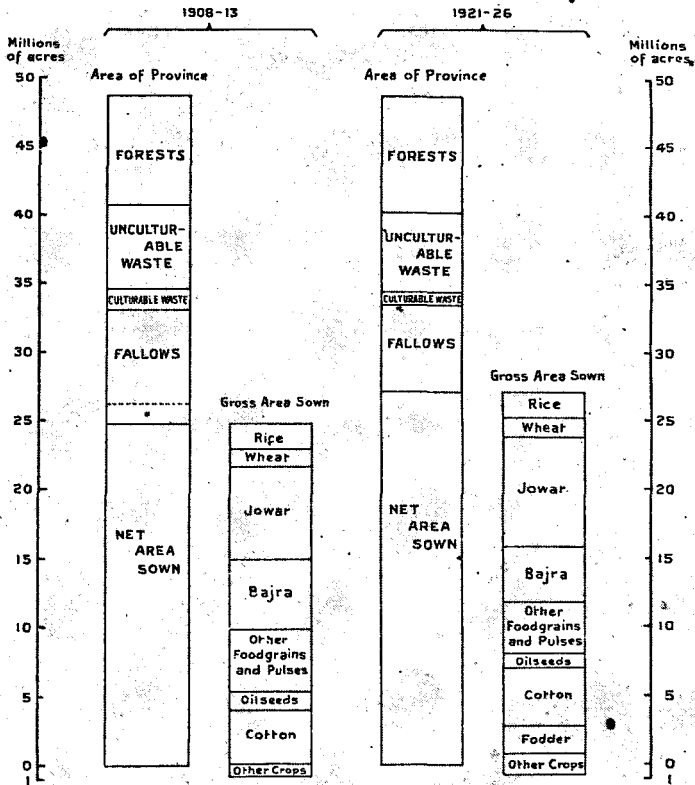


THE  
CENTRAL PROVINCES  
AND BERAR  
Scale 1 Inch = 32 Miles  
1928

- REFERENCE**
- Province or State Boundary..... - - - - -
  - District Boundary..... - - - - -
  - Railway (Broad gauge) Double Line..... = = = = =
  - Do - ( - Do - ) Single Line..... + + + + +
  - Do - (under construction)..... - | - | - |
  - Do - (Metre Gauge)..... + + + + +
  - Do - (Narrow Gauge)..... + + + + +
  - Metalled Road..... = = = = =
  - Unmetalled Road..... - - - - -
  - Experimental Farm..... ●
  - Seed and Demonstration Farm..... ■
  - Proposed Seed and Demonstration Farm..... □
  - Demonstration Plot Temporary..... ▲
  - Cattle Breeding Farm..... ■
  - Proposed Cattle Breeding Farm..... □

**BOMBAY (PRESIDENCY PROPER)**  
**CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS**  
 (5 Year averages)

NOTE: The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.



\* Approximate area of Fodder Crops included in Fallows. In 1915-16 areas under Grass and Babul previously shown as Fallow were included in the Area Sown under Fodder Crops; the area so treated in 1915-16 was about 1 1/2 million acres. The corresponding area for the years 1908-09 to 1912-13 is not known, but it has been assumed that it was about 1 1/2 million acres. Fodder Crops other than Grass and Babul averaging about 47,000 acres for the period 1908-13 are shown under other Crops.

In the Karnatak, the cold season is short. During the hot season the climate is tempered by westerly breezes from the sea and extremes of heat, except in the east of the division, are seldom reached. In the whole of the presidency, outside Sind, frost is very rare though not quite unknown.

The total number of villages in the presidency proper is 22,841. The relative importance of the chief crops of the Bombay Presidency including Sind is shown by the accompanying diagram. The columns show, for the periods 1908-13 and 1921-26, the proportion of the whole area which is cultivated; and they have been sub-divided into sections showing areas occupied by different crops.

The total cultivated area of the presidency proper is 33·5 million acres. Of this, the gross cropped area in 1926-27 was 28·5 millions, about half a million being cropped more than once. The uncultivated area, more than half of which is forests, is about 15·2 million acres. Of the cropped area, 19·5 million acres are under food crops and 8·5 millions under non-food crops. Amongst the former, *juar* 7·5 millions, *bajri* 4·5 millions, rice 2 millions, and wheat 1·3 millions are the most important. Sugarcane is grown on 66,000 acres. The most important non-food crop is cotton which is grown on 4·3 million acres. Oil-seeds account for 1·2 million acres.

A census of livestock is taken every five years. Recent figures for cattle are:

				Millions.
1909-10	..	..	..	7·5
1915-16	..	..	..	9
1919-20	..	..	..	8
1924-25	..	..	..	8·5

In the last census, there were over 3·3 million plough cattle, 2·8 million milch cattle and 2·8 million cattle for other purposes. The sharp fall in the number of cattle in 1919-20 was the result of the serious drought in 1918-19 and 1919-20. The rapidity of recovery in favourable seasons is shown by the figures of 1915-16 and 1924-25. There are at present 11 plough cattle and 9 milch cattle for every 100 acres cropped. The number of sheep and goats in 1924-25 was 1·8 millions and 2·8 millions respectively, while there were 126,000 horses in the presidency.

## 2. PROVINCIAL INCOME AND EXPENDITURE.

The development of agriculture and other rural activities being closely connected with the question of provincial finance, a Table is appended showing the provincial income and expenditure during each of the last five years.

## GOVERNMENT

(Figures are in  
Revenue and Expenditure charged to Revenue)

Receipt heads	1922-23	1923-24	1924-25	1925-26	1926-27	Expenditure heads	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						<i>Expenditure charged to Revenue</i>					
<b>Principal Heads of Revenue—</b>						<b>Direct Demands on the Revenue—</b>					
Land Revenue ..	559	509	517	541	467	Land Revenue ..	167	183	63	65	66
Excise ..	423	435	448	415	409	Forests ..	40	44	44	44	43
Stamps ..	176	180	178	176	168	Other heads ..	44	47	49	63	73
Forests ..	70	71	73	75	77	Capital outlay on Forests charged to Revenue ..					2
Registration ..	13	13	12	18	12	Irrigation—Revenue Account ..	73	71	92	95	85½
Other heads ..	6	9	9	16	19	Irrigation—Capital Account charged to Revenue ..		30			10
Irrigation ..	53	54	53	42	49	Debt Services ..	109	155	202	277	250
Interest on debt ..	80	103	133	166	168	Civil Administration—General Administration ..	117	103	223½	231	228
<b>Civil Administration—</b>						Administration of Justice ..	67	70	73	75	76
Administration of Justice ..	14	15	15	16	18	Jails and Convict Settlements ..	27	25	26	26	25
Jails and Convict Settlements ..	5	5	5	5	6	Police ..	174	168	171	172	170
Police ..	8	6	5	8	8	Education ..	172	193	186	198	201
Education ..	10	10	11	11	11	Medical ..	45	44	45	49	52
Medical ..	6	6	6	6	5	Public Health ..	18	20	23	25	22
Public Health ..	5	8	6	6	6	Agriculture (including Veterinary and (co-operation) ..	24	24	27	27	27
Agriculture (including Veterinary and Co-operation) ..	4	4	3	3	3	Industries ..	3	2		1	1
Other departments ..	1	2	2	3	2	Other departments ..	8	9	6	5	5
Civil Works ..	16	18	15	16	16	Civil Works ..	106	100½	95	96	126
Miscellaneous ..	24	33	28	30	35	Miscellaneous ..	159	136	147	166	161
Miscellaneous adjustments between Central and Provincial Governments (net) ..		28	41	10	4	Contributions to the Central Government ..	56	56	56	34	28
Extraordinary receipts ..					3						
<b>Total, Revenue Receipts.</b>	<b>1473</b>	<b>1509</b>	<b>1555</b>	<b>1558</b>	<b>1486</b>	<b>Total, Expenditure charged to Revenue ..</b>	<b>1409</b>	<b>1479½</b>	<b>1528½</b>	<b>1649</b>	<b>1651½</b>



## OF BOMBAY

lakhs of rupees)

*Capital Receipts and Expenditure*

Receipt heads	1922-23	1923-24	1924-25	1925-26	1926-27	Expenditure heads	1922-23	1923-24	1924-25	1925-26	1926-27
	<i>Capital Receipts</i>							<i>Capital Expenditure</i>			
Revenue Surplus ..	64	29½	26½	..	..	Revenue Deficit ..	..	..	..	..	91,165½
Bombay Development Scheme ..	28	28½	24	28	25½	Capital outlay on Forests ..	2	4	1	..	..
Loans from Central Government ..	765	1025	704½	..	..	Construction of Irrigation, etc., works ..	69½	70	156	246	207
Famine Insurance Fund.	61	33	50	51	47	Capital outlay on improvement of Public Health ..	6	1	..	12	8
Sinking Funds ..	10	11	11	12	12½	Capital outlay on Agricultural Improvements ..	..	1	..	..	..
Loans and Advances by Provincial Government	96	68	37	87	83	Bombay Development Scheme ..	265½	248	158	77	45
Advances from Provincial Loans Fund ..	..	..	..	658	262	Civil Works ..	45	66	85	78	37
Other Capital Receipts ..	..	..	4	9	7½	Other Works not charged to Revenue ..	18	2	1	..	10
						Payment of commuted value of Pensions ..	..	..	..	..	4
						Loans from Central Government (repaid) ..	29	29	29	..	..
						Sinking Funds ..	10	11	11	12	7½
						Loans and Advances by Provincial Government	359	610	330	188	93
						Advances from Provincial Loans Fund (repaid) ..	..	..	..	75	70½
Total, Capital Receipts ..	1024	1190	857	845	437½	Total, Capital Expenditure ..	804	1042	771	779	647½
Opening Balance ..	214	434	582	668	734	Closing Balance ..	434	582	668	734	524

The finances of the presidency are not in a prosperous condition. A considerable effort at retrenchment was made in 1922, but owing to the expansion of various activities, an increase in expenditure became inevitable, and was met by increased taxation. Since 1922, Government has increased its famine fund from practically *nil* to nearly Rs. 2 crores

and its balances from Rs. 2 crores to about Rs. 3·5 crores. The expenditure in 1926-27 shows an increase of 123 lakhs over the actuals of 1924-25. This figure indicates the expansion of the demands of the administrative departments, especially on the transferred side of Government.

On the income side, land revenue is responsible for 34 per cent, excise comes next with 28 per cent, followed by stamps 12 per cent. Forests bring in a revenue of about 5 per cent, while the other sources of income contribute only 21 per cent. The land revenue system is described in another section. Any increase under this head can only follow increases sanctioned at revision settlements. There has been a strong opposition in the Legislative Council in recent years to any increase, in spite of an appreciable rise in prices. In the case of excise, the increase in revenue has been due not to any increase in consumption—which on the contrary has fallen very greatly—but to an increase in taxation. The policy of the Government has been to reduce consumption, first by increasing the cost to the consumer, and secondly by rationing. The latter course will bring about a considerable reduction in the revenue under this head.

The new taxes levied during the last few years were a tax on entertainments and a totalisator tax. Stamp duties and court fees have also been increased.

On the expenditure side, next to debt services and general administration, education comes first and expenditure on it has risen to over Rs. 2 crores or twelve per cent of the total expenditure. The amounts spent on agriculture, public health and medical are two per cent, one-and-a-half per cent and three per cent, respectively.

### 3. REVENUE ADMINISTRATION AND LAND RECORDS.

The Governor is assisted by four Members of the Executive Council who deal with law and order, finance, irrigation, land revenue and famine relief: and by three Ministers who deal with agriculture, co-operation, veterinary services, local self-government, public health, education, excise and forests.

The revenue administration of the presidency is carried on by four Commissioners, under whom are Collectors, one for each district. One Commissioner is in charge of Sind, the other three are in charge of the Northern, Central and Southern divisions. The collectorate generally comprises ten talukas each consisting of 100 to 200 villages. The village in some respects still retains traces of the old system of village government by the rural community. Each village has its regular complement of officers, some of whom are hereditary. The principal village officer is the *patel* who is the headman of the village for revenue and police purposes. The *kulkarni* or *talati* is the village accountant, the *mahar* is the messenger and there is also the watchman. The *patel* and *kulkarni* usually hold a certain area of land rent-free and are in addition

remunerated by cash payment. The *mahar* and the watchman also hold land on favourable terms and receive, in addition, grain and other payments in kind from the villagers. The village is for government and for social purposes generally self-contained. Each taluka is in charge of an officer called the *mamlatdar*. He looks after the revenue administration of the taluka and treasury and is ordinarily also a magistrate. Over the *mamlatdar* comes the assistant or the deputy collector with a subdivision consisting of three or four talukas. For seven months in the year he is on tour to inspect the revenue work and ascertain the needs of the villagers. The Collector is the revenue head of the district and also the district magistrate. The Revenue Commissioner exercises general superintendence and control over the revenue administration of a division of six or seven districts. It is his duty to advise Government on the major problems of administration and on the qualifications of officials under him.

The land revenue system of the presidency is known as *ryotwari*. Every plot of land is held from Government in perpetuity as a transferable heritable property on condition that the holder pays land revenue to Government as fixed at the settlement. The settlement is in force for a period of thirty years. At the conclusion of the period of settlement, the revenue payable is liable to revision, within certain fixed limits. An increase in the assessment is based on an increase in prices and is supported by such considerations as improvement in communications, increase in rents and prices of land. The enhancement, however, in the case of a whole taluka cannot exceed 33½ per cent over the previous settlement rate nor can it exceed 100 per cent in the case of an individual holding. Recently it has been decided to reduce the general limit to 25 per cent in the case of all talukas that have already undergone a second revision. Any improvement of land made by the landholder either at his own cost or from money borrowed from the Government is exempt from enhanced assessment.

The preparation of original survey settlements began in 1835 and continued till 1901. The principles of the existing system were evolved some eighty years ago by Messrs. Wingate and Goldsmid. Each piece of land was measured and classified and its relative productive capacity was assessed with accuracy. The comparative valuations of the fertility of soils were expressed as parts of a rupee, sixteen annas representing a perfect field, from which deductions were made for disadvantages such as slope, excess of lime or moisture, inferiority in character or depth of the soil. After the relative valuation in fertility of the soil of every field had been completed, the villages were divided into groups, each consisting of villages judged to have equal climatic and economic advantages. Then the rate of assessment of the 16 anna land in each group was determined as the maximum rate; and all other

land was assessed on a comparative basis, the rates fixed to be paid annually after harvest or in two instalments.

Two important improvements which have been introduced in recent years in the revenue system are the record of rights, and rules for the suspension and remission of land revenue. The record of rights was prepared from 1904 onwards. It is based on possession and shows in detail all rights in each piece of land. It also shows the tenure of the land and all encumbrances thereon. When crops fall below a certain standard owing to drought or the failure of the water supply in irrigated land, provision is made by rules for the grant of suspensions or remissions of land revenue. The Collector ascertains by local enquiries that there has been a partial or total failure of crops and suspends the collection of land revenue accordingly.

#### 4. THE CULTIVATOR.

Out of the total population of 16 millions in the presidency proper in 1921, 7·7 millions were landholders and tenants, 2·3 millions agricultural labourers, while the non-agricultural population was about 6 millions. Compared with 1911 this shows an increase in the rural population of Gujarat and Khandesh, a decline in other parts of the presidency, and a diminution in the number of agricultural labourers generally who declined from about 3 millions in 1911 to 2·3 millions in 1921, a decline partly due to migration to urban areas, and partly to transfer to the rank of landholder.

As regards the cultivators in the different parts of the presidency, there are great differences in economic condition and mental and moral development. There is the cultivator of Gujarat who is as efficient as any in the world and the hard-working and patient cultivator of the Deccan; and there is the backward and lazy member of the wild hill tribes who has recently turned agriculturist and secures only the minimum outturn from his land. The people mostly live in villages containing from 100 to 1,000 houses. It is only in the Konkan that cultivators have homesteads on their own lands. The village site is usually provided with a *chavdi* where the village officers hold their office, and which is also a common meeting place of the inhabitants. The water supply in villages not situated on a river comes usually from a common well, or, in some places, from the village tank. As regards sanitation, while the people are personally clean, there is no communal effort and the surroundings of their houses are often dirty. Their diet, except in the rice growing tract, consists mainly of *juar* or *bajri*. Wheat is consumed only by the more prosperous classes, while in the hill tracts inferior millets are the staple food.

The province being almost entirely *ryotwari*, the average holding is small and often there is a dense population on the land. The following Table shows the size and distribution of holdings in each

division, together with the land assessment for the holdings per acre in 1922-23 :

Details	Gujarat	Deccan	Karnatak	Konkan	Total, Presidency Proper
	No.	No.	No.	No.	No.
<b>Number of holdings—</b>					
1. Under and up to 5 acres ..	273,683	353,754	150,905	195,344	978,686
2. Over 5 and up to 25 acres ..	124,654	423,932	199,623	61,429	809,638
3. 25 to 100 acres ..	18,224	140,830	50,913	14,363	224,355
4. 100 to 500 acres ..	1,544	12,905	4,927	2,465	21,841
5. Over 500 acres ..	130	435	195	141	901
<b>Total ..</b>	<b>418,235</b>	<b>936,906</b>	<b>406,568</b>	<b>273,742</b>	<b>2,035,451</b>
<b>Total area in acres ..</b>	<b>3,063,825</b>	<b>14,828,255</b>	<b>6,350,176</b>	<b>2,293,174</b>	<b>28,535,401</b>
<b>Average—</b>					
Area of holding in acres	7·3	15·8	15·6	8·3	14·0
Assessment per holding	Rs. 16 6 9	13 12 5	12 0 1	12 8 6	13 14 1
Assessment per acre	Rs. 2 3 10	0 13 11	0 12 0	1 9 10	0 15 11

These figures show how small are the holdings, but it is impossible to compare one district with another as the land varies so much in fertility that a small holding in Gujarat may be equal to a much larger one in Konkan or the Deccan. In the presidency proper, there are only 22,742 holdings of more than 100 acres, or a proportion of 1·1 per cent of the whole. The units of cultivation may be far smaller, being often scattered in different parts of a village. The fragmentation thus caused acts as a severe handicap to proper cultivation, as in the Konkan, for instance, where there are fragments of less than 1/40th of an acre and even as low as 1/160th of an acre. So far, very few attempts at voluntary consolidation have been made as the work presents special difficulties, especially in areas where the quality and depth of soil vary greatly.

An attempt is being made to tackle the problem by means of legislation and a Bill has recently been introduced in the Bombay Legislative Council for the purpose.

The greater part of the Bombay Presidency bears one crop, *kharif* or *rabi*, the first from June to November, the second from September to March. During the remaining months the inhabitants of the villages, except in the irrigated tracts, have a considerable amount of spare time. During this time, carting is done, and some home industries such as spinning and weaving are carried on; in some places, there are small local industries such as sugar making from palms, cane preparation, lacquer work and rope making. Muhammadans and the depressed classes keep poultry but caste Hindus regard fowls as unclean animals. Cattle breeding is common in all parts of the province; and sheep and goats are the care of special castes. These occupations, however, do not occupy the whole leisure time available, nor do they supply an adequate income.

The position of labourers has improved considerably in recent years. The standard of living is reported to have risen in all parts of the presidency and to be higher now than at any previous date. The daily

wages of field labourers in rural areas increased from As. 2-3 in 1900 to As. 4 in 1913 and to As. 7-6 in 1927. In the case of other labourers, the corresponding figures are As. 2-6, As. 4-6 and As. 10-3. In urban areas similar wages have risen from As. 3-6 in 1900 to As. 5-9 in 1913 and to As. 10-3 in 1927. Compared with a decade ago, the working day in agriculture has been shortened. The hours now are from 7 a.m. to 11-30 a.m. and from 2 p.m. to 5-30 p.m. For casual labour the number of hours are  $9\frac{1}{2}$  to 10. The direct influence of industrial centres, such as Bombay, on rural areas has been to shorten hours and to tempt the labourer away from rural employment. The chief industrial cities are Bombay, Ahmedabad and Sholapur and in these cities the cotton mills alone employ a force of 230,000 mill hands. The indirect effect has been through the concentration of capital in the towns and the loss of it to the country-side. Industrial concerns, banks, etc., have provided an alternative investment to land and moneylending. Commercial activities connected with the flourishing export and import trade of Bombay city similarly engage surplus capital and employ labour on a large scale.

Much employment has been provided in recent years by the State in the extension and duplication of railways, and the extension and improvement of roads, and by municipal bodies in town planning schemes.

Special mention should be made of the Marathas of the Deccan and Konkan. They number three millions, and retain the martial qualities which were famous on land and sea in the seventeenth and eighteenth centuries. They maintained that reputation in the great war.

The cultivator may be said to be as conservative as in other parts of the world. He cannot afford to take risks, but, when satisfied of the value of a new crop or implement, he does not hesitate to adopt it, as may be seen from the spread of groundnut and the introduction of the iron plough. The burden of debt lies heavy upon him; much of it has been incurred for unproductive purposes, such as marriages, funerals and pilgrimages. There is ground for hope that co-operative societies may lead to the redemption of debt and to the discouragement of unproductive borrowing.

## 5. THE AGRICULTURAL DEPARTMENT.

In 1802, the Government of Bombay imported cotton seed "reputed to be of a superior description" for cultivation in territories then held by Maratha Rulers. In 1830, the Agri-Horticultural Society of Western India was formed at Poona. In 1878, classes for agricultural education were started in the Poona Civil Engineering College. The Department of Agriculture was established in 1883. At first, the duties of the department were mainly statistical; to compile and maintain an analytical study of each district in order to ascertain its need for protection against famine; also to prepare agricultural statistics and maintain a record which was likely to be useful for revenue settlements. Experimental work was undertaken at farms started in Khandesh, Sind, Gujarat and Poona. An experimental farm was also attached in 1888 to the

Poona Engineering College. When the late Dr. Mollison joined the service in 1890, the operations of the department expanded with the opening of farms at Surat and at Manjri and a cattle breeding farm in north Gujarat for the preservation and improvement of the Kankrej breed of cattle.

In 1904, the Department of Land Records was separated from the Department of Agriculture and the Director was enabled to devote more time to the direction of research, propaganda, and demonstration. In 1907, came the establishment of the Agricultural College as a separate college in Poona. The college had then a staff consisting of a professor of agriculture, an economic botanist and an agricultural chemist. These officers were also in charge of research work and experiments. There has been a steady expansion of the department in the last twenty years. In 1907-08 its budget was Rs. 4·5 lakhs, in 1915-16 it rose to Rs. 8·5 lakhs, and is now about 17 lakhs. The principal officers at present are: the Director, six deputy directors of agriculture, one for each division, an economic botanist, agricultural chemist, professor of agriculture, horticulturist, plant pathologist, agricultural engineer, livestock expert, and soil physicist. A recent addition has been that of a professor of agricultural economics.

The work of the department may be considered under the heads of—

- (a) Research and investigation.
- (b) Demonstration and propaganda.
- (c) Agricultural education.
- (d) Cattle breeding and dairying.
- (e) Agricultural statistics.

*(a) Research and Investigation.*

The progress made in the matter of research is to be measured both by the results achieved and by the improvement in the methods used. The latter have become more scientific, and purely empirical experiment is falling more into the background. The organisation of the work has also been transformed in recent years. Research work in recent years has been along the line of giving the worker as much liberty as possible under the control of a committee which is usually under the chairmanship of the Director of Agriculture, and is composed of men who have special knowledge of the work in hand. The men recruited for research work are usually chosen from the graduates of the Poona Agricultural College and are at first placed under a competent research officer to gain experience.

The most important research work done is that on cotton. Hybridisation has produced several new and improved types on the farms, and the seed has been distributed over large areas. The introduction of the new type 1027A in southern Gujarat has been estimated by a commercial authority to have added not less than Rs. 30 lakhs annually to the value of the crop in the tract. Good results have also followed from selection of such varieties as Dharwar No. 1, and Gadag No. 1 in the Southern Maratha country. In Khandesh, a high yielding type (N. R.) has been popularised and now covers very large areas. So also new varieties of

groundnut, the Japanese and Spanish pea-nut, have been widely introduced. Between 1912-13 and 1926-27, the area under this crop in Khandesh and in Gujarat has increased from about 5,000 to nearly 312,000 acres. This crop which is worth Rs. 80 to Rs. 100 per acre has replaced millets which only fetch half that sum. As regards wheat, Pusa varieties have been introduced in some of the districts of Gujarat. A new variety of rice has been distributed very recently and gives an increased yield of nearly twenty per cent. Some good work has also been done on tobacco and sugarcane.

Further research is in progress on the evolution of new types of cotton and on the improvement of existing types, on the study of cotton wilt, on the improvement of potato and *bajri* crops and of grass-lands. It is hoped that the pure types of rice and *juar* now being distributed will yield fifteen to twenty per cent more grain than was obtained before.

Success has also been achieved in the introduction of certain kinds of improved implements and in checking some plant pests. The iron plough and iron sugar mills are now widely adopted in the Deccan. The enterprise of Messrs. Kirloskar Brothers, who have established in Satara a very valuable pioneer factory for the manufacture of implements, has greatly assisted the spread of the iron plough and the sugar mills in the Deccan. In regard to plant diseases, mention may be made of the increasing use of copper sulphate as a preventive of smut in *juar* and of Bordeaux mixture for grapes and betelnut. Reference may also be made to the use of concentrated manures for garden crops and of castor cake for cotton. In Gujarat, ridge cultivation has been introduced for cotton and *juar* and has consistently given an improvement of twenty to twenty-five per cent in yield.

Investigations are also being carried out on methods of tillage. Dry cultivation, particularly in the tracts in the Deccan which are liable to drought, is one of the most important problems for the department. The soil experts are seeking to find methods for the preservation of soil moisture, and experiments in green manuring are in progress. Work is also being done on the discovery and development of suitable fruit crops. The work of the department has been assisted by a grant from the Indian Central Cotton Committee who have provided Rs. 65,000 a year for five years, for the investigation of the cotton boll worm in Gujarat and for wilt diseases of cotton. In 1911, in commemoration of the visit of His Majesty the King Emperor to India, a private donor, the late Sir Sassoon David, established a trust with an endowment of £53,400 (Rs. 8,01,000) the interest on which is to be used chiefly in giving grants-in-aid of expenditure incurred in establishing vernacular agricultural schools, or in conducting experiments for the introduction of improved methods of agriculture or the devising of improved agricultural machinery.

There are now seventeen experimental and seed stations of which five are in Gujarat, two in Khandesh, five in the Deccan, two in the Karnatak and three in the Konkan.



*(b) Demonstration and Propaganda.*

In recent years, the Agricultural Department has been working in close touch with the Co-operative Department, with private individuals in many districts and with taluka development associations subsidised by Government. The staff employed on this work consists in each division of a deputy director of agriculture supervising district agricultural overseers of whom there are usually two to each district. A divisional board of agriculture has recently been created for each division. This is presided over by the deputy director of agriculture or the assistant registrar of co-operative societies, and has secured the services of non-official gentlemen interested in rural development. They advise the Director of Agriculture and the Registrar of Co-operative Societies on the application of the agricultural and co-operative policy and they control the propaganda work in their division. They distribute government grants for loans to agricultural societies and the discretionary grant for propaganda purposes. The number of these divisional boards is now six. The taluka development associations are a recent creation and date from 1922. They receive a subsidy from Government equal to the amount which they collect, subject to a maximum of Rs. 1,000 per annum; and some of them are reported to be making substantial progress. The close touch which has been established between the Agricultural and the Co-operative departments has resulted in the successful organisation of several co-operative societies for the purchase of agricultural requisites and for the sale of agricultural produce. In some areas arrangements have been made for the supply of implements on hire. Methods of co-operative sale have also been effective in the case of cotton and *gur*: and one taluka development association is reported to have made progress in introducing co-operative fodder storage. Seed farms for the distribution of improved seed have been established by the department itself. The uncertainty of finding water, when wells are sunk, has been a very serious difficulty for the cultivator and has caused the loss of considerable sums of money so invested. For several years the department has undertaken boring operations to ascertain the presence of supplies of water and also to deepen existing wells; and recently experiments have been made, with considerable success, with water-divining. The terracing of lands and the leading of hill streams on to these terraces is a special feature of cultivation in the Deccan and presents engineering problems of some complexity. A special staff has recently been engaged by Government to assist cultivators with the expert knowledge necessary to deal with these problems.

“Generally speaking,” says the Director in his last report, “we can look round the presidency and see in most areas improvements worked out or introduced by the Agricultural Department in large scale use; a gradually increasing desire among the cultivators for fresh development and a very strong movement towards the organisation of local agricultural development by the people themselves in many areas.”

*(c) Agricultural Education.*

Higher agricultural education was introduced in 1878 after a severe famine which attracted attention to the necessity of the improvement of agricultural methods and practice. A course was started at the Poona Civil Engineering College specially designed for men who were to occupy the position of revenue inspectors. The course was for two years and attracted the attendance of thirty students. But the class declined in numbers when the students found that this course was not a direct road to government employment. In 1880, a farm was started and practical instruction given. In 1885, the University of Bombay was moved to grant a degree in agriculture, but it was not till 1890 that the university decided to give a diploma. The men trained received no preferential treatment, except for appointments to minor posts. This was not encouraging, and numbers again declined, and no student obtained a diploma in agriculture between the years 1897 and 1901. In 1897, the standard of admission to the course was raised and Government agreed to recognise an agricultural diploma as equal to a degree of the university. In 1899, the university consented to establish a regular course leading to a degree in agriculture. The number of students gradually increased; in 1907, 11 received degrees and in 1925, 59. In 1907, a separate agricultural college was established. The course of study was laid down by the university, and under Dr. Mann the college attained a considerable reputation, and attracted students from countries so far distant as Burma, Ceylon and Persia.

The department maintains six vernacular agricultural schools, of which that at Loni, near Poona, was the first. These schools are definitely vocational and are meant for the sons of cultivators possessing not less than 30 acres of dry or 10 to 12 acres of irrigated land. Boys are admitted between the ages of 14 and 17 provided that their aim is to go back to private farming and not to take service. They are required to do a considerable amount of practical work on the fields. Education, board and lodging are free. Each boy costs Government about Rs. 260 per year, or Rs. 520 for the full course of two years.

In 1922, a new course was introduced on the Punjab model for agricultural education in the higher standards of primary vernacular schools, and provision was made for teaching both theoretical and practical agriculture, with instruction in village carpentry and iron work in addition to the ordinary school routine. Each class is in charge of a teacher who has received a year's special training at a training school maintained by the Agricultural Department. Forty-three such classes have now been opened and have proved successful.

There is a short practical one-year course in agriculture at the Poona Agricultural College which is attended every year by about twelve to twenty young men belonging to the land-owning classes. There are also short courses on some of the government farms, the most successful is one in sugarcane-growing at the Manjri farm. This class which is very popular lasts for three weeks.

*(d) Cattle breeding and Dairying.*

Bombay has many breeds of cattle, each suited to its own region, of which the following eight have distinctive characteristics :—

Kankrej in Gujarat,  
 Malvi in Khandesh,  
 Krishna Valley in Belgaum,  
 Amrit Mahal in Dharwar,  
 Gir in Kathiawar,  
 Dongri in Thana and Nasik,  
 Khillari in the Deccan,

In Sind { Thar and Parkar for draught, and  
 Karachi for milk.

In general, however, it may be said that the cattle are of mixed breed, poor milkers, and mature very late. Attempts at improvement have been made by Government since 1881 when bulls were distributed to each district in charge of the district local boards. In 1907 the Civil Veterinary Department distributed premium bulls to individual landholders. This system has proved useful. There are now 63 bulls so kept with a subsidy from Government, and the demand is rapidly increasing. Owing to the difficulty of finding good bulls, Government established farms for different breeds to produce their own bulls. These breeding farms were established for the Kankreji cattle at Chharodi and Surat, for Amrit Mahal cattle at Bankapur and for Sindhi cattle at Karachi. Government are also subsidising two *gowshalas* to produce pedigree Gir cattle. Some other *gowshalas* have also been recognised and are being conducted under Government advice. Some half a dozen cattle shows are held every year.

The chief difficulty in the improvement of cattle consists in the absence of castration as a general practice. The village herds wander on communal pastures and good cows are spoiled by wholly unfit bulls. The sanctity of the animal prevents the elimination of the unfit and large numbers are preserved which are of no economic value.

Attempts have been made to establish a dairying industry in the Kaira district of Gujarat. Butter and cream are transmitted to Bombay, a distance of 300 miles, but the industry has not yet proved a success on a large scale.

*(e) Agricultural Statistics*

These fall under three heads :—

- (1) land and its assessment,
- (2) agricultural resources, and
- (3) crops and tenancies.

The first is mainly fiscal. The second includes information for the quinquennial census of cattle and resources, and of the sources of water supply.

The third consists of the record of crops and tenancies, the abstract and forecasts of various crops, fortnightly statements of prices of principal agricultural products and weekly season reports. Most of the statistics are prepared in the first instance by village officers and then

checked by superior officers. They are fairly accurate for practical purposes.

#### 6. THE VETERINARY DEPARTMENT.

In 1909, the Civil Veterinary Department, as at present constituted, was established. Before that date veterinary work dealt principally with horse breeding and was in charge of officers lent from the Military Veterinary Department. Horse breeding was then transferred to the Military Department and the Civil Department concentrated its operations on cattle. Veterinary hospitals and dispensaries are in charge of the district local boards, Government contribute towards their maintenance and bear the cost on account of the veterinary assistant surgeons in charge of them. Cattle breeding is now in charge of the Agricultural Department and under the control of their livestock expert, and the Veterinary Department confines itself to dealing with cattle diseases.

There are 103 veterinary dispensaries in the presidency proper, and some districts, in which the local boards are affluent, such as East and West Khandesh, will shortly have one dispensary in each taluka. Poorer districts, such as those on the coast, have on the average only three dispensaries to a district. Progress in the matter of construction of new dispensaries has been accelerated since 1910 when the Trustees of the estate of the late Mr. N. M. Wadia, C.I.E., offered to place at the disposal of Government Rs. 15,000 a year for the construction of such buildings. Eighteen veterinary dispensaries have so far been built with the help of this donation, half the cost of construction being met from it and the remaining half from provincial and district local boards funds. So far, it appears that the dispensaries have not been largely resorted to by the rural population and have chiefly benefited the people living in towns and surrounding villages. Touring dispensaries are being started in certain districts.

The Glanders and Farcy Act is at present the only Act for the control of diseases of livestock. In regard to rinderpest, preventive inoculation has been fairly successful. But there are difficulties in securing timely reports and there are prejudices against inoculation. These are gradually being overcome. Proposals for legislation for isolation of animals, for restriction of their movement and for compulsory inoculation are now before Government. In 1926-27, it is reported that 360 villages were affected with rinderpest, 15,189 cases and 7,002 deaths being registered.

A veterinary college was established in Bombay in 1886 primarily to train men for employment by Government or local bodies. There are about ninety-one students on the rolls, and the course lasts for three years. Of the sixteen candidates who passed last year, nine entered government service, and seven obtained employment in Indian States.

The department consists now of two officers of the Indian Veterinary Service and seven of the Provincial Veterinary Service, and the expenditure is a little over Rs. 5 lakhs.

#### 7. IRRIGATION.

Out of the total cropped area of 27·5 million acres, less than a million acres are irrigated ; and of this irrigated area nearly two-thirds is in the

Deccan. The sources of irrigation are : (1) government canals irrigating 260,000 acres, (2) wells irrigating 500,000 acres, and (3) other sources, such as tanks and hill streams irrigating 200,000 acres.

Out of the total area of 260,000 acres irrigated from government canals, 230,000 are in the Deccan chiefly on works constructed for the protection of the country from famine. In the year 1874-75, the first attempt at the storage of the heavy monsoon rains was made and Lake Fife close to Poona was constructed to feed the Mutha canals. In 1884, the Nira Left Bank canals were constructed. After the report of the Irrigation Commission of 1903, a systematic survey was made, and several new projects were prepared and have since been carried out, such as the Godavari canals, the Pravara canals and the Nira Right Bank Canal. This last work is now nearing completion and the total then irrigated will exceed 400,000 acres. The economic conditions of the famine tract have been greatly improved thereby, and the people generally are not only more secure against famine but more prosperous in normal years. These works are important enough to deserve some detailed description.

(1) The Nira Left Bank Canal protects a part of the Poona district which receives precarious rainfall. Although designed as a protective work, it yields a net return of eight per cent on the irrigation of 83,000 acres.

(2) The Godavari canals irrigate a part of the Nasik district. They were completed in 1915-16 at a cost of a little over a crore of rupees. The area irrigated is 40,000 acres, of which 7,500 are under sugarcane. The villages in the canal tract are growing into busy towns.

(3) The Pravara canals were completed in 1926 at a cost of Rs. 1.5 crores. They irrigate 49,000 acres, of which 9,000 are under sugarcane.

(4) The Nira Right Bank Canal will be completed in 1931-32 and will irrigate 70,000 acres at a total cost of Rs. 4,91,00,000.

As the storage provided by the Lloyd Dam at Bhatgar for the Nira Right and Left Bank canals will not be sufficient for the full development of irrigation in the Nira Valley, a complete scheme which provides for the widening and remodelling of the Nira Left Bank Canal and for building a new dam at Vir to supplement the supply of the Bhatgar Dam has been sanctioned. The additional works will cost Rs. 135 lakhs.

The area irrigated from wells exceeds the area irrigated from government canals and other sources, and the cultivation thereon is of a very high order. The water is ordinarily drawn up by bullock power by means of big leather bags. In some places Persian wheels are found and oil engines are now being introduced, particularly in the Kaira district of Gujarat. In recent years there has been a lowering of the water level in wells, which has rendered the supply in some cases insufficient, and has everywhere increased the cost of irrigation.

Other natural sources of water supply have not yet been fully tapped. Opportunities are available for the construction of small tanks and masonry dams on hill-streams which might irrigate terrace cultivation and would supplement the supply from wells in the vicinity. Such works

already exist in the hilly tracts of the Deccan and in some parts of the Karnatak, and the scope for their extension is considerable. Government have recently appointed a special officer of the rank of superintending engineer to investigate the question of such minor irrigation works. This officer works under the Revenue Department and the work is financed from the famine fund. The results obtained have been encouraging.

The Irrigation Department also carries out some experimental and research work. Research problems are connected with waterlogging and salt efflorescence and the reclamation of such lands. Experiments are made in designing drainage channels to save land from waterlogging and in different methods of preventing leakage. Surveys have also been made with a view to distributing crops on soils best suited to them.

The importance of these canals to the cultivation of sugarcane may be appreciated from the fact that, in 1915-16, thirty per cent of the total area under sugarcane was irrigated by government canals but, in 1924-25, this area was sixty per cent of the total. This crop is also reciprocally valuable to the canals, for it pays a considerable proportion of their total revenue.

Mention may be also made here of three big hydro-electric works on the Western Ghats, established by the Tata Company. The power generated by these works is used almost entirely in urban areas for industrial and other purposes. There does not seem to be any immediate possibility of employing this power for the benefit of agriculture but the question of using the tail water of one of these works for purposes of irrigation is under consideration.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

The area under forests is 15,000 square miles, or twelve per cent of the total area of the province. The distribution, however, is uneven: one district, Kanara, contains one-fifth of the total, Khandesh and Thana contain another one-fourth, while some of the districts in the Deccan and Gujarat have very small areas under forests. One-sixth of the area is in charge of the Revenue Department, the remainder being in that of the Forest Department. Large tracts are open for grazing and grass-cutting and are thus a valuable source for the supply of fodder. Complaints are sometimes heard about the closure of forests against grazing; but the area so closed seldom exceeds fifteen per cent of the total.

The Forest Department deals with all operations of technical forestry, but in matters concerning the rights and privileges of the people, the supply of grass, grazing, and fodder, the local revenue officers have a voice; and the Revenue Commissioner of the division exercises a general control.

The value of the Forest Department to the country is seldom fully recognised. While it has preserved forest growth for the use of future generations and has brought the forests under scientific regulation, it has eased the burden of the tax-payer by bringing in a net revenue of Rs. 30 to 40 lakhs.

The claims of agriculture have also been fully respected, and the cultivators in the neighbourhood of forests obtain their supplies of timber for

building, wood for agricultural implements, leaves for manure, fodder, grass, and grazing for cattle, at very low rates. The charge for grazing cattle in forests is a nominal fee of 2 to 4 annas per head per annum; and the total number of cattle admitted to graze in 1925-26 was about 2·5 million. In the principal forest district of Kanara, an experiment has been started of creating a minor forest department, to be in charge of forests which, though not growing valuable timber, are of special importance from the agricultural point of view. Experiments are also being made with a new system of closure of various areas for grazing so as to improve the quality and quantity of the grass; and some land has been handed over to the Agricultural Department to investigate the comparative effect of heavy or light grazing on the growth of grass.

Under the famine insurance scheme, forest grass has been stored in certain places, the reserves in Thana and the Panch Mahals amounting to 14,000 tons, and in West Khandesh to 8,000 tons. The grass is pressed and baled and is available for transport in times of scarcity to famine areas, the transport by rail being effected at special concession rates.

#### 9. GENERAL EDUCATION.

In response to a growing popular demand due to the wider recognition of the need for the improvement and spread of education, the State and local bodies have enlarged the expenditure on the subject in recent years. As noted in section 2, State expenditure represents twelve per cent of the revenue. Between 1913-14 and 1926-27 the total expenditure on public instruction rose from Rs. 159 lakhs to Rs. 381·5 lakhs. Of this total, government funds contributed fifty-two per cent, municipal boards\* eighteen and three-quarter per cent, fees seventeen and a quarter per cent, and other sources twelve per cent. Half the amount was spent on primary education. The State expenditure on education increased during this period from Rs. 73 lakhs to Rs. 198·6 lakhs.

The detailed figures of State expenditure for the year 1926-27 are given below :—

1926-27

#### *Institutions*

—	Boys		Girls		Total	Percentage
	(Figures in lakhs)		(Figures in lakhs)			
	Ra.	Ra.	Ra.	Ra.		
University .. .. .	12·7	..	12·7	..	12·7	6·35
Secondary .. .. .	17·4	5·2	22·6	..	22·6	11·3
Primary .. .. .	105·2	16·5	121·7	..	121·7	60·85
Special .. .. .	10·6	1·9	12·5	..	12·5	6·25
Buildings .. .. .	7·1	0·3	7·4	..	7·4	3·7
Miscellaneous, including scholarships. .. .. .	7·2	1·1	8·3	..	8·3	4·15
<b>Total .. .. .</b>	<b>160·2</b>	<b>25·0</b>	<b>185·2</b>	<b>..</b>	<b>185·2</b>	<b>92·60</b>
Direction and inspection .. .. .	12·1	0·7	12·8	..	12·8	6·4
Exchange and expenditure in England .. .. .	..	..	2·0	..	2·0	1·0
<b>Grand Total .. .. .</b>	<b>..</b>	<b>..</b>	<b>200·0</b>	<b>..</b>	<b>200·0</b>	<b>100·0</b>

\* Includes District Boards.

If we take the figures for the whole of India for 1924-25 the last year on record, we find that the expenditure per head for India was Rs. 21, while in Bombay it was Rs. 35. The percentage of scholars to population was 3·96 for India and 5·28 for Bombay. In the year 1926-27 the total number of pupils under instruction in Bombay was 1·15 million. The percentage of male scholars under instruction to the total male population was 9·12, the corresponding figure for girls being 2·43. The percentage of attendance varies very greatly according to the keenness for education in different communities. It is reported from the Deccan, for instance, that the Brahmin community send 100 per cent of their boys to school. The higher scale of expenditure in this presidency compared with the rest of India is in part due to the larger provision of trained teachers and to the higher salaries paid to them. Sixty per cent of the teachers had passed through a training institution; thirty-six per cent had passed a qualification standard; and less than four per cent were without qualification.

The primary schools are subject to the same criticism as elsewhere in India that they serve largely as a crèche for infants. Out of the 9·3 lakhs of pupils, thirty-one per cent are in the infant class and only twelve per cent reach the fourth standard. Thus much of the money spent is wasted and is not effective in raising the standard of literacy. There is considerable popular support for the view that compulsion is necessary to secure the attendance of pupils until a stage when they may be regarded as literate. In 1923, Bombay passed a Primary Education Act under which compulsion could be introduced both in urban and in rural areas. This Act enabled municipal and district local boards to introduce compulsion. But so far, few of these bodies have taken advantage of this power. The areas in which it has been introduced are the following:—the municipal areas of Surat, Bandra, Dhulia, Byadgi, Satara, Ahmednagar, Sholapur and Broach. It has not yet been applied to any rural area.

The delay has been due partly to the need for a revision of the District Local Boards Act in which considerable changes were found necessary owing to the proposed transfer of the management of the primary schools to local bodies; the Act was revised in 1925 in the light of the Primary Education Act of 1923, and opportunity was also taken to broaden the basis of representation for the rural classes on the local bodies. Twenty-two out of the twenty-seven district local boards in the presidency have now taken over control of primary education.

On an average, there is one boys' primary school for an area of 10·3 square miles and the male population under instruction in primary schools is 6·8 per cent. Out of the total expenditure of 198½ lakhs on primary education, 62 per cent was found by Government, 28 per cent by local boards, 2·5 per cent by fees and about 7·5 per cent from other sources.

An attempt was made some years ago to separate the urban primary course from the rural. But this did not prove popular, since pupils taking the rural course were not able to pass into the English middle school; and



this distinction was therefore removed. An alternative syllabus for the vernacular final examination has now been introduced in order to adapt the education to the needs of the children of agriculturists. This experiment gives every promise of success.

Attempts have been made to introduce education for adults, and funds for this experiment were supplied by a private donor, the late Sir Vithaldas Thackersey. On the death of the donor, the experiment was discontinued.

To encourage education amongst the backward classes, a system of scholarships has been established, and in some cases special communal institutions have been founded. These backward classes number 3·7 millions and represent nineteen-and-a-half per cent of the total population; and the percentage of literacy amongst them is very small. The problem is, therefore, very urgent and is engaging the earnest consideration of Government.

In order to arouse public interest in rural areas on subjects connected with village welfare, such as education, agriculture, co-operation, and public health, magic lantern lectures have been recently instituted. These usually attract big crowds and have proved valuable in spreading useful information amongst a section of the populace which cannot be reached by printed matter.

#### 10. CO-OPERATION.

The problems of providing finance for agricultural operations have been long examined and debated. The dependence of the cultivator on the village moneylender has led to much tyranny and oppression, and the cultivator has been handicapped by his illiteracy and his inability to understand accounts. In the 'seventies', this oppression led to agrarian riots and, in 1879, the Deccan Agriculturists' Relief Act was passed, which was subsequently extended to other parts of the presidency. This Act enabled the civil courts to examine the whole relation between a creditor and a debtor and to investigate the conditions in which the bonds were passed. The rapidly rising value of land was held to afford too facile credit to cultivators who were thereby encouraged to raise money for unproductive purposes without being able to understand the meaning of the engagements into which they entered. Attempts were, therefore, made to restrict their credit but with partial success in improving their condition. In 1883-84, all-India Acts were introduced to provide State loans of short-term credit for the purchase of seed and cattle and of long-term credit for the improvement of lands by the construction of wells and embankments. In 1904, the Co-operative Credit Societies Act was passed. This was restricted at first to the provision of credit. It was revised in 1912 so as to admit forms of co-operation other than credit and was replaced in 1925 by the Bombay Co-operative Societies Act. The Agricultural and Co-operative departments are concerned with the improvement of the economic condition of the ryot, and have worked together in close and intimate connection. Until 1920, the Registrar of

Co-operative Societies was subordinate to the Director of Agriculture, but since then he has held an independent post, and sits on a joint board with the Director of Agriculture.

From the first, the co-operative society enlisted the sympathy and help of private individuals with influence in rural areas, who, from a sense of public duty, help the department in the work of propaganda and organisation. The education of the agricultural classes in the co-operative idea and its economic and moral lessons was uphill work and made slow progress in the beginning. A great impetus to the credit movement was given by the establishment of the Bombay Central Co-operative Bank, now known as the Provincial Co-operative Bank. This was the first bank of the kind on the debentures of which Government guarantee the interest. This bank, like all other co-operative banks subsequently started, may lend money only to societies registered under the Co-operative Societies Act.

The progress made has been very rapid. The number of societies in 1910-11 was 256 with a membership of 20,000, the number in 1926-27 was 5,091 with a membership of 482,000. The working capital has also increased during these years from Rs. 14 lakhs to Rs. 10·3 crores. Of these societies, 4,286 societies are agricultural primary societies with a membership of 3 lakhs and a working capital of Rs. 3·8 crores.

The organisation in Bombay has a threefold division. There is first the government department under the Registrar which is responsible for the registration and cancellation of societies, their audit and liquidation, their general control in their relation to the State and their maintenance within the provisions of the law. In addition to the Registrar, the staff employed for this purpose consists of 7 assistant registrars, 44 auditors, and 10 organisers. The organisers are concerned mainly with the organisation and supervision of non-credit societies. The work of the auditors consists chiefly in auditing the accounts of the societies once a year. The general supervision is in the hands of the assistant registrars. The policy has always been to allow the societies to manage their own affairs and to reduce interference from outside to the minimum possible.

Secondly, there is a network of central banks with the Bombay Provincial Co-operative Bank at the head. This organisation deals with finance of societies. There is, thirdly, the Bombay Central Co-operative Institute with its branches, which undertakes propaganda, instruction and supervision on the moral and educative side. While the influence of the institute is growing, the Registrar and his staff also take their part in the work. The aim is to make the institute the central federal organisation of co-operative societies, representative of them and controlled by their delegates. Constitution of the institute has been revised and made more democratic. It has now a network of district branches. The institute holds conferences and training classes in English and in the vernaculars. The institute is helped both by the department and by the central financing agencies.

The most important unit in the organisation is the member of the individual primary society. The village co-operative credit society is formed on the basis of unlimited liability without shares. There is usually one society to a village. The capital of the society is raised by means of local deposits supplemented by loans from the district or from the Provincial Bank.

Credit still plays a chief part in the movement, but there has been some considerable development also on the non-credit side. The distribution of seed is mainly done through existing credit societies, and in some cases through sale societies. Societies for the hiring of machinery have been successfully started, dealing chiefly with ploughs and sugarcane crushers. Two power pump societies have been established to irrigate lands belonging to the members, and two ginning societies have been registered, one of which has worked well for the last two years. Sale societies, dealing chiefly in cotton and *gur*, sold goods last year to the value of over Rs. 72 lakhs. In one case, opposition was encountered from local middlemen but was successfully overcome. Individual members of credit societies also made use of the Bombay Provincial Co-operative Bank for the sale of cotton and *gur*.

Another development has been the formation of fencing societies which construct walls to protect lands from the ravages of pigs and other animals. There are eleven such societies. It is anticipated in many cases that the protection thus afforded will pay for the cost of the walls in a year or two. There are eighteen societies for the breeding of cattle, fifteen of which are found in the Southern division where they are working well.

Much help has been derived from taluka development associations referred to in section 5. In all measures undertaken by private enterprise Government has afforded encouragement through the assistance given to the divisional boards, taluka associations, and a liberal grant to the Central Co-operative Institute. The central banks command the confidence of the public and are able to raise considerable sums.

A very important proposal which was recently before Government is the organisation of land mortgage banks. At present, long-term capital is supplied partly through the proceeds of debentures issued by the Provincial Bank and partly through the amounts placed at the disposal of the movement by Government out of its *taccavi* grant. If, however, the relief of indebtedness is to be undertaken on any appreciable scale, much larger amounts will be required. It is proposed that, in order to facilitate the formation of such banks, debentures should be issued and the interest thereon should be guaranteed by Government. It has been decided to start, as an experimental measure, two land mortgage banks, one in Gujarat and the other in the Karnatak.

## 11. COMMUNICATIONS AND MARKETING.

The presidency is served by three railways, namely the Great Indian Peninsula, the Bombay Baroda and Central India, and the Madras and Southern Mahratta. The first two are on the broad gauge and the last

is a metre gauge line. The Great Indian Peninsula connects Bombay with Calcutta and Madras, the Bombay Baroda and Central India with Delhi, while the Madras and the Southern Mahratta runs to Mysore. There are also branch lines in different parts of the presidency. The total milage of railways at present serving the presidency proper, excluding the States of Western India, is 2935. On the coast, communications are maintained by steamship lines which sail at regular intervals from Bombay to Karachi and the Persian Gulf in the north and to the ports of the Kolaba and Ratnagiri districts and on to Goa and Mangalore in the south.

The present milage of metalled roads is 8836. The principal roads in charge of the Public Works Department in the Central and Southern divisions are in very good condition. In Gujarat, partly owing to the fact that the country is interspersed with rivers and partly owing to the difficulty of getting metal, the condition of the roads is bad. Roads in charge of district local boards are not usually well maintained as the boards have not sufficient funds at their disposal.

In recent years, large sums have been expended on the provision of bridges and the improvement of low level crossings of rivers and streams. But off the main roads a great deal remains to be done in providing access to remote villages. The chief means of transport from the field to the market place or the railway station is the bullock cart. The motor bus has recently come in and is popular wherever the roads permit of its use. The motor lorry for transport is still in the future. The bullock cart has supplanted the pack animal which was the chief means of conveyance sixty years ago. Many types of cart are used, and some are capable of improvement both for the sake of the animals and to save the wear and tear of the roads. With better transport there will be encouragement for growing fruit and vegetables of a perishable character which cannot now be marketed quickly enough. In 1926, a Road Board consisting of officials and non-officials was appointed by Government. This Board is to advise Government on the classification of the roads and lay down standards to which each class of road is to conform. When funds are available for the construction of new roads, the Board will advise Government as to the allocation.

The greater part of the agricultural produce is dealt with in local centres for local consumption. Crops for export represent a small percentage of the total. The market of the export crops is highly organised, particularly in the case of cotton. Grading for sale on any large scale is unknown, except in the case of cotton and *gur*. In regard to cotton, government officers assist the grading done by cotton sale societies in the Karnatak and in regard to *gur* the Provincial Co-operative Bank supplies experienced valuers.

The small cultivator sells his produce either to the village *bania*, who is usually both a moneylender and a trader, or to an itinerant purchaser who comes to the village at harvest time; or he may take his produce to the nearest market and sell it through an *adatya* (broker). The broker finds a purchaser for the produce and fixes the price for the cultivator.

The cultivator is generally at a disadvantage and is unable to dispute the price fixed for him by the broker.

In addition to the difficulty of communications, the cultivator is handicapped by the high rates of transport by rail and by the multiplicity of weights and measures which are sometimes manipulated to his disadvantage.

## 12. LOCAL SELF-GOVERNMENT.

The present system of local self-government dates from the year 1884 when an Act was passed to promote interest amongst the people in local matters and to give them a voice in the disposal of local funds. Under this Act, each district was to have a district local board and each taluka a taluka local board, the latter board being subordinate to the former. The proportion of elected to non-elected members was two-thirds and one-third respectively. By a recent Act, the constitution and powers of local boards have been revised, and the proportion of elected members has been increased to three-fourths. The franchise has been widened and women can now be elected members. Additional sanitary and other powers and wider powers of taxation have also been granted. Presidents and vice-presidents are now non-officials elected by their respective boards. The policy during the last decade has been to give more power and responsibility to the local boards and, where control is still exercised by the State, it is used solely for the purpose of safeguarding the interests of tax-payers, especially in cases where State funds have been lent. The funds at the disposal of the boards consist chiefly of the local fund cess on land revenue, other sources of revenue being receipts of ferries, tolls on local board roads, quarrying fees, etc. The boards also have power to levy, with the sanction of the Commissioner, such local taxes as the local authority is authorised to impose under Section 80A of the Government of India Act. In addition, considerable grants are made by Government for education, roads, water supply, village sanitation and maintenance of dispensaries. The management of schools is now almost entirely handed over to these bodies.

Every district in the presidency has a district board. There are 27 such boards and 220 taluka boards. The total income of the boards is over two crores. The incidence of taxation varies from district to district, the maximum being in Broach, 12 annas 3 pies, the minimum in Ratnagiri, 10 pies. In 1925-26, the aggregate expenditure of the boards chargeable to current revenues was Rs. 173 lakhs. The main heads of expenditure were administration, education, medical relief, and public works. The boards spent Rs. 85 lakhs on education, Rs. 7½ lakhs on medical relief, and Rs. 40 lakhs on public works. The government contributions to the expenditure under these heads were Rs. 75 lakhs, Rs. 1½ lakhs, and Rs. 19 lakhs respectively.

On the review of the administration of local boards for 1924-25, Government remarked: "The working of the boards was, on the whole, fairly satisfactory. The chairman and members have evinced greater interest and energy in their work. Generally, the boards were opposed to additional

taxation and are prone to depend upon Government for increased grants from provincial revenues for works and objects of purely local importance. This resulted in inadequate attention to medical needs and to neglect of roads, etc. The principal question which the boards have to face courageously and to solve is one of finance."

Besides these local boards, there used to be, in some of the bigger villages, committees known as sanitary committees and for certain groups of villages, boards known as sanitary boards. These were formed under the Village Sanitation Act and had the power to raise a small cess for sanitary purposes. Most of these committees and boards have now been superseded by *panchayats* formed under the Village Panchayat Act, a recent enactment. *Panchayats* have been formed in other villages as well but their number is small and they have not as yet proved a great success, the chief obstacle in their way being their unwillingness to raise money by taxation.

### 13. PUBLIC HEALTH AND SANITATION.

The Department of Public Health is controlled by a Director assisted by five officers. It also runs the Vaccine Institute at Belgaum and certain public health laboratories. The chief duties vested in the department are the supervision of the sanitary conditions of the people and the recording of health statistics, reporting on the prevalence and prevention of disease, advising local authorities as well as Government on schemes and questions relating to sanitation and suggesting precautionary measures against epidemics in general.

The department is handicapped for want of an adequate staff. Much of its work is done in urban or semi-urban areas. The prevention of epidemics such as the cholera epidemic which used to be a common feature at fairs in former times is a notable example of the success achieved by the department. Health conditions in the villages are not very satisfactory. As the Director of Public Health remarks in his annual report, "the extent to which sanitation or the lack of it affects the material prosperity of the rural population must be considerable though it cannot be accurately estimated in the absence of statistics showing the number of persons incapacitated by sickness day by day throughout the year." Although the health of the rural population of the presidency may be said to compare favourably with that of other provinces, there can be no two opinions as to the urgent necessity for improvement. The death rate for the rural areas is about 25 per 1,000 as compared with 11.6 recorded in England and Wales in 1923.

Medical dispensaries are established in towns and large villages. To bring medical aid to small villages Government have decided to give a trial to a scheme which is known as the Village Aid Scheme. Arrangements are made to train primary school masters in elementary medicine and first-aid help. The work though recently started has been highly spoken of by local officers and there is a demand for an extension of the scheme.

A scheme of subsidising private practitioners to induce them to settle in small towns in rural areas is also before Government.

In recent years, health propaganda is being carried out in various parts of the presidency by Baby Weeks and Health Weeks. This propaganda, though originally started in urban areas, has now begun to reach the villages. An important part of the work of the Public Health Department is vaccination. The number of those vaccinated each year comes to nearly 700,000 persons and as many as 100,000 were re-vaccinated last year.

Half of the total mortality is from fevers. Epidemics like plague and cholera have been very considerably brought under control. The water supply in certain villages gives rise to intestinal troubles. The influenza epidemic of 1918 took a severe toll in most parts of the presidency.

# BURMA

## 1. GENERAL FEATURES.

Burma is the northern part of the Indo-Chinese Peninsula and the most easterly province of the Indian Empire. It comprises all the country enclosed by the eastern off-shoots of the Himalayas and the sea. In the northern part it consists of high mountains; towards the south these mountains open out into separate ranges enclosing river valleys, while along the sea border is a flat coastal strip. It is shut off from India on the north-west by a mass of densely forest-clad mountains ranged in steep and high ridges running nearly north and south and intersected by deep and narrow valleys inhabited by wild tribes. These mountains form a barrier which has kept the peoples of the two countries separate in race, language, religion and customs. Its total area is given in the census of India as 233,707 square miles and in area it is the largest province of the Indian Empire, being more than twice the size of the United Provinces of Agra and Oudh; more than one-third larger than Madras; and nearly twice the size of Bombay. It lies between Assam on the north-west and China on the north-east and between the Bay of Bengal on the west and south-west and Siam on the south-east. Waterways form its main means of internal communication, while sea communications furnish the principal commercial link between Burma and the outside world, including the other provinces of the Indian Empire.

The main physical features of the province are its mountains and its rivers. The chief mountain ranges and their spurs run nearly north and south and make communication east and west difficult. The ranges gradually become lower as they run south and as they receive a bountiful rainfall they are plentifully covered with forest and other vegetation. The rivers of Burma are the key to its physical geography. They are three in number, the Irrawaddy, the Salween and the Sittang and flow from north to south parallel to the line of the mountain ranges. Their effect on the natural divisions of the country will be explained in the next section.

The rainfall varies greatly from tract to tract of the country, and, on the Arakan and Tenasserim coasts on which the monsoon coming across from Ceylon makes its first impact, the annual rainfall averages over 200 inches. In the Irrawaddy delta the average is about 100 inches. Here the monsoon breaks, as a rule, early in May and continues till the end of September. In Central Burma, between the Arakan Yomas on the west and the Shan Hills on the east, conditions approximate somewhat to those of the Indian Deccan. The Arakan Yomas protect this tract from the south-west monsoon and there are often long breaks of rainless



weather in the monsoon season. The average rainfall is a little over 30 inches. This is the only part of Burma where scarcity is at all likely to occur. The water channels are dry except in the wet season and there is a great deal of island and river bank cultivation as the Irrawaddy subsides after the rains. North of the central dry tract lies the Upper Burma wet zone comprising the districts of Katha, Bhamo, Myitkyina and part of the Shan States. The rainfall here varies considerably and ranges from 50 to 100 inches.

As most of Burma lies in the tropics, the climate generally, except in the dry zone of Central Burma, is hot and damp. On the hills to the north and east it is more temperate but Burma usually escapes the extremes of heat and cold to which northern India is subject. The maximum temperature in Lower Burma seldom rises to 100°. In Central Burma, it may reach 110° to 115°, but this excessive heat is compensated for by cooler nights in the winter months. In the Shan States and the Chin and Kachin Hills the elevation gives a temperate climate, the thermometer seldom rising above 80°, and in the colder months there is frost at night.

The agricultural practice of the country is almost entirely dictated by the rainfall and so much of the province has an assured and ample supply of rain that it is not surprising to find that rice dominates the agricultural energies of the country. Thus of the total occupied area, in 1925-26, of 19,969,425 acres, 11,558,371 were under rice. The acreage under all other crops was 4,473,894 acres only, of which sesamum contributed 1,132,862 acres, beans 795,005 acres, millet 700,789 acres, groundnut 498,587 acres, cotton 449,168 acres and fruit gardens 370,840 acres. Minor crops are maize 199,388 acres, gram 118,166 acres and wheat 48,202 acres. The valuable crops, tobacco and rubber, occupied 83,665 and 79,222 acres respectively.

It is estimated that the culturable waste available is over 21 million acres, but this figure is purely conjectural.

As regards livestock, the supply of working bullocks would appear to have kept pace with the demand although prices have risen greatly in the last few years in sympathy with the rise of prices of other agricultural products. The last Season and Crop Report gives the number of working bullocks at 1,890,950, bulls 637,127, cows 1,391,797 and young stock 995,097. In Lower Burma and in the wet zone of Upper Burma, the buffalo is an animal of great agricultural importance and the figures for them are, buffalo bulls and bullocks 364,530, buffalo cows 401,094, buffalo calves 672,024. Sheep are relatively unimportant and thrive only in the central dry zone. They number 73,871. Goats are numerous though they receive little attention and number 620,696. Pigs are kept by Karens and the hill tribes and amount to 371,170. Horses and ponies number only 84,353.

## 2. NATURAL DIVISIONS.

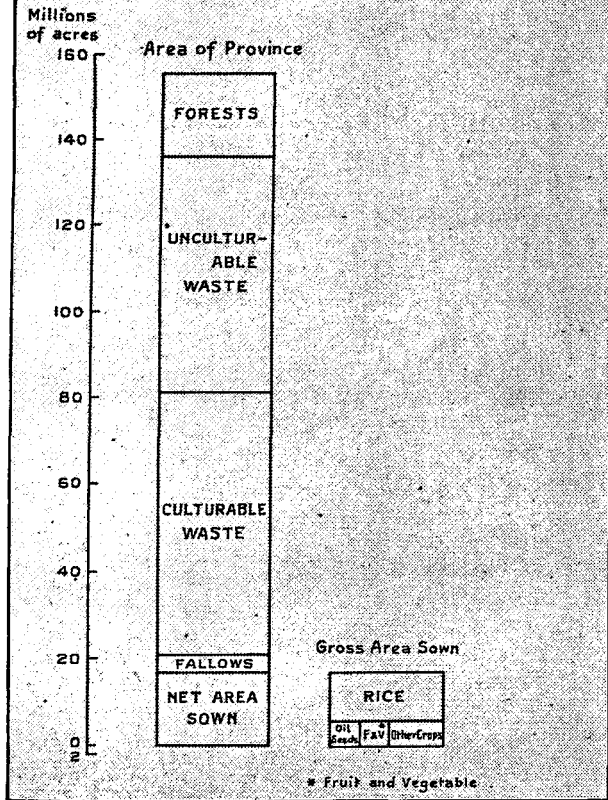
The agriculture of Burma is determined almost entirely by considerations of rainfall and the province divides naturally into four main regions

# BURMA

## CLASSIFICATION OF AREA AND AREA UNDER VARIOUS CROPS

(Averages for the 5 years 1921-22 to 1925-26)

Note: The difference between the Gross Area Sown and the Net Area Sown represents the area Sown more than once.



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or tracts. The first and most important of these is the Lower Burma wet tract which comprises the Arakan, Tenasserim and Pegu divisions with a rainfall varying from 80 to well over 200 inches. In this tract falls the rich delta of the Irrawaddy and a narrow strip of level land in Arakan and Tenasserim between the mountains and the sea. This is the great rice tract of the province—entirely rain-fed. The area under rice has increased as follows:—

				Acres
1896	..	..	..	5,451,541
1906	..	..	..	9,283,801
1916	..	..	..	10,070,250
1926	..	..	..	11,558,371
1927	..	..	..	11,797,303

The export figures for the last ten years to India and elsewhere have been:—

Year	India	Elsewhere	Total
	Tons	Tons	Tons
1917 .. ..	659,824	891,986	1,551,810
1918 .. ..	487,148	1,314,744	1,801,892
1919 .. ..	2,175,176	418,590	2,593,766
1920 .. ..	1,342,856	724,212	2,067,068
1921 .. ..	1,432,850	804,096	2,236,946
1922 .. ..	1,050,313	1,493,308	2,543,621
1923 .. ..	796,967	1,453,937	2,250,904
1924 .. ..	692,737	1,811,356	2,504,093
1925 .. ..	1,427,867	1,967,838	3,395,705
1926 .. ..	1,041,713	1,861,982	2,903,695

Apart from rice, a certain amount of sugarcane is cultivated on the alluvial land along the banks of streams while most villages of importance have groves of mangoes or coconuts. Tenasserim has valuable gardens of the much-prized durian and mango steen fruits peculiar to Burma and the Malay States. In Tenasserim also are found the principal rubber plantations.

The soil of the delta consists of old alluvium of great depth. On the ridges and foot-hills the soil is sandy or lateritic. Along the banks of the Irrawaddy and other rivers there are considerable stretches of

new alluvium on which such crops as beans and tobacco can be grown in the cold weather.

North of this wet alluvial tract lies the Upper Burma dry tract which occupies practically all the central belt of the country. In general appearance the country is undulating, consisting of low hills of tertiary formation. In Mandalay, and Kyaukse, however, there are large tracts of level land under cultivation. The soils vary from stiff black clay on the lower grounds to light sands and gravels on the slopes and uplands. Where irrigation is available, rice is exclusively cultivated as also in the valleys where it is rain-fed. Where irrigation is not available, dry cultivation is engaged in, the principal crops being the millets, maize, cotton, sesamum, gram, beans and groundnut. The introduction of this last crop, largely through the agency of a government garden, has completely revolutionised the agriculture of the dry zone and in twenty years its cultivation has advanced from practically *nil* to 460,000 acres.

The Upper Burma wet zone comprises the northern districts of the province, Katha, Bhamo, Myitkyina, the Upper Chindwin and parts of the northern Shan States. Vast tracts of country are available for cultivation here. The sparsity of population, difficulties of labour and the unhealthiness of the tract are limiting factors. Paddy is cultivated in the lowlands and shifting cultivation on the hills. In Myitkyina, a serious attempt is being made to grow sugarcane on a factory basis.

The last tract is the Shan States, a federation of States under the Governor of Burma. This tract has great agricultural possibilities, consisting as it does of a vast plateau extending from the eastern boundary of Burma to the Chinese frontier with an elevation of from 3,000 to 6,000 feet. Development is retarded however by lack of population and communications. Excellent potatoes are grown in the States while the wheat produced is of good quality.

The division between these climatic zones is not precise or definite and in them we come across areas of intermediate rainfall. For instance, between the Lower Burma wet tract and the central dry tract lies Pynmana with a rainfall of from 50 to 80 inches where the best sugarcane in the province is cultivated. Cattle breeding is almost entirely confined to the dry zone and the Shan States, it being practically impossible to produce young stock in the wet tracts of Lower Burma or in the northern wet range. The cattle produced in the dry zone and in the Shan States are yearly driven down in huge droves for sale to the cultivators in the riverain tracts of Lower Burma.

### 3. PROVINCIAL INCOME AND EXPENDITURE.

The receipts and disbursements of the Government of Burma from 1921-22 till 1926-27 are shown in the following statement. The provincial contribution, originally Rs. 64 lakhs, was reduced for the years 1925-26 and 1926-27 and has been permanently remitted from 1927-28, and some Rs. 50 lakhs have thus become available for

the ordinary purposes of administration. From the point of view of agriculture and general rural uplift, the most interesting feature is the progressive expansion of expenditure on education, medical relief, public health, agriculture and industries.

## GOVERNMENT

(Figures are in

*Revenue and Expenditure*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue .. ..	531	496	472	571	534	523
Excise .. ..	98	112	119	116	124	133
Stamps .. ..	49	50	58	62	67	66
Forests .. ..	221	183	178	182	210	217
Other heads .. ..	38	5	5	12	16	21
Railways .. ..	..	..	1	..	..	..
Irrigation .. ..	4	42	36	39	43	24
<b>Debt Services—</b>						
Interest .. ..	5	6	8	13	13	11½
<b>Civil Administration—</b>						
Administration of Justice ..	7½	9	9	11	11	12
Jails and Convict Settlements ..	4½	4	4	4	5	5
Police .. ..	4½	6	6	9	5	5
Education .. ..	3	4	4	5	5	6½
Medical .. ..	1½	2	2	2	2	2½
Public Health .. ..	..	..	..	1	1	1
Agriculture (including Veteri- nary and Co-operation) ..	..	..	1	1	1	1
Industries .. ..	..	..	..	..	..	..
Other departments .. ..	1	1	1	2	4	3½
Civil Works .. ..	6	8	10	13	9	13
Miscellaneous .. ..	31	6	8	7	5	8
Miscellaneous adjustments bet- ween Central and Provincial Governments .. ..	7	..	..	2	..	..
Extraordinary Receipts .. ..	..	..	..	..	9	8
<b>Total, Revenue Receipts ..</b>	<b>1,012</b>	<b>934</b>	<b>922</b>	<b>1,052</b>	<b>1,064</b>	<b>1,056</b>

## OF BURMA

lakhs of rupees)

*charged to Revenue*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
<b>Direct Demands on the Revenue—</b>						
Land Revenue .. ..	54	51	51	57	69	68
Forests .. ..	93	102	102	97	81	84
Other heads .. ..	18	22	21	22	34	26
Capital outlay on Forests charged to Revenue .. ..	..	..	..	..	8	8½
Railways .. ..	37	65	-109	..	..	-5
Irrigation—Revenue Account ..	33	66	49	46	45	36
Irrigation—Capital Account charged to Revenue ..	9	9	7	8	24	23
Debt—Interest .. ..	-14	-17	-13	-14	-14	-25
<b>Civils Administration—</b>						
General Administration ..	84	92	95	106	101	106½
Administration of Justice ..	43	49	55	59	62	65
Jails and Convict Settlements ..	24	26	30	27	29	30½
Police .. ..	148	141	142	132	135	149
Ports and Pilotage .. ..	23	32	30	30	19	3½
Education .. ..	59	67	73	79	97	113½
Medical .. ..	31	33	34	36	38	48
Public Health .. ..	8	7	9	8	11	24
Agriculture (including Veterinary and Co-operation) ..	13	16	19	20	20	20
Industries .. ..	2	1	1	3	4	4½
Other departments .. ..	3	8	7	4	4	5½
Civil Works .. ..	190	203	213	192	243	233
Miscellaneous .. ..	46	51	69	75	70	87
Provincial Contribution ..	64	64	64	64	44	50
Miscellaneous adjustments between Central and Provincial Governments ..	30	2	..	2	1	31½
<b>Total, Expenditure charged to Revenue .. ..</b>	<b>998</b>	<b>1,090</b>	<b>9,459</b>	<b>1,053</b>	<b>1,125</b>	<b>1,192</b>

GOVERNMENT  
(Figures are in  
*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Receipts</i>						
Revenue Surplus .. ..	14	..	..	..	..	..
Famine Insurance Fund ..	1	..	..	0½	0½	1
Depreciation Fund .. ..	..	..	..	..	..	1½
Loans and Advances by Provincial Governments ..	23	27	26	37	44	27
Total, Capital Receipts ..	38	27	26	37½	44½	29½
Opening Balance .. ..	572	585	368	304	279½	243
Total .. ..	610	612	394	341½	324	272½



OF BURMA  
 lakhs of rupees)  
*and Expenditure*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Expenditure</i>						
Revenue Deficit .. ..	..	156	27	1	61	136
Famine Insurance Fund .. ..	..	..	..	..	..	..
Depreciation Fund .. ..	..	..	..	..	..	0½
Loans and Advances by Provincial Governments ..	25	88	63	61	20	29
<b>Total, Capital Expenditure ..</b>	<b>25</b>	<b>244</b>	<b>90</b>	<b>62</b>	<b>81</b>	<b>165½</b>
<b>Closing Balance ..</b>	<b>585</b>	<b>368</b>	<b>304</b>	<b>279½</b>	<b>243</b>	<b>107</b>
<b>Total ..</b>	<b>610</b>	<b>612</b>	<b>394</b>	<b>341½</b>	<b>324</b>	<b>272½</b>

#### 4. REVENUE ADMINISTRATION AND LAND RECORDS.

The tenure of agricultural land in Lower Burma is simple when compared with the variety of tenures found in other provinces. Briefly put, the ownership of land is regarded as vested in the State but by continuous possession for twelve years and the regular payment of revenue over that period, an occupant is given the status of a landholder. This gives him a permanent, heritable and transferable right of use and occupancy of his land, subject only to the payment of all such revenue tax, cesses and rates as may from time to time be imposed in respect of such land under any law for the time being in force and to the reservation to Government of all mines and mineral products and of all buried treasure. In order to establish his position as a landholder and to acquire a title deed as against the State, he is entitled to receive on application a landholder's certificate. Land may also be granted to cultivators for all time or by lease or given on licence for a specified period. Subject to the strict observance of the conditions attached to these grants and leases, the cultivator obtains a firm possession of his land as against Government or third parties. Where a cultivator has not obtained the status of a landholder or has not taken out a grant, licence or lease, he is a tenant-at-will of Government until he has attained twelve years of uninterrupted occupation and theoretically is liable to ejection without compensation during these twelve years. This power of Government is, however, only used in cases where non-agriculturists have obtained possession of land. In Upper Burma, land is divided into two categories, non-State and State. Non-State land was land in which the Burmese kings were understood to have recognised the existence of proprietary rights against the State. No rights against the State can be acquired on State land by occupation throughout a period of time or, as the regulation puts it, "an occupier of State land can have no heritable or transferable right of use or occupancy therein nor can any rights adverse to the Government exist in such land unless they have been created or continued by a grant made by or on behalf of the British Government." In the case of non-State land, a landholder has complete proprietary rights and is practically in the position of the person who has attained landholder's rights in Lower Burma. But rights to non-State land cannot be acquired in respect of land which was not declared non-State land when the tenure was decided after enquiry by Government. A consolidated land law applicable to Upper and Lower Burma is under consideration and will probably be introduced shortly in the form of a Bill in the Legislative Council.

Practically all occupied land in Burma has been cadastrally surveyed and mapped on a scale of 16 inches to the mile. Every field is surveyed in detail and the map is kept up to date by the local surveyors who are supposed to measure up new cultivation and mark other changes every year and bring the map up to date. This work is in the hands of the Land Records staff who maintain annually an accurate survey, a record of persons liable to assessment and an annual crop marking of all crops. The Land Records Department is a very strong one and

consists of revenue surveyors dealing with from 10,000 to 15,000 acres with inspectors, usually one to each township,\* all working under the Superintendent of Land Records. The Superintendent of Land Records and his establishment are under the immediate control of the Deputy Commissioner who is responsible for the proper carrying out of all land records work. The whole department is under the control of the Commissioner of Settlements and Land Records.

Before land records, however, we have the settlement, which is not such an elaborate affair as it is in India. There is no settlement in the sense of an engagement made by a farmer to pay so much revenue in respect of so much land for such and such a period. The only things which are settled in Burma are rates of assessment and the period for which these rates are to be in force. The settlement officer in fact originally laid the foundation of all the revenue assessment and collection. He started off with a clean map provided by the Survey of India and entered the boundaries of every holding on the map. He then prepared a list of the persons in occupation of the land and proceeded to arrive at his assessment rates by crop cuttings to ascertain the fertility of the soil. On these results the land is divided into fertility classes. Enquiries into cost of production, the value of produce over a period of years and rents and mortgages are all recorded and he arrived at a theoretical rate on a proportion of the surplus left when the cost of production is subtracted from the average value of the produce. This theoretical rate, which Government claims as its right to take as revenue, is one-half of the net produce, but in point of fact this maximum is seldom, if ever, attained. Rents are only beginning to be a factor in the fixation of assessment rates though competition rents have always been taken into consideration. As a rule, settlements are for twenty years at the end of which period the settlement is revised. Enhanced rates notified after revision settlement must not exceed the expired rates by more than thirty-three per cent during the first five years of the new settlement nor during the next five years exceed sixty-six per cent, while allowance is made to cultivators who have incurred expenditure to improve their lands by the granting of exceptional and favourable terms. Assessment in Burma is a fluctuating assessment and separate rates are notified for separate assessment tracts within a district. Whenever waste land is brought under cultivation, the new area is measured up and assessed generally at the same rates as land in its immediate neighbourhood. In Lower Burma, a nominal acreage rate of two annas is assessed on land which is left fallow for special reasons. But in Upper Burma in the dry zone all land not cultivated is exempted from assessment. In Lower Burma where a crop is destroyed by floods or other natural cause, the land is not assessed and in the dry zone of Upper Burma, if the crop is less than three-quarters of normal, it is considered a total failure and completely exempted from assessment.

After the original settlement, the settlement party handed over to the Land Records Department their maps with the boundaries of holdings

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\* An administrative unit corresponding to a local revenue division of a district in India (*tehsil*).

marked and the holding register and these it is the duty of the Land Records Department to keep up to date. This holding register is only a record and has no presumption of validity. The Land Records staff merely enters against each holding the name of the person who appears primarily liable to revenue as in possession of the holding directly under the State and any dispute must be settled by the civil court. Where mutations are ordered by a court, they are communicated to the surveyor by the court. Mutations by registered holders must be brought to the surveyor's notice, and it is incumbent on all parties to alienation to report these to the revenue surveyor.

On his holding register and on his map, as corrected, the revenue surveyor draws up his annual assessment register. He has also in the course of his field inspection recorded statistics of the areas under different crops and of tenancies, mortgages and sales. When the rolls of the assessment season are complete, he prepares a tax ticket for each holding and these tax tickets are issued from the Deputy Commissioner's office.

The total expenditure on the Land Records Department for 1925-26 amounted to Rs. 25,46,158, including figures for Rangoon and the special survey party. The percentage cost to total assessment (excluding figures for Rangoon and the special survey party) was 5.99.

#### 5. THE CULTIVATOR.

The total population of Burma at the census of 1921 was 13,212,192, of whom no less than 9,158,932 were engaged directly or indirectly in agriculture. Although Burma is the largest of the Indian provinces, it is by far the most sparsely populated and the bulk of the population lives in villages which number 35,048 as against only 79 towns. The balance between males and females is very level, there being 6,756,969 males and 6,455,223 females.

The density of population per square mile in Burma stands at 57 as against 226 for all provinces of India, but beyond the statement of this fact no useful inferences as to under-population or over-population can be drawn. In some districts where cultivation is widespread, the population is naturally denser than in those where there is a large amount of forest or unculturable waste and it is enough to state the figures without trying to draw any particular conclusions. There are three principal races of Burma, the Burmese, the Karens and the Shans while in the north and north-west part of the province we find the Chins and Kachins. Of these by far the most important are the Burmans, and the predominating religion of the country is Buddhism in which at the last census no less than 11,172,984 persons affirmed their belief. Buddhists are more than 5½ times as numerous as all the non-Buddhists put together and are nearly 19 times as numerous as the Animists who are the next largest class.

The ordinary village habitation is a hut raised on piles some little distance off the ground, built of jungle timber and bamboo matting and roofed with thatch or split bamboo. Better class houses have plank walling and floors and corrugated iron roofs are more and more being adopted. The house as a rule consists of a front verandah and an upper room which is reached by a flight of steps. The front verandah is used

as the living room of the house, the cooking generally being done outside on the ground or in a small kitchen at the side of the building: the upper room forms the sleeping accommodation of the family:

The Burmese dress is very attractive. The male dress consists of a jacket which is generally white, a cotton or silk coloured skirt (*paso* or *longyi*) and a silk head covering (*gaungbarung*). The women wear a jacket resembling the men's and a petticoat or skirt of silk or cotton. A gaily dressed Burmese holiday crowd is a very pretty sight as the brilliant colours of their silks get their full value from the bright sunshine.

The life of the average cultivator is made up of periods of arduous and exhausting labour in the fields followed by considerable spells of comparative idleness. But these slack periods are fully taken up by pagoda festivals or *pwès* (theatrical performances) and the observance of other social and religious customs which tradition has imposed upon him. During the seasons he is not employed in the fields, he resides in his permanent dwelling in the village. In the rainy season, when the cultivation of paddy or other crops absorbs all his energies and attention, he spends the greater part of his time in the fields, and, for convenience in working his land, he builds there a temporary bamboo hut where he can live with his family or hired labourers and with his working bullocks beside him.

In the drier tracts there is a greater variety in the choice of a dwelling place and it is more common to find the cultivator living throughout the year on his holding. Even in the paddy plains of Lower Burma permanent homesteads are becoming common in some districts, but the homestead as such is not a feature of the country-side. This herding together in villages is partly due to the natural inclination of the cultivator himself and partly to the operation of the Burma Village Act, which, for purposes of crime control, discourages the erection of permanent dwellings outside the boundaries of the village site.

The agricultural year may be said to commence with the break of the rains in May. In the paddy tract, field huts are built and firewood stored during the slack months of April and May and the nurseries are got down by the first fortnight in June. Ploughing and harrowing the remainder of the holding and the transplanting of the main crop are carried on into August, and in some of the later districts, may extend even into early September. But from then onwards till the latter half of November, when the early paddies begin to ripen, there is little field work to be done.

Harvesting becomes general during the first half of December and by the middle of January most of the crop in even the latest districts is off the ground. Threshing and winnowing the paddy occupy the greater part of February and by March the bulk of the crop has found its way into the hands of millers and brokers, or into the godowns of traders in the towns and villages who hold it for a rise in the market.

In the dry zone, the operations and seasonal work are of course different and probably cover a greater part of the year. But in all tracts, except in some of the irrigated areas, there is the same alternation of busy and slack periods with a more or less general cessation of agricultural activity in the hot weather.

The size of the average holding varies a great deal with the district but is generally a simple multiple of the area which can be ploughed by a pair of bullocks. Especially is this the case in the Lower Burma paddy plains where agriculture has become industrialised into the production of a single crop mainly for export, and where mixed farming is unknown. In these tracts the general allowance is one yoke of bullocks to every twelve acres although this proportion may vary from eight to fourteen acres in heavy and lighter lands. In Upper Burma, where farming is more mixed and carried out on a less extensive scale, the area worked by one pair is fifteen acres, but the yoke of bullocks in Upper Burma plays a smaller part in fixing the size of a cultivator's holding. In the dry tract, we find very small holdings associated usually with garden cultivation or worked as a part-time occupation by a cultivator who has another non-agricultural source of income; but as a sole means of livelihood the diminutive holding, frequent in parts of India, is by no means common.

The Land Record Department has produced a Table which shows the size of the average holding in Upper and Lower Burma :—

	Under 5 acres	Over 5 Under 10	Over 10 Under 20	Over 20 Under 50	Over 50
	Per cent	Per cent	Per cent	Per cent	Per cent
Lower Burma .. .. .	55	15	15	11	4
Upper Burma .. .. .	62	20	12	5	1

The figures in this Table, however, have little agricultural significance, for they refer only to complete holdings owned by individual landowners in arbitrarily fixed areas of about 600 acres called *kwins*; the actual area worked by a cultivator as a farm unit with the assistance of his family and hired labour is more. This unit is given in several settlement reports for particular districts, and the Agricultural Department has recently collected figures throughout the greater part of Burma which indicate more nearly what this unit is. In Lower Burma, it is comparatively large but declines in size northwards through the drier zones. The following figures, although not based upon a sufficient amount of data to give reliable averages for whole districts, convey a better impression of the size of holding met with most frequently :—

Crops	Districts	Average size of holding in acres	Crops	Districts	Average size of holding in acres		
Paddy ..	Hanthawaddy ..	67	Cotton .. Sesamum .. Sugarcane, beans .. Paddy .. Paddy (Upper Burma).	{ Myingyan .. Thayetmyo ..	8·8 4·4		
	Insein ..	40				Yamethin ..	14
	Pegu ..	35		Mandalay ..	7·9		
	Tarrawaddy ..	17					
	Thaton ..	81					
	Bassein ..	34					
	Myaungmya ..	26					
	Maubin ..	23					
Akyab ..	17						

Quite large farms of 200 to 250 acres are found in Hanthawaddy, Pegu and Thaton districts worked by tenants on a yearly lease and, although these are not numerous, they demonstrate the system of agriculture which has been induced by the industrialisation of the paddy crop grown mainly for export.

The mention of tenants and hired labour indicates that peasant proprietorship is by no means universal in Burma. In an inquiry carried out into the condition of agricultural tenants and labourers by Mr. Couper in 1923, it was found that, in the places where figures were collected, an average of thirty-eight per cent of the land was worked on yearly tenancies and that in some townships it rose to as high as seventy-two per cent. This refers to Lower Burma where land is freely bought and sold by both agricultural and non-agricultural classes and where, by foreclosure, the small owner cultivator has frequently to part with his land in settlement of debts during a succession of bad seasons.

A small owner cultivator frequently rents additional land to work with his own, or he may hire out his own land and rent a larger holding to cultivate himself. The rents are almost always paid in kind and are fixed at so many baskets per acre usually representing from one-fourth to as much as one-half of the total produce. It is customary for the owners to pay the land revenue which varies from Rs. 1-8 to Rs. 4-8, Rs. 5 or Rs. 6 per acre according to the productiveness of the soil.

Tenancies are for a period of one year and the cultivator frequently changes his holding. Mr. Couper, for instance, found that out of ninety-nine cultivators only twelve had been in the same holding for more than four years. There is no great sentimental attachment for family reasons amongst owners and cultivators to particular land; and, as already indicated, paddy land is regarded among owners almost solely in the nature of an investment to be bought and sold as occasion demands. Affection for a paddy field does not exist, but where dry land is concerned, as in Upper Burma, sentiment plays a more prominent part and frequent changes of ownership are not so common.

Peasant proprietorship is the rule in Upper Burma, but in Lower Burma absentee landlordism with its attendant evils is a conspicuous feature of the paddy tracts. The larger landowners live in the towns and hire out their land yearly to the highest bidder. This instability of tenure acts as a severe handicap to progressive agricultural improvement, for the cultivator can never be sure at the beginning of a season whether he will get his own land back again, or, indeed, whether he will get any land at all. If he loses his holding he may become a labourer for the year and hire both himself and his bullocks to some one else; but this represents a drop in status to be remedied, if possible, in the succeeding year by again becoming a tenant should land be available.

In spite of the large holdings and the comparatively extensive form of agriculture pursued, there is, as yet, enough land to go round if fairly distributed. The density of the population varies, of course, from district to district, being greater in the rice lands of the delta and diminishing

in the dry zone and towards the hills. The delta, although comprising only fifteen per cent of the total area, contains thirty-seven per cent of the population and the more densely populated districts are naturally found in this sector. There are four dense patches in the areas influenced by the large towns of Rangoon, Mandalay, Moulmein and Akyab, but even here the population is sparser than is common in India. The most dense population is in Maubin district with 201 persons per square mile, and the least dense Myitkyina with a figure of only 11 per square mile. Dry zone districts vary from 54 in Thayetmyo to 179 in Sagaing, the latter coming to a certain extent under the influence of Mandalay.

With a comparative plenitude of land and the lack of any custom insisting upon the subdivision of holdings among the members of his family on the decease of an owner, fragmentation of holdings in the Indian sense constitutes at present no problem whatever in Burma. When an occasion for the division of a property arises, the land is generally sold and the proceeds divided.

The Burman cultivator stands high among his Eastern fellows in respect of literacy. Owing to the existence of Buddhist monastic schools in almost every village, the vast majority of the village boys are taught the rudiments of reading and writing. A heavy percentage lapses into illiteracy after such imperfect instruction, but those who remain literate into the adult stage constitute a proportion of the population which is more than three times as large as that in any other province of India. The 1921 census gives the following comparative figures :—

Average number of literates per 1,000, aged 10 or over

Males		Females	
Burma	India	Burma	India
576	161	123	23

The standard of literacy is not, of course, high, but the Burma figures include only those who are able to indite a simple letter to a friend; and most cultivators are capable of signing their names to a document even though they may not be able to read it completely or entirely understand its contents. Within recent years there has been a great expansion of vernacular newspapers. These find their way into most of the villages, especially those near the main roads and railways, and the happenings in the outer world, the prices of cotton and paddy in the main towns and all the miscellaneous items of news that go to make up a vernacular newspaper are available to most cultivators. The newspapers are very widely circulated and extensively read, the more enlightened villager reading them aloud for the information of his less advanced brethren.



With the means at his disposal, the Burman cultivator cultivates paddy and other crops in an intelligent and fairly efficient manner. As a ploughman and paddy cultivator he is better than the average Indian immigrant; his fields are cleaner and better planted, and he shows more discrimination in the selection of varieties best suited to his land. As, however, it takes eight men to reap the crop which five men have sown, the Indian labourer is in considerable demand at harvest time and a good deal of the crop is reaped by such casual labour on contract rates. As has been previously noted, the total number of immigrants to Burma by all routes during 1926 was 408,464, and although a very large number of these are permanently employed at the large ports and at the rice mills in the seaport towns, a considerable number seek only seasonal employment in the reaping of the paddy crop. In 1906, 342,597 emigrated back from Burma so that the balance of immigrants over emigrants was only 25,877. These become absorbed permanently in the industrial labour round the large cities, very few of them settling down in the country areas.

As he is able, as a rule, to obtain a comfortable living by his seasonal work, the Burman shows little inclination to exert himself to accumulate wealth, and thrift is not one of his marked characteristics. The Burman is notoriously generous and when funds are available money is spent freely either on religious objects or on giving entertainments for the amusement of his fellow villagers. When the money is gone, resort is had to the moneylender or landlord for the means of financing the next year's crop. On account of his light-hearted attitude to the accumulation of wealth, chronic indebtedness is almost universal amongst the cultivating classes and the greater the credit the greater usually is the debt which is incurred. When the cultivator borrows from the *chettiyar* (a member of a Madras banking caste) on a strict business basis of security, the rates of interest vary according to the security tendered and are by no means as high as when he borrows from his landlord or village Burmese moneylender on the basis of repaying his debts in kind after harvest. The latter method of borrowing is most popular in the villages as the *chettiyars* are somewhat strict in demanding security and are now unwilling to advance money on land. Loans of this nature—that is, repayment of debt in kind after harvest—are taken during the cultivating season, the basis being a sum of money for which a hundred baskets of paddy are paid back in February. The following Table indicates the scale of repayment required:—

Loan taken in		Amount of loan	
May	.. ..	Rs. 60 to 70	Repaid in February by
July	.. ..	„ 80 to 90	100 baskets of paddy
August	.. ..	„ 100	worth Rs. 160 to
September	.. ..	„ 110	Rs. 170.

## 6. THE AGRICULTURAL DEPARTMENT.

The history of the Agricultural Department may be divided into three periods. The first is the period anterior to 1906 when agriculture was under the Director of Land Records and Agriculture. Under this administration, action on the agricultural side was spasmodic; there was no trained agricultural staff and a few government gardens under amateur enthusiasts represented the limit of effort. To these gardens, however, was due the introduction of the groundnut which has brought such great agricultural wealth to the province.

The second period dates from 1906 when a civilian Director of Agriculture was appointed. An agricultural chemist joined the staff that year and two deputy directors of agriculture were appointed in 1907. A period of acute financial stringency, in which the very existence of the department was threatened, followed by the outbreak of the great war, brought operations practically to a standstill and it was not till 1918 that a forward step could be taken. But even in this period two large experimental farms were opened at Mandalay and Hmawbi, and various smaller district farms of about twenty acres in extent for the trial under local conditions of new strains of seed produced on the central farms at Mandalay and Hmawbi. During this period, the posts of economic botanist and of third deputy director of agriculture which had been sanctioned were not filled and the idea of an agricultural college was abandoned largely on account of financial stringency.

With the cessation of hostilities, Government was in a position to devote more attention to the Agricultural Department and a comprehensive reorganisation scheme was sanctioned by the Secretary of State in 1919. This scheme was in general endorsed by a committee appointed by the local Government which reported in 1925, and as a result of the local Government's orders on that report the department is now constituted as follows.

The department is divided into two sections, the one dealing with field experiments, district demonstration and propaganda and the other with agricultural teaching and research. For the purposes of field experiments and district demonstration, the province is divided into eight circles, each under a deputy director of agriculture. This excludes the Shan States for which it is hoped that two deputy directors will ultimately be appointed when financial circumstances permit. At present an arrangement has been made by which work in the Shan States is superintended by deputy directors of agriculture stationed in Burma.

It is the intention that each of these circles should ultimately have a central farm. Up to date five such central experimental farms have been opened at Hmawbi, Pyinmana, Mahlaing, Allanmyo and Akyab while the large farm at Mandalay, which is now the college farm, has up till now served the purposes of the Northern circle. Two more farms are now being equipped at Mudon in the Tenassarim circle and Myaungmya in the Irrawaddy circle and, with the selection of a central farm for the Northern circle, the chain of central farms will be complete. There

are also subsidiary farms for special crops at Pwinbyu, Padu, Tatkon, Thayetmyo and Kyaukpyu.

The main duties of the deputy director are research on the agricultural problems of his circle. His first duty is to discover what these agricultural problems are and, having found them, to experiment on the central farms with a view to finding a solution. When a solution has been found he must endeavour to have it introduced into the general agricultural practice of his circle by demonstration and propaganda. He is assisted in the work of his circle by an assistant director, who is a member of the Burma Agricultural Service, two senior agricultural assistants for demonstration and propaganda work and the supervision of subsidiary farms, and two senior agricultural assistants on the staff of each of his central farms. Great emphasis is laid on the importance of seed distribution and propaganda work. A considerable amount of this is done through the assistance of the Co-operative Department while in some tracts agricultural unions for the distribution of pure seed have been found very effective. The village or group of villages under a village headman is taken as the unit and in each union there is one or more privately owned seed farms which multiply pure strains for distribution to the individual members of the union. The necessity for the rapid multiplication of pure seed strains has been fully realised and it is the policy of the department to provide a connecting link between the central experimental farms and the agricultural unions or co-operative societies by the provision of seed farms in the areas where pure seed can be rapidly multiplied. In pursuance of this policy a number of areas, varying from 50 to 100 acres, have been taken up by purchase or by exclusion from grazing grounds so as to provide as large a number of such farms as possible. These will be let out to approved tenants of the Agricultural Department who will be responsible for the maintenance of the purity of the seed and, to a large extent, for its distribution. Some of these farms in the more important centres will be equipped with seed godowns and quarters for an agricultural assistant and fieldman so that the growing of the pure seed crop can be kept under the closest observation.

As has been pointed out above, the department was only organised in 1919 and the full recruitment of a superior staff sanctioned under that scheme was not completed till 1923. The result is that the work of the department is still largely in the experimental stage, and it is only in the Southern and Northern circles, which existed prior to 1919, that it has been possible to develop work on any organised scale. At the same time a few outstanding results have been achieved. For instance, in the Myingyan circle, which is one of the main cotton tracts of the province, a high yielding strain of cotton with a ginning percentage of 36 as against the ordinary 31 to 32 per cent is under distribution and seed has been given out for 5,000 acres. Both the *kapas* and lint of this strain can be disposed of at a premium of Rs. 5 per 100 *viss*,\* but at present the crop is bought back by the department, ginned by them and the seed

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\* The *viss* = 3.6 lbs.

distributed by sale to cultivators. Further promising varieties have been obtained by selection and hybridisation. These have been submitted to the Cotton Technological Research Laboratory, Bombay, for spinning tests and as these have proved satisfactory the varieties will be thoroughly tried out under field conditions.

In the Lower Chindwin area the gram crop was practically wiped out by a wilt disease and the devastation was so general that Burmans called this area the "gram cemetery." By the introduction of an immune variety the Agricultural Department has totally replaced the local crops.

The work of the Central circle with headquarters at Pinyinmana is largely concerned with sugarcane. A central farm of 54 acres was acquired in 1924 and the buildings and equipment have just been completed. The duties of its deputy director will be an intensive study of sugarcane in all its aspects and although too little time has elapsed for any particular results to be achieved, the existence of the farm has resulted in the introduction of sugarcane into several new areas in the neighbourhood. There is a ready demand for all available supplies of exotic canes for planting.

The central farm of the West Central circle is located at Allannyo and extends to 143 acres. Its concern will largely be cotton and the improvement of the Lower Burma strain of that crop. In this circle two subsidiary farms have been opened, one for the study of tobacco and the other for irrigated rice in the Mon Canal area. From this farm, which has been in existence for a number of years, improved strains of paddy have been introduced in the Mon Canal area. The total seed distributed to date is 213 tons and there are now 52 private seed farms multiplying the strains for distribution.

The Southern circle dates back to the earliest days of the Agricultural Department and at that time was responsible for practically the whole of the experimental work for Lower Burma. Its field of operations has now been considerably restricted. The area of the farm is 450 acres—400 acres of rain-fed paddy land and 50 acres of garden land. The main object of the farm is to investigate problems connected with the cultivation of paddy under Lower Burma conditions, and, in particular, to improve the quality and yield of varieties suited for the export trade. Pure line selection from indigenous races has been the method adopted to improve the paddy varieties grown in the country and no less than 1,043 strains in all have been dealt with. As a result, seven improved strains of paddy are at present being distributed to suit most of the conditions met with in Lower Burma. The amount of pure improved seed issued from this farm last year and from its attached seed farms was 550 tons, sufficient for 24,652 acres. In addition to this work of selection, experiments on the manurial requirements of the soil and the utilisation of indigenous manures have been carried out, as also experiments in seed rates and methods of planting. The central farm has a ring of seed farms around it to demonstrate the results obtained on the farm to the cultivator in the district. Twenty seed farms, totalling 1,216 acres, have been opened and ten more farms, totalling 532 acres, will be opened

shortly. In addition, it is proposed to open two larger seed farms equipped with godowns at two of the main centres. These larger farms will have an area of 155 acres and 125 acres respectively and will act as the main centres of seed distribution of the two outlying halves of the circle. In the three other circles, the Irrawaddy circle, the Arakan circle and the Tenasserim circle, little progress has been made as these circles have only recently been constituted and the farms have not yet been fully equipped. In the first two the improvement of paddy will be the principal problem, and in the Tenasserim circle, although this will also be the principal crop, fruit and coconut will occupy a good deal of the attention of the deputy director.

The scientific research work of the department is concentrated at the Agricultural College and Research Institute at Mandalay, the research officers being also professors in their subject at the Agricultural College. In the field of agricultural chemistry the agricultural chemist has for many years been engaged in an investigation into the prussic acid content of Burma beans (*Phaseolus lunatus*). This enquiry was forced upon the department by the trade as one or two unfortunate accidents in feeding cattle, which had been attributed to Burma beans forming a part of their diet, had very seriously affected the market for this product. After many years' study the conclusion arrived at is that the prussic acid cannot be eliminated from the beans by selection and the efforts of the department are now being devoted to research for a substitute. The work has now been handed over to the economic botanist who has under trial 80 varieties of indigenous and exotic beans with a view to finding prussic acid free substitutes for the Burma beans of commerce.

From time to time a large amount of work has been done on soil surveys and systematic surveys of two districts are now in hand. The object is to discover, if possible, a co-relation of soil types with paddies particularly suited to such types, a work which when successfully completed will be of permanent value. Apart from these systematic surveys detailed, surveys have been made of all the government farms and a large number of surveys for private applicants. Another line of work is a series of analyses with a view to investigating the possibilities of the manufacture of citric acid and the extraction of essential oils. An investigation of some interest and of a rather peculiar nature was undertaken by the agricultural chemist at the instigation of the Department of Public Health. Frequent complaints were received that the process of parboiling of paddy amounted almost to a nuisance to the neighbourhood in which the operation was carried out on account of the supposed noxious gases which were given off in the process. The problem has been completely solved and the improved process has been adopted by European millers and others in Burma. It is understood that it has also been taken up in the Federated Malay States, in Siam and in Ceylon. In addition to these particular lines of investigation a great amount of work has been done in the analyses of soils, manures, fertilisers, oil-seeds, etc., for the Agricultural Department and for other departments of Government and the public. It may be noted that great difficulty has been experienced in recruiting suitable trained assistants for the

subordinate staff. But this state of affairs will doubtless be remedied when the Agricultural College begins to function.

Until the arrival of an economic botanist a large amount of botanical work was done by the deputy directors in Upper and Lower Burma. Now that an economic botanist has been appointed to the staff he has been given a separate area and establishment on the college farm at Mandalay on which all the plant breeding and selection work in connection with rice and various dry zone crops is carried out. The area devoted to plant breeding and selection is 20 acres and in connection with the college a teaching garden containing representative species of the various natural orders is being laid out while a fruit garden will also be opened for purposes of instruction. In addition to this, the economic botanist has free access for work to certain of the central farms. Work at present is being mainly devoted to paddy, wheat, gram, beans and sesamum, but here again, as in the chemical section, much difficulty is experienced in getting a trained staff of assistants.

A mycologist was appointed to the staff in 1923 but the college laboratories for his accommodation were not completed until 1924. A beginning has been made with the study of various fungus diseases of sugarcane, sesamum, *juar*, wheat, gram, cotton, betel vine and groundnuts, while a considerable amount of advice has been given to rubber companies and to sugarcane, tea and coffee estates.

An entomologist (who is a member of the Burma Agricultural Service) deals, so far as he can, with the vast number of insect pests to which the crops of Burma are subjected. Considerable success has attended efforts to deal with palm beetle and with land crabs both of which are serious pests of the province. Attention has also been devoted to lac culture, the object being to work out a practical method of growing lac on cultivated plants for cultivators in the plains while some experiments have also been carried out in bee-keeping. The most important part, however, of the work of the entomologist has been in connection with sericulture. Here the lines of work have been first to find out a multivoltine race of worms suitable to local conditions. Considerable success has been achieved in this direction, two strains having been obtained which are wholly multivoltine and give a much higher yield of silk. The other main objects are to work out the best method of growing mulberry under the varying conditions in the hills and plains of the province and to study the economics of the industry from the point of view of the rearer. Efforts are being made to foster the industry by the supply of mulberry cuttings and seedlings and of eggs or seed cocoons of improved races which have been examined and guaranteed free from disease, while the question of reeling has also been taken up and efforts made to introduce the industry into new districts.

The agricultural engineer is fully occupied with the routine work of the department and with the manufacture of improved implements, water-lifts and other agricultural appliances. A new type of plough has been designed and put on the market. At present these are manufactured in England, but a local blacksmith at Pyinmana is also turning out these ploughs in quantity for local sale and to supply orders

from the Agricultural Department. There seems no reason why the manufacture should not ultimately become local. The manufacture of improved water-lifts, introduced by the agricultural engineer, has been taken up by certain village carpenters and they are being sold freely. A new type of jaggery-boiling furnace has also been designed which is capable of burning the dried stems or megass. This effects a very marked economy in fuel. In addition to his actual work on agricultural machinery the agricultural engineer has also the supervision, in some cases, of the construction of the smaller departmental buildings on the farms.

It is to be regretted that practically no progress has been made in the matter of stock breeding or dairying, but it is now proposed that the Tatkon farm should be devoted to cattle breeding, the object being to build up a herd of pure Burmese cattle and also to conduct certain experiments in cross-breeding.

An interesting feature has been the establishment of agricultural improvement committees which have been formed in five districts. These are largely non-official though for the time being the deputy commissioner of the district or the deputy director of agriculture acts as chairman. The functions of these committees are mainly advisory and may be defined as follows:—

(1) The committees act in an advisory capacity to Government in general and to the Agricultural Department in particular in matters relating to the agricultural improvement and development in a district.

(2) The committees arrange for the holding of shows and exhibitions in the district.

(3) The committees make recommendations with regard to the grant of loans or grants-in-aid under the Land Improvement Loans Act and carry out such other duties as may be referred to them from time to time by the local Government.

The main results achieved by the department up to date may be briefly summarised as follows. It is estimated that 200,000 acres of rice in the province are under selected varieties distributed from the Hmawbi and Mandalay farms. The superior value of this rice is now recognised by the market both in London and on the Continent. It is free from the objectionable red grain, is of a uniform shape and consistency and when milled gives an increased outturn which averages about three baskets of white rice per hundred baskets of paddy milled. Premia are paid by millers of all classes for paddy grown from the Agricultural Department's seed, these premia varying from Rs. 5 to Rs. 15 per hundred baskets\* of paddy.

In certain parts of Upper Burma, the gram crop was almost entirely eliminated by the fungus *Fusarium udum*. The soils had become so impregnated with this disease that it was impossible to grow the crop more than one year on the same ground. The Agricultural Department tackled the problem and, after experiment with varieties received from every province in India, a variety from Karachi which was found to be

\* Baskets vary but average weight is 46 lbs.

fairly immune was placed under selection with the result that a completely immune strain was evolved and seed multiplied. In 1923, enough seed of this immune variety was distributed to sow 28,000 acres. The distribution has continued with the result that the old variety has been completely ousted. The Director estimates that the annual money value of this piece of work is nearly as much as the present expenditure on the whole department.

In cotton, work has hardly advanced beyond the experimental stage but the selected varieties with a higher ginning percentage have been distributed and 5,000 acres sown with this seed. Cambodia cotton has also been introduced and distributed in suitable areas, the total area now being about 6,000 acres. Similarly new types of groundnut, showing an increase of 15 per cent in the oil content and much easier to harvest than the local varieties, have been successfully introduced. Considerable improvements have also been effected in agricultural machinery.

With regard to agricultural education, as has been noted above, the idea of an agricultural college was for financial reasons kept in abeyance until it was revived in the reorganisation scheme of 1918. During this period and until the completion of the college, the province had to rely upon the friendly offices of the Government of Bombay for the training of its subordinate staff and by an arrangement with that Government large numbers of students were trained at the Poona Agricultural College. The Agricultural College at Mandalay was formally opened by His Excellency the Governor, Sir Harcourt Butler, in December 1924. It is well equipped with laboratories which provide ample accommodation for teaching and research in agricultural chemistry, botany, mycology and entomology, while instruction is also given in English, mathematics and physics. There is also an excellent library. The early experiences of the college have not been too happy. Apart from research its primary object was laid down as the instruction of a staff for the Agricultural Department. It was at first proposed to hold a four-years' course leading to a diploma and when the course commenced in 1924 stipends were given to 24 students, for the most part possessing the high school qualifications, with a promise of employment in the upper subordinate establishment in the event of their obtaining a diploma. It was also intended to introduce a shorter two-years' course for candidates for the lower subordinate establishment. The high school final qualification, however, was not found to be satisfactory, the standard being too low and an attempt was then made to substitute a three-years' course with I.A. or I.Sc., as a standard of entrance. The intention was to affiliate the college to the Rangoon University but the scheme had to be abandoned almost immediately owing to the paucity of candidates that applied. A three-years' diploma course is now being started. At the beginning of March, 1927, there were 11 third year students, 15 second year students and 20 first year students taking this course.

Apart from the courses of instruction at the college, special short courses are held at central farms to provide practical instruction for cultivators and their sons. These courses are designed to give practical



instruction in the use of improved implements and to demonstrate improved methods. Stipends are also offered to the sons of cultivators and landowners to enable them to undergo training for longer periods on the central farms.

Outside of government effort, the only other attempt at agricultural education in the province is the Pyinmana Agricultural School—a vernacular school conducted by the American Baptist Mission. Government give grants for building construction up to half the total cost or Rs. 75,000, whichever is less, and a yearly grant for recurring expenditure increasing from Rs. 2,200 to Rs. 18,000. The aim of the school is to give an agricultural education to village boys who have completed the fourth standard of the vernacular primary school. Instruction is entirely in Burmese although English and literary subjects of the middle school course are also taught. The total area of the school farm is nearly 180 acres and the buildings are nearing completion. There were, in 1927, 62 students in the school, but there will be accommodation for 120 when the buildings are completed.

The following statement shows the receipts and expenditure under "Agriculture" for the ten years 1917-18 to 1926-27 :—

Year	Receipts	Expenditure
	Rs.	Rs.
1917-18	17,328	2,66,882
1918-19	20,562	3,84,717
1919-20	31,178	3,10,585
1920-21	20,810	3,84,066
1921-22	34,489	5,05,373
1922-23	40,563	6,50,249
1923-24	54,930	7,83,847
1924-25	61,987	8,17,394
1925-26	57,207	8,98,393
1926-27	62,744	8,51,840

## 7. THE VETERINARY DEPARTMENT.

The Government of Burma devoted some attention to veterinary matters long before the question of an agricultural department was considered. Thus as long ago as 1876 we find that there was a veterinary instructor in the province and from 1884 onwards a certain number of veterinary assistants. The staff of veterinary assistants rapidly increased until, in 1906, there were 120 with 10 inspectors, 5 deputy superintendents and 3 superintendents. At the end of 1926 there were actually employed 3 superintendents, 7 deputy superintendents, 1 assistant instructor, 22 veterinary inspectors and 226 veterinary assistants.

The special committee which recently investigated the Agricultural Department reported also on the Veterinary Department and on their

recommendations the Government have passed the following orders. The province will be divided into four circles and nine sub-circles, the former being under superintendents and the latter under deputy superintendents. The cadre of the Burma Veterinary Service (Provincial) will be increased from nine to fifteen, nine to be employed in charge of the sub-circles in the district and six at the Veterinary College at Insein. Veterinary inspectors will be increased to twenty-eight and veterinary assistants to two hundred and eighty on pay ranging from Rs. 50 per month to Rs. 150. Simultaneously the standard of education required for admission to the Insein Veterinary College will be raised to the high school final. At present veterinary assistants are appointed after passing a three-years' course at the Veterinary School at Insein. Inspectors are recruited partly by promotion from the rank of veterinary assistants up to two-thirds of the cadre of inspectors and the remainder from amongst students who have taken a diploma at the Calcutta Veterinary College. These students were sent to the Calcutta College with stipends by the local Government. Deputy superintendents are selected from among Calcutta-trained graduates and in rare instances by the promotion of vernacular veterinary inspectors. The province is divided into circles controlled by superintendents of the Indian Veterinary Service and these circles are divided into sub-circles controlled by deputy superintendents. The scheme aims at two veterinary inspectors for each sub-circle and one veterinary assistant for each township. A certain number of assistants are kept in reserve for emergencies or to control frontier stations. District councils are in theory responsible for the health of cattle in their districts but veterinary assistants are paid from provincial funds which also pay for their travelling allowance. They are lent to the district council for the districts to which they are posted. District councils pay their contingent expenses and copies of all diaries go to the chairman of the district council. The head of the Veterinary Department has the power to transfer veterinary assistants from one district to another. In Burma, the duties of the staff are largely determined by the Cattle Diseases Rules, 1914, which apply practically to all areas in which the Burma Village Act of 1907 is in force. Under the Burma Village Act the registration of the death of cattle is compulsory and must be done by the owner within 48 hours of the death. The Cattle Diseases Rules of 1914 lay down clearly the responsibilities of villagers in cases of outbreaks of cattle disease and as to treatment of the carcasses and skins of cattle that die. The system followed in Burma is that of the peripatetic veterinary assistant. There are only four veterinary dispensaries in the province and the public seem to evince little enthusiasm for them. The vast areas of the agricultural districts and the difficulties of moving cattle militate against any wide development of the principle of the stationary dispensary and it is thought that more good is done by the veterinary assistants moving freely from village to village with supplies of medicine and attending to cases in the course of their tours.

In 1923, Government appointed a committee to investigate the question of the Insein Veterinary School and its future. As a result, the school is now being completely reorganised as a teaching and research college.

When this reorganisation is completed, Burma will be independent of other provinces for training its superior staff. A building scheme involving an expenditure of slightly over Rs. three lakhs has been put in hand and the buildings are nearing completion. It is intended that the college should be fully equipped with laboratories both for teaching and research. The entrance standard proposed is the high school final followed by a three-years' course at the college and accommodation has been provided for eighty students. If the standard is kept sufficiently high it will be possible to train students at Insein for admission to the Burma Veterinary Service.

### 8. IRRIGATION.

Burma is so bountifully blessed by Nature in the matter of rainfall that it is only in the dry central zone that irrigation is of any importance. It may be said that where irrigation is available it is entirely directed to rice cultivation. In fact this crop represents ninety per cent of the whole area under irrigation. On the four major canals of the province no less than ninety-nine per cent of the land irrigated is under rice. It is only in the Kyaukse district that irrigation is devoted to any extent to crops other than rice and this district accounts for about half of the total irrigated area under crops other than the rice crop. Here also a certain amount of double cropping is done, sesamum being sown over a large area before a late rice crop is taken off.

Irrigation was practised by the Burmans long before the British occupation of the country and in fact has been known in the dry zone of Upper Burma from time immemorial. The physical formation of the province militates against irrigation schemes of any magnitude but smaller schemes can be multiplied and the area irrigated in Upper Burma has been trebled since 1901. In many cases, the work has consisted of the realignment and remodelling of schemes originally started by Burman agency.

Irrigation works in Burma were reclassified in 1926 and for purposes of comparison this reclassification may be applied as having existed from 1891, the year from which reliable records are available. The classification is into two groups (1) productive works for which capital accounts are kept, (2) unproductive works for some of which capital accounts are kept and others for which capital accounts are not kept. The first group includes the Shwebo and Mon canals, constructed between 1901 and 1911, and the more important of the indigenous works—the Kyaukse Canal, the Shwetachaung Canal, the Man Canal and the Meiktila Lake. The second group embraces the Mandalay and Yeu canals, the Salin Canal, the Nyaungyan-Minhla Tank and the Kyaukse Tank, for which capital accounts are kept, and all the numerous petty canals for which no accounts are kept.

The average annual irrigation area for five-year periods has increased from 238,331 acres in the quinquennium 1891-95 to 737,883 acres in the quinquennium 1921-25.

The irrigation done by the four major canals has increased from 358,997

acres in 1921 to 406,472 acres in 1925. The area irrigated by productive capital works (group 1) has increased between 1900 and 1925 by 325,168 acres or 206 per cent; that by capital unproductive and non-capital (group 2) by 196,389 acres or 214 per cent. In 1901, the mileage of government channels open for irrigation was 593; in 1925 it was 1,717 miles, representing an average increase of 45 miles per annum over 25 years.

The total capital outlay—direct and indirect—on productive works in operation till the end of 1925-26 has been Rs. 1,86,25,709. The percentage of profit on capital outlay (including interest on capital outlay) has been 4.34 per cent and the total income, including water rate and miscellaneous receipts and share of land revenue due to irrigation works, has been 7.72 per cent on the capital outlay. The corresponding figures for unproductive works for which capital and revenue accounts are kept have been Rs. 1,47,96,785 capital: 1.05 per cent profit on capital outlay and 2.48 per cent profit when the total income—direct and indirect—is included.

The four major canals were originally constructed from funds supplied by the Government of India. In 1921-22 the Government of Burma purchased them for Rs. 2,20,98,665 and the revenue from irrigation is now entirely provincial. No water rate is charged. A consolidated rate is levied on all irrigated areas, the Irrigation Department receiving in some cases a credit of a percentage of the consolidated rate and in others the whole rate less a fixed rate credited to land revenue. The object aimed at is to simplify collection of the revenue and it has worked well. In the Shwabo Canal area, the canal revenue staff, whose duties consist of seeing to the distribution of water and checking areas irrigated, has been amalgamated with the land revenue staff and it is proposed to extend this system to other districts. The policy is to amalgamate the irrigation revenue staff and the land records staff so far as this is possible and so effect economies in revenue collection. Up till now the revenue has always been assessed and collected by the revenue officers.

In a country like Burma where there are so many natural waterways and where the control of these natural waterways and protection against flood are of almost equal importance with that of the provision of water through irrigation channels, it is but natural that a great deal of the work of the Irrigation Department is devoted to questions of navigation and embankments for the prevention of floods.

On the side of navigation there are two important canals in Lower Burma maintained by the department which are of great importance in the commercial development of the province and on which tolls are levied by Government. The first is the Pegu-Sittang Canal completed in 1877-78 and the other the Twante Canal completed in 1916-17. The former canal connects the Sittang with the Pegu river and enables timber from the Sittang Valley to be floated to Rangoon *via* the Pegu river. It also carries a considerable traffic of rice, vegetables, bamboos and firewood. The Twante Canal carries a very heavy traffic in rice from the delta districts to the Rangoon mills and also provides a short cut for river steamers coming from the delta to Rangoon. The Pegu-Sittang Canal

has never paid for its upkeep directly, though it is a very useful waterway and probably makes indirect contribution to the revenues of the province by the commercial advantages which it gives. In 1925-26 the gross revenue was Rs. 1,95,141, the working expenses being Rs. 7,65,972. The Twante Canal, on the other hand, brought in Rs. 5,77,421 in the same year, the working expenses being Rs. 3,60,562 and the net revenue Rs. 2,16,859 representing a profit percentage of 4.2 on the capital outlay. This canal was constructed from funds supplied by the Government of India, but it was purchased by the local Government in 1921-22 for Rs. 45,64,692.

In Upper Burma, the only navigation canal of any importance is the Shwetachaung Canal in the Mandalay district which combines the functions of an irrigation and a navigation canal. This has never been a considerable source of income to Government and, as a metre gauge line is being constructed parallel to the canal and it is proposed to construct a metal road along the canal bank, it is likely to cease to be used as a navigation canal for the carriage of goods by water.

Within recent years nearly twenty-five lakhs of rupees have been spent in cutting new waterways and improving existing ones in the Irrawaddy delta to facilitate communications between stations in the delta and Rangoon and expenditure approximating to Rs. 16 lakhs is in contemplation. All these improvements, while they give no direct return, facilitate the movement of agricultural produce to market and materially improve the trading conditions of the country.

The third branch of the activities of the Department of Irrigation is concerned with embankments, the majority of which are regarded as productive as the department receives a credit of fifty per cent of the gross land revenue demand on the areas protected by them. These embankments have been in existence for many years, the Maubin Island and the main Irrawaddy embankments dating back to the early 'eighties.' The capital cost of the seven embankments which are regarded as productive was Rs. 48,86,617, protecting in 1924 an area of 848,891 acres and yielding a net revenue of Rs. 5,84,116. These figures show a return of nearly twelve per cent on the capital cost of the works taken collectively. In addition there are numerous small protective works up and down the delta which are regarded as unproductive and in many cases small embankments have been made and are maintained by the cultivators themselves.

Finally, it only remains to remark that great attention is now being devoted to projects for improving the drainage of areas liable to floods. An interesting system of river training without embankments has been evolved by Messrs. F. A. Leete, C.I.E., and G. C. Cheyne, M.B.E., and gives every prospect of permanent success.\* The result of this comparatively inexpensive method of river training is to reclaim annually large areas of land suitable for cultivation by a regulated deposit of silt.

\* "Regulation of Rivers without Embankments." Published by Messrs. Crosby Lockwood and Son, Stationers' Hall Court, Ludgate Hill, London. 1924. Price 30 shillings.

from the streams. Extensive surveys are being made all over Lower Burma with a view to estimating what further steps can be taken to improve the drainage of these flooded tracts.

Reference may also be made to the hydro-electric survey of the province. A rough general survey has been carried out, but a more detailed investigation of certain areas is being undertaken, especially with reference to the provision of a hydro-electrically directed water supply for the city of Rangoon. In this enquiry attention will also be devoted to the possible industrial utilisation of the power generated.

## 9. FORESTRY IN RELATION TO AGRICULTURE.

The latest report of the forest administration in Burma gives the total area of forest land as 148,376 square miles or two-thirds of the whole province, of which 116,916 square miles are unclassified forests and 31,460 square miles are reserved.

In unclassified forests the control of the Forest Department is generally limited to the protection of certain species, principally teak. For the reserved forests, the Forest Department is directly responsible for the entire management. Little attention can be devoted to the unclassified forests and in consequence promiscuous grazing and unregulated extraction of forest produce are rapidly depleting them of useful growth with the result that they are steadily deteriorating. In the more remote and less accessible forests, the objectionable custom of *taungya* or shifting cultivation, carried out by wandering tribes of cultivators, is having a most deleterious effect on the forests.

In the case of reserved forests, the interests of the cultivators are safeguarded by the forest settlements at which the settlement officer lays down the amount of bamboos, thatch or other forest produce which can be removed under the settlement by the villagers in the vicinity. In 1925-26, the value of produce, including grazing, removed from the reserved forests under the rights and privileges conferred by the settlements was Rs. 2,65,000 and timber for use for house building and other produce granted free under the similar arrangements was valued at Rs. 1,98,000. This, however, by no means represents the total benefits derived by the cultivators from the forests as naturally they take the bulk of their supplies from the unclassified forests which are not under control and no records of such extractions are kept.

It may be noted that apart from direct benefits derived by cultivators from the free utilisation of forest produce, the principal benefit which forests confer on agriculture in Burma is the amount of work provided for the agricultural population in these forests. It may be said that labour required for the trade extraction of timber is almost entirely supplied by the agricultural population. About a million tons per annum are extracted at an average cost of at least Rs. 25 per ton and a very large amount of this total sum of 2½ crores of rupees passes into the hands either of agriculturists who work in the forests in their spare time or of members of agricultural families who can be spared for more continuous

work in the forests. In addition, the constant demand for bamboos for building and for fuel and other minor forest products gives constant part-time employment to the agriculturists while the labour required for the various works necessary for the improvement and maintenance of the forests is supplied almost entirely by agriculturists in their spare time. In fact, in a country where all the houses outside of the larger towns are built of wood and bamboos and roofed with thatch the relations between the agriculturists and the forests are of the closest and not unnaturally the bulk of the work in connection with the extraction of these products is conducted by the agriculturists themselves. The Chief Conservator of Forests estimates the average annual requirements of the rural household in forest produce at, timber 50 cubic feet, firewood 250 cubic feet, bamboos 300 cubic feet, thatch 400 bundles and in practically every case the requirements of the small agriculturist are extracted and handled by himself. The records for grazing show that, during the year 1925-26, only 5,402 buffaloes and 26,474 cows and bullocks availed themselves of grazing on payment. On the other hand, over 150,000 buffaloes and over 340,000 cows and bullocks enjoyed grazing in forests by rights conferred upon the cultivators under the settlement, while a certain amount of free grazing was also granted during the pleasure of Government or otherwise than under the settlement.

At present, it cannot be said that the conflict between agriculture and forests is acute though in the more densely populated parts of Lower Burma there is constant conflict between cultivation and forest rights when applications for the throwing open of a fuel reserve to cultivation come up. Any proposal to throw open a fuel reserve to cultivation is almost invariably opposed by a public opinion equal in strength to that which demands transfer to cultivation and the maintenance of the balance between the conflicting interests of agriculture and forestry will become increasingly difficult as the population increases and as the forests near villages become depleted of the produce which the agriculturist requires for his local needs. The present position may be summed up in the statement that at present the supply of forest produce is generally adequate, but the accessible areas of supply outside reserved forests are being rapidly depleted before the demands of cultivation, grazing and wasteful exploitation. The people now have to go further afield for their supplies and in many cases this has involved such a burden that a recognised trader in forest produce replaces the old system by which the individual extracted his own requirements. In these circumstances, the policy of the future contemplates the gradual absorption of the vast areas of unclassed forests so far as this can be effected either by reservation or by allotment as village waste for the use of definite village communities. The definite allotment of land as village waste has the advantage that the villagers concerned will have the right to protect such land, a right which at present they do not enjoy. In order to meet the increased demand on the reserved forests which has arisen within recent years, considerable attention is being devoted to regeneration and planting up operations. On the general relation between

forests and agriculture in Burma, the Chief Conservator writes as follows :—

“ Where the interests of forestry conflict with those of agriculture the problem of correlating them is not always easy. It is accepted as axiomatic that land suitable for permanent cultivation should be released for the purpose unless there are exceptionally strong reasons for retaining it under forest. On this policy the bulk of the reserved forests have been relegated to the hills and those in the plains have been restricted in area to what is essential to supply the wants of the surrounding population. Pressure of population upon the soil is responsible for periodical demands to eliminate the limited blocks of forest that have been retained in the plains. It is, however, generally recognised that a cheap and accessible supply of forest produce is a necessity to the peasant proprietor and this supply cannot be made available unless there is a proper provision for the maintenance of land under forest. A recent careful enquiry into the status of the reserves in the plains on either side of the Pegu Yomas has shown that, when the matter is properly examined, both the district authorities and the people themselves are fully alive to the value of these reserves in the rural economy. In the case of the reserved forests on the hills the demand to push back their boundaries has not arisen and is unlikely to arise in the near future in view of the low agricultural value of the land and in the face of our present policy of working the accessible portions primarily for the benefit of the local people. There will, however, arise at intervals a clamour against the restrictions imposed by forest regulations. In resisting this, much will depend on the extent to which people can be educated to realise the necessity for conserving supplies and to understand that restrictions in the methods of extracting and utilising forest products are necessary for conservative management. The ideal position would be to have portions of the communal lands set aside for the production of forest crops and managed by co-operation under State supervision. Under existing conditions, bamboos are frequently planted as a garden crop, and occasionally an enterprising individual has planted cutch trees for use as house-posts and fuel. There has, however, been little system and no co-operation in the matter, and until these materialise any reduction in the accessible areas of our reserved forests would be a very short-sighted policy, both from the point of view of the State and that of the agriculturist.”

#### 10. GENERAL EDUCATION.

The latest report of the Director of Public Instruction shows that the percentage of scholars to the total population in 1921 was 7·01 males and 2·66 females or a percentage total for the province of 4·89. The province has one university consisting of two constituent colleges, the University College, Rangoon, and the Judson College, Rangoon, and an Intermediate Arts College at Mandalay. For males, there are 149 high schools with 40,251 pupils, 1,214 middle schools with 128,483



pupils, 3,913 primary schools with 207,666 pupils and 827 special schools with 13,756 pupils. For females there are 25 high schools with 6,423 pupils, 118 middle schools with 13,306 students, 606 primary schools with 31,171 pupils and 32 special schools with 715 pupils. In addition to this there are 18,449 unrecognised institutions with 202,670 pupils. It may be remarked that the monastic system of education takes a very large place in the education of the rural population. 1,124 of these schools with 72,794 pupils are on the aided list and in addition there is a very large number of private monastic schools roughly calculated at 17,392 with 177,849 pupils. From the point of view of the Education Department these schools are of no great value in the strict educational sense but it cannot be denied that they contribute very largely to the literacy of the province. Thus the census figures for 1921 show an average proportion of literacy over the age of ten as 576 for males in Burma in every thousand as compared with 161 in India, and 123 females in Burma as against 23 in India. It is to be feared however that, as in India, the bulk of the pupils go very little further than standard II. In these circumstances the possibility of introducing agricultural teaching into the ordinary schools of Burma seems very remote despite the higher general standard of literacy in the province. There has, in fact, been no attempt at teaching agriculture in ordinary schools beyond an experiment with school gardening which failed in its object because it was regarded as a vocational subject and not merely as an effort to introduce some pleasant variety into the school curriculum. As a college of agriculture has only recently been opened in the province, no serious attempt has yet been made to tackle the question of agricultural education in other institutions.

The total expenditure on education in 1926-27 was Rs. 1,93,83,804, nearly 21½ lakhs of rupees more than in 1925-26. Of this Rs. 91,26,512 was met from provincial funds, Rs. 25,41,805 from local funds and Rs. 9,59,463 from municipal funds. The balance is met from fees, funds of the Federated Shan States, and payments by missions or managers on account of their share in the maintenance of schools which receive grants-in-aid. It may be remarked that over fifty per cent of the expenditure shown under local funds was contributed by provincial revenues. As in other provinces of India, education is a matter in which the local legislature takes the keenest interest and progress both in expenditure and in the raising of the standard will be rapid.

## 11. CO-OPERATION.

The co-operative movement is one of great importance and statistics of the movement may be of interest. At the end of June 1926 there were 5,383 societies of all kinds with a total membership of 147,264. The total amount of working capital, excluding sale and insurance societies, was Rs. 4,74,83,833 and the total expenditure on management Rs. 16,48,435. During the last few years, there has been a considerable weeding out of unsatisfactory societies and the number of societies and of members shows some reduction over the last four years.

The apex institution of the movement is the Burma Provincial Co-operative Bank Limited, with headquarters at Mandalay and branches at Rangoon, Thaton and Bassein. The capital of the bank is made up of shares of Rs. 100 each held by individual shareholders and shares of Rs. 100 held by constituent societies and the capital of the bank, at the close of the financial year 1926, was Rs. 6,61,540. Fixed deposits are received from the public at rates of interest which are varied according to the requirements of the bank, but run about  $5\frac{1}{2}$ , 6, 7 and  $7\frac{1}{2}$  per cent for one, two, three or four year deposits. The bank, at the close of the financial year 1926, held fixed deposits of Rs. 85,62,002. An important source of finance also are the deposits in its saving bank section which undoubtedly have induced a spirit of thrift among the people. In addition, certain co-operative societies also deposit their reserve or surplus funds in the provincial bank and over  $7\frac{1}{2}$  lakhs were made available from these sources during the year. The bank has investments in Government paper of over  $33\frac{3}{4}$  lakhs. The Provincial Bank as the apex bank of the system provides fluid reserves for all district banks, town banks and urban societies which seek its assistance and its branch banks at Rangoon, Thaton and Bassein undertake the duty of financing credit societies in their local area and also of attracting local capital.

In addition to the Provincial Bank, there are 23 central banks which perform for small areas the functions of the Provincial Bank from which, if local supplies of capital are not ample, they can obtain funds. Omitting money lent by societies of one class to societies of another class, the net amount of working capital in these central banks was at the end of June 1926 Rs. 49,80,225 and they showed a profit on working of Rs. 1,29,191.

As in other provinces, the most important and most numerous class of society are the primary agricultural societies of which there were at the end of June 1926, 3,919 pure credit societies, 111 tenancy co-partnership and credit and 2 land mortgage societies. These credit societies are of course the base of the whole movement and engage most of the time of the administrative staff. Primary credit societies have a total membership of 87,781 and a share capital of Rs. 37,57,386. The profit for the year amounted to Rs. 3,59,420. The average loan at the end of the year under report was Rs. 197. Above these primary societies are unions for supervision and guarantee numbering 569. These exercise supervision, inspection and primary audit.

In comparison with credit societies, progress in other directions has not been great. For instance, there are only twenty-one agricultural and six non-agricultural purchase and sale societies. There are six agricultural production societies and three non-agricultural production societies. There are 395 cattle insurance societies, confined entirely to five districts in Upper Burma, but it cannot be said that they are very active. It is in district agricultural and co-operative associations and union group boards that the link between co-operation and agriculture is strongest and it is the policy of the Agricultural Department to run private seed farms by the agency of co-operative societies and their members. Some success has

been achieved in Upper Burma where a considerable amount of seed and implements have been distributed through co-operative societies, and private seed farms have been established which are run by co-operative societies and their members. In Lower Burma, progress is slower but the principle is gaining in popularity and the Agricultural Department look to the Co-operative Department for great assistance in the matter of running seed farms and in the distribution of the approved products of the Agricultural Department. The link between the officers of the two departments is close and, as the Agricultural Department supplies the material, the Co-operative Department will be in a position to assist in its wider distribution. From the statistics given, it cannot be said that co-operation has made any very marked impression in Burma as a whole. It is doubtful if more than five per cent of the total population who might become co-operators have as yet joined the movement.

## 12. COMMUNICATIONS AND MARKETING.

The physical features of the province have been the principal factors in shaping the systems of internal communication as these have been progressively developed. The general conformation of the country is that of river valleys separated from each other by great mountain ranges and these naturally present considerable obstacles to the construction of a general network of roads or of railways such as is possible in the great plains of India. The rivers have been the dominating factor and the tendency therefore has been for trade to establish itself most firmly in those areas possessing natural means of communication by water. In fact, it has been pointed out that only ten of the thirty-eight district headquarters cannot be reached at all times of the year by ocean steamers or river launch. When the British occupied Burma there were practically no roads in the accepted sense of the term, but only jungle tracks, and such roads as were constructed in the early days of the British occupation were designed mainly to link up posts on the frontier with district headquarters. The first road of any importance was constructed in 1861 from Myede in the Thayetmyo district through Prome to Paungde, and ten years later it was continued to Rangoon. When in 1874-77 a metre gauge railway was constructed along this road to connect Prome with Rangoon, a new road was necessitated parallel to the railway. Simultaneously a road between Pegu and Rangoon was constructed and its continuation to Toungoo was contemplated. But with the construction of the railway to Toungoo in 1885 the scheme was abandoned and attention was devoted to the construction of feeder roads. A road was also started from Moulmein, the ultimate terminus of which was contemplated as Ye, but this road has never been completed. Moulmein is now connected with Ye by a railway.

The annexation of Upper Burma diverted expenditure from communications in Lower Burma to the provision of roads for military requirements in the upper province, and frontier troubles led to the construction of numerous roads on the frontier. Fortunately, however, railway construction has kept pace with the general development of

the province, and the line from Rangoon to Mandalay was opened in 1889. An extension from Sagaing on the west bank of the Irrawaddy to Myitkyina was begun in 1890 and opened in 1899. The requirements of the delta were met by the construction between 1873 and 1900 of three canals to connect the creeks at the mouths of the Irrawaddy, Rangoon, Pegu and Sittang rivers to provide inland waterways for country boats. Of these, the Twante Canal is the most important. It has been widened and improved and is freely used by rice traffic while the Pegu-Sittang Canal is now utilised mainly by timber rafts. The third canal, the Sittang-Kyaikto, has become inoperative since the construction of the railway to Martaban. To sum up, at the beginning of the present century the communications of Burma consisted of about 1,100 miles of metre gauge railway line and 8,000 miles of roads of all classes in addition to the inland waterways. Within recent years, there has been a great advance in railway construction and the mileage is now approaching 2,000. Rangoon is connected by railway with Moulmein, Bassein, Mandalay, Myingyan, Heho in the Southern Shan States, Hsipaw and Lashio in the Northern Shan States, with Myitkyina in the extreme North and with the Lower Chindwin district. There are now about 10,000 miles of roads. The great difficulty in the maintenance of roads in Burma is the scarcity of metal in Lower Burma and the rapid deterioration of timber bridges which were used in the earlier days. A special sub-committee appointed in 1920 to examine road proposals for the province recommended an expenditure of no less than eight crores of rupees and these recommendations have been accepted by the local Government. The general financial situation also has considerably curtailed development and a great deal more expenditure has been incurred on maintenance and repairs than on original works. This may be seen from the fact that for the decade ending 1910 the average yearly expenditure on roads was only Rs. 18 lakhs for original works and Rs. 21·2 lakhs for repairs and for the decade ending 1920, Rs. 18·8 lakhs for original works and Rs. 33 lakhs for repairs. In 1919, Rs. 75 lakhs were specially allowed for expenditure during the next three years on road improvements and, in 1922, Rs. 244 lakhs were earmarked from the profits derived from the rice control scheme to be spent in conferring permanent benefits on the agriculturists of the province.

Since 1923, a Communications Board, which has been given powers of administration, was formed for the province and since then there has been a distinct forward movement in the matter of communications. It has considered 241 projects and approved of work estimated to cost Rs. 467 lakhs. The most important work sanctioned is the programme of trunk road construction which is to be completed in 1931. An important link in this chain of trunk roads is a bridge across the Irrawaddy at Sagaing, and it is understood that the sanction of the Government of India has now been accorded to its construction. This will link up the east and west banks of the Irrawaddy. Since the appointment of the Communications Board the expenditure, for the seven years ending 1926-27, has increased to an average of Rs. 43 lakhs on original works and Rs. 43·5 lakhs on repairs. The expenditure for 1926-27 on provincial

main roads alone has been Rs. 57·2 lakhs on original works and Rs. 38·9 lakhs on repairs. Of the 10,000 miles of road in the province, 6,000 are main roads which are maintained by the local Government and 4,000 miles are maintained by local authorities as district roads. Up till 1923, the Public Works Department was responsible for the maintenance of district roads, but since the passing of the Burma Rural Self-Government Act, this responsibility rests with district councils or with deputy commissioners in areas excluded from this Act. Where local authorities have not an adequate staff and plant, the Public Works Department undertakes maintenance of the roads. It is estimated that to maintain these district roads at their present standard Rs. 27½ lakhs is required annually and to this the local Government make a contribution of Rs. 17 lakhs. In order to prevent works being carried out by any district council which are beyond the financial capacity of such district council to maintain, the local Government have limited the capital expenditure on district roads to Rs. 6½ lakhs per annum and contribute the funds for other approved works which are carried out by the Public Works Department.

In common with other provinces of India, the advent of the motor car is making itself felt in Burma and the number of motor vehicles imported into Burma during 1926 was no less than 2,664. Wherever a road permits of it, motor bus services financed privately are immediately started to connect the surrounding villages with the nearest town, steamer or railway station.

It may be of interest to note the principle that is being followed in the construction of new main roads. Where possible, these follow the general alignment of established cart tracks, but when they run in the same direction as a railway they are generally constructed within two miles of the line and parallel with it, now on one side, now on the other, and crossing the railway at the principal towns or at suitable points about every tenth mile. They thus form lateral feeders to which subsidiary feeder roads of reasonable length may be constructed on either side of the railway to connect with the principal stations, and without such subsidiary feeders having to pass over or under the line. Main roads are from 22 to 24 feet broad, the central 12 feet being metalled with stone, and permanent bridges are now being put in with a 16 feet broad roadway capable of taking a weight of 12 tons. The cost of construction varies from Rs. 30,000 to Rs. 50,000 per mile according to whether stone and laterite are obtainable locally and the cost of maintenance varies from Rs. 1,500 to Rs. 5,000 per mile. Under the direction of the Communications Board and subject to the possibility of providing finance, an extensive programme of road construction in all districts on a definite plan has been initiated and is being rapidly pushed forward.

#### *Marketing.*

Marketing in Burma presents no particular features. The chain is from the small village broker to the local dealer residing in the surrounding markets and milling centres and thence to the small local mill or the

large rice mills in Rangoon. Formerly, it was the custom for these large Rangoon mills to give advances to their brokers to enable them to purchase paddy in bulk but it is understood that this custom has now been discontinued.

When a cultivator has threshed and winnowed his paddy, he sets aside enough to pay his land revenue if he is a landowner or his rent if he is a tenant. He then pays his hired labour and any advances he may have taken towards the expense of raising the crop under disposal. He then sets aside his *wunsa* or the amount which he calculates will be necessary for his domestic purposes for the year and the remainder he holds ready for sale. If a small man, he deals with the local village broker who arranges for its transport to the large broker at the local railway station or river siding. The ruling prices in Rangoon are generally well known in paddy-producing tracts and the cultivator seeks, by bargaining with the broker, to obtain a price as closely approximating to the Rangoon level as the broker may be willing to concede. Another matter of dispute is the basket with which the paddy is measured, for the basket varies from village to village in the most extraordinary degree even within a radius of five miles. As a rule, however, an amicable settlement is arrived at and there are few cases of serious dispute. Occasionally, the cultivator gets the advantage of carting his own paddy for which he is paid cart hire.

When the paddy has reached the large broker, various things may happen. If the broker is not working in direct arrangement with a Rangoon mill, he may store it in his own godowns for a rise in the market. Large ranges of these buildings will be seen at all the principal railway stations and at many of the river sidings in Burma. If he adopts this policy, he can hold the crop for a rise in price, or, in other words, speculate on the market. If he does not incline to speculation, he can dispose of the paddy at once to the numerous local small rice mills which within recent years have sprung up in formidable numbers all over the delta or he may forward it at once to the large rice mill in Rangoon. The produce of the small mills either finds its way to Upper Burma or is sold in the neighbourhood of the mill or it may be sent after milling to Rangoon, where it is handled both by the brokers and by the large shippers, in the latter case being frequently re-milled. Another industry which has sprung up within recent years and which is mainly in the hands of the small millers is the parboiling of rice for the Madras and Ceylon markets.

The bulk of the crop, however, is dealt with by large mills in the ports of Akyab, Bassein, Moulmein and Rangoon. These mills classify paddy by the somewhat artificial distinction of rail and river paddy which, so far as they are concerned, merely means the route by which the paddy arrives, although in actual fact there is a slight difference in the quality and class of paddy carried by the different routes. Rail paddy, as a rule, is a short-lived variety and slightly inferior to the boat paddy, which is a long-lived variety. This latter has the advantage that it has generally been put straight from the threshing floor or river siding into

the paddy boats and is therefore cleaner and has suffered less from adulteration.

All the large rice mills have their sidings or jetties and at these the paddy is delivered to the mill from the railway or from the country boat. In Rangoon the method of purchase is on the basis of a 9 gallon basket weighing 46 lbs, a bonus being given for weight in excess of 46 lbs. and a proportionate cut if the paddy weighs less than 46 lbs. There are numerous complaints of collusion between the weighman, the broker and the tally clerk, but these are not serious. It may be remarked that a considerable amount of skill can be exercised in measuring paddy as paddy lightly dropped from a height into the weighing basket may weigh considerably less, bulk for bulk, than does a basketful closely filled and pressed down, but the paddy seller, as a rule, is no fool and is quite capable of looking after his own interests. There are, of course, numerous cases of theft from wagons or boats while in transit or while stored on the threshing floor and at railway sidings, but this is a feature by no means peculiar to Burma. There are also constant complaints of the lack of supply of railway trucks, but, as a rule, the railway administration does all it can to deal with the crop at the rush period.

The marketing of cotton is not quite so satisfactory. As a rule, this crop is grown by a small cultivator who is generally in financial difficulties. In some cases, if his debts are considerable he finances his agricultural operations on credit and on the arrangement that he repays in *kapas* when the crop is plucked. Naturally not much is left to him by the time his crop matures. If his indebtedness is not so acute and if he can finance himself until the picking season, he may still be obliged to have recourse to the village trader for money to tide him over and, here again, the arrangement is to repay the cash loan in *kapas* at a fixed market price. This fixed price, it is to be feared, is generally in favour of the trader and the price must cover the interest on the loan and the risk taken. It is only in rare cases where a cultivator can refuse financial help altogether that he gets the full benefit of his crop.

These arrangements have far-reaching effects, not the least of which is the agricultural disability created. Instead of being able to keep their best seed, these cultivators have to hand over their whole crop to the trader and to buy back from him any seed which he likes to supply. As a result, it is seed of bad germination and mixed seed that comes back to the cultivator and the efforts of the Agricultural Department to improve the crop are, for that reason, handicapped. It is unfortunate that in cotton there is no free market. The cultivator is, in the first place, in the hands of the trader who does not deal with large ginneries direct but works through a broker and thus there is a long chain between the field and the mill, which militates both against the cultivator and against the efforts of the Agricultural Department to improve his crop. The Agricultural Department has attempted to open cotton markets as recommended by the Indian Cotton Committee, but it is understood that no great success has so far been achieved.

The other commercial crop of importance is groundnut and the eccentricities of this market are graphically described by Mr. Chalmers

Development Commissioner, in a memorandum submitted to the Commission from which the following is an extract :—

“ The cultivator in marketing this crop is less well organised than in the two crops already discussed. The main markets are on the river bank from Pakokku to Allanmyo. The Magwe market, which is probably the worst from the cultivator’s point of view, may be taken as a sample of the seller’s experience in disposing of his crop. The cultivator arrives in Magwe,—generally overnight in order to save his cattle travelling in the heat of the day—he puts up at the compound of his broker and early in the morning the local buyer appears on his bicycle and bargaining begins. The buyer examines the consignment and depreciates it as much as possible ; the broker, if he is honest, holds a brief for the cultivator,—by repute he seldom is—his bias is towards the buyer with whom he has many transactions, whereas he sees the seller but once a year. If a bargain is struck, the cart of nuts is chalked, and proceeds to the buyer’s godown or dump. Here the usual chicanery takes place. The nuts are delivered on a weight *cum* volume basis. The baskets vary considerably at the various stations. The Rangoon basket is supposed to weigh 25 lbs. and the prices advices are on a F. A. Q. standard. The buyer’s measurer takes over on a Magwe basket heaped, which normally weighs 37 lbs. If the Rangoon quotation is, say, Rs. 180 per 100 baskets the Magwe buyer adds to this fifty per cent to cover the basket difference, and deducts Rs. 50 the freight charge to Rangoon to get a starting price ; whatever he is below this is gain—gain of a perfectly legitimate kind : but it is at this point that the cultivator is skinned. From time to time a basket is weighed and should it fall below 37 lbs. a cut is made on the price of the consignment. No bonus is given for an excess in weight as in the case of paddy. The basket is heaped up with nuts and may be pressed down or shaken. In the latter the weight may go up as high as 40 lbs. per basket, and the loss be as much as eight per cent of his crop. The nuts spilled are the perquisite of the measurer ; in a morning’s weighing this may amount to something considerable as any ‘ broken basket ’ is also his.

The cultivator is but a child in the hands of the broker and the measurer. If he attempts to adulterate his nuts with husk or shell, he is caught out when the basket is weighed, and the cut is sufficient to cover the buyer’s probable loss. Shingle added is easily detected. Watering when the nuts have to travel a long way so that there is time to absorb it, and steaming for quick absorption of weight are resorted to ; but the buyer and measurer meets this every day and can soon detect ‘ doctored ’ nuts. These are the difficulties of the cultivator when the deal is on the straight. What are his chances when the broker takes secret commission, the measurer is a rogue, and the weight false ? For the present indifferent methods the cultivator has himself in part to blame. He has but to organise and he can dictate his own terms provided they are reasonable. He could, if he had sufficient intelligence, less suspicion, and any power to combine, market his produce in an open market, where prices would be known daily on advice from Rangoon, sell by weight which is the best test of good nuts, unless we are going to test for oil content and have prope



stamped scales and a neutral weighman. Until this is done there can be little improvement in the market conditions. To summarise: the ideal we ought to struggle for is:—

- (1) an open market with daily market prices published (elimination of the broker);
- (2) sale by weight with a bonus for consignments over F. A. Q.;
- (3) genuine weighment by neutral tallymen.

The first two can be accomplished if the cultivator through his societies will combine; but strange to say Magwe district is one of the areas where co-operation has not taken hold.

The third is a difficulty, as honesty is a rare quality, and where it does exist it is apt to be destroyed by the seller or buyer bribing the man appointed to give them a square deal.

The cultivator has been done so often, that he is a bundle of suspicions: the better the plan devised for his good, the more suspicious he becomes: the fact that he cannot detect a catch in a good scheme only confirms him in his belief of the cunning used to invent it. He will in most cases have none of it; if he does come in, he comes in with the intention of perverting it at the earliest opportunity. Arcadia only exists in the imagination of the poets. The agriculturist enjoys 'slim' practice so long as he is not the victim. Buying by weight is steadily gaining in favour and the other riverine markets have adopted it. Magwe will in time follow. The question of freight has not been examined: but Rs. 50 for the freight of about 1½ tons of nut from Magwe to Rangoon appears to be excessive; the crop is a bulky one and takes up much space. The Myingyan method of dealing with the nut is more economical. The oil is pressed, the shell burned, and the cake resulting is in the best form for transport. The oil can be disposed of in the province, and the cake exported for cattle-feed. Perhaps the line of advance here is the small mill; but the difficulty is to deal with the by-product; the cake in a small unit: it means expensive hydraulic presses and good marketing facilities for the oil and cake if the venture is to be a success."

With regard to the marketing of cattle, this also is somewhat haphazard and there are no real stock markets in the province. As has been pointed out, the dry zone is the great breeding centre of Burma and the animals from this area are drifted down the river on rafts, marched down by road or conveyed by train to Lower Burma. There is a kind of cattle market at Allannmyo in the Thayetmyo district on the east bank of the Irrawaddy and this has attained some reputation and is fairly successful. Should sales not be effected there, the cattle continue their march south to Paungde in the Prome district where a considerable business is also done. Pyawbwe in the Yamethin district is also a large cattle-dealing centre where many cultivators go to buy their supplies, but the markets are not organised or controlled. The ordinary vendor of cattle is the cattle breeder who has his own stock to dispose of, buys a few from his neighbours or is entrusted with the sale of others and starts off on his march southward selling as he goes. The other dealers are large buyers from Lower Burma who go to cattle-breeding centres buying from village to village and on their return disposing of the animals in their own local

areas in Lower Burma. It may be remarked that a considerable number of cattle also come in to the more eastern districts of the province from Siam and the French States.

### 13. LOCAL SELF-GOVERNMENT.

Local self-government in the sense in which it is known in other parts of India only came into effect with the passing by the local legislature, in 1921, of the Burma Rural Self-Government Act. This enactment provides the basis for the education of the rural population in the responsibilities of representative institutions by transferring the administration of local matters outside municipalities, including vernacular education, from purely official control to elected councils and boards, such local bodies being, as far as possible, neither assisted nor controlled by government officers. Prior to this the only suggestions of local self-government in the accepted sense were municipalities of which, as a rule, the Deputy Commissioner was president with an official or non-official vice-president and in the smaller towns, town committees. Outside these areas rural administration was regulated by the Burma Village Act administered by village headmen and village committees. Prior to its amendment in 1924, the village headman was practically all-powerful within his village tract, but since that date some of his powers have been transferred to a village committee, especially in connection with the trial of civil and criminal cases. Under the Act, it is the duty of the headman to report certain matters to the officer in charge of the nearest police station, for instance, the arrival in his village of any suspected criminal, the committing of or the intention to commit various major offences, the occurrence under suspicious circumstances of any death in his village tract and any matter likely to affect the maintenance of order. His main duty, however, is the collection of the revenue of his tract and the general supervision of his village. Rules have been made under this Act prescribing the duties of the headmen of village tracts in respect of contagious or infectious diseases among human beings and it is also under this Act that are defined the duties of the headman and residents of a village tract in respect of the prevention and suppression of cattle disease. These undoubtedly have formed a very powerful assistance to the Veterinary Department.

With regard to the Burma Rural Self-Government Act, 1921, this Act provides first for the creation of circle boards and secondly for district councils. So far, however, the only functions definitely assigned to circle boards are the election of members to the district councils and the submission of an annual statement of their requirements and estimates of expenditure for the coming financial year. Other functions can be exercised only on the transfer of any matter by the district councils under Section 53 of the Act and, in general, district councils have made no complete delegation of the control and administration of any matters to the circle boards. A further delegation would be from circle boards to village committees which are contemplated in the Burma Village Act as amended in 1924, but since the circle boards have had no functions

delegated to them which they can delegate in turn to village committees under Section 25 of the Burma Rural Self-Government Act, 1921, these committees cannot yet take any place in the scheme of rural self-government as dealt with in the Act. And, indeed, so little has been delegated to circle boards that they are practically moribund.

It is too early as yet to say what success will attend these councils as they only really came into effect at the end of 1923, but there is no doubt that at present they are suffering from lack of trained secretaries, engineers and other staff, while the inexperience of the members is also an obstacle to rapid advance. It thus follows that in the meantime a large number of duties are performed as they were before the introduction of the Act, for instance, village headmen continue to have duties in respect of public health and the health of cattle in subordination to the district officers of Government and independent of the new local bodies, and the Public Works Department does a considerable amount of their road construction and maintenance. These difficulties, however, are merely temporary and will disappear as experience is gained.

The total provincial contributions to district councils during 1926-27 was Rs. 36,73,842. Of this total Rs. 18,83,816 was for education and Rs. 17,90,026 for general purposes\*. The total receipts of district councils (excluding opening balance and debt) were Rs. 95,48,474 and their payments (excluding debt) Rs. 76,94,851.

#### 14. PUBLIC HEALTH AND SANITATION.

As a rule, the Burman is vigorous, healthy and active; and although rice is the staple food the population does not suffer from the deficiency of diet which seems to depress other rice-eating groups of India. This is probably due to the fact that his diet is varied and that, even in the poorest household, salt fish forms an integral part of the food ration. In addition, a very large amount of country vegetables and roots are consumed, while the fact that the preparation of the raw paddy in the village hullers does not lead to high polishing or the removal of nutritive portions of the rice probably contributes to the soundness of the diet. In the more congested parts of Lower Burma, however, the very large influx of Indian immigrants, who, in 1925-26, numbered no less than 408,464, tends by the somewhat lower standard of living of these immigrants to depress the average level of nutrition, while there is no doubt that by this same agency a considerable amount of disease is introduced and spread. That the Burman is on the whole better fed than the other races of India may be inferred from the expectation of life figures which were worked out for the 1911 census: these enquiries gave an expectation of life for a Burman male as  $31\frac{1}{2}$  years and for a female  $32\frac{1}{2}$  years, figures which are only approached by Madras where the expectancy of life for males is 26 and females over  $27\frac{1}{2}$ . In other provinces the figure is about 21. Added to this is the fact that, except in the largest cities, there is very little congestion of population

\* Of this sum Rs. 10,77,844 was for public works, Rs. 3,68,195 for public health and Rs. 2,89,714 for medical purposes.

as Burma is much under populated, the average density of population per square mile being only 68, the next province being the Central Provinces with 139 to the square mile, rising to no less than 608 persons to the square mile in Bengal.

Burma is subject to diseases similar to those which work havoc in India and amongst the most important of these, and by far the dominating disease, is fever in one form or another. When we consider that for six months of the year, the delta of Lower Burma is practically entirely under water and that for months afterwards shallow pools are left scattered about the country—most suitable breeding grounds for mosquitoes—it is not to be wondered at that a large number of the population are constant victims to malaria. This liability to malaria undoubtedly reduces the working efficiency of a large part of the rural population. Plague is now more or less established in the province, principally in Rangoon from which it is liable to be disseminated up-country. Cholera outbreaks are frequent and there is a considerable amount of small-pox. Hookworm disease is also unfortunately present, though so far it has not proved serious.

As regards hygiene, the Burman is by habit scrupulously clean and the houses are as a rule also kept in a tidy and orderly manner. There is, however, a tendency to carelessness in the village surroundings and the general custom of keeping the cattle in villages at night as a protection against cattle theft does not tend to improve matters. Wells and drinking tanks are apt to be neglected and the ideas of rural hygiene may be said to be of the most primitive. It may be remarked, however, that as in the delta the population lives in houses surrounded by water for a considerable part of the year, it is not easy to attend to matters of village hygiene though it may also be hoped that the thorough cleansing with water which the villages receive during this period may do something to remove accumulations of filth and refuse.

Within recent years, the Public Health Department in Burma has been very substantially strengthened and during the year 1925-26 the total amount spent in the province on civil sanitary works was Rs. 54·37 lakhs, of which Rs. 18·64 lakhs were devoted to water supply and Rs. 19·8 lakhs to conservancy. In the towns and municipalities the percentage of income spent on conservancy was 6·01 and on water supply 5·87 and the total expenditure on sanitary works was Rs. 49,72,000. But the department is by no means strong enough to deal with the great problems of the country. At present it consists only of the Director with two assistant directors, and in most districts the civil surgeon combines with his duties as medical officer those of district health officer. Recently sixteen Burman sub-assistant surgeons have been placed at the disposal of the Public Health Department but this number must be very much increased if any impression is to be made on the province. A Public Health Institute has been opened in Rangoon and doubtless, with this provision for training, the staff of district health officers will in due course be largely increased.

In conclusion, it may be remarked that very considerable improvement has been effected in the sanitary condition of some of the larger

riverine towns of the delta by raising their level. This has been effected by pumping up sand by dredgers from the adjacent rivers. In some cases this has been accompanied by a new layout of the towns and in these areas the general health has been materially improved.

While the expansion of medical relief has gone on rapidly and there is now practically one medical institution for every 794 square miles of country and for every 45,000 of the population, these schemes hardly touch the needs of the rural population as the hospitals are in the main located in the towns. A scheme has, therefore, been drawn up by which private practitioners and retired sub-assistant surgeons are given a subsidy of from Rs. 50 to Rs. 125 per month provided they will settle and practise in smaller towns where no hospitals or dispensaries exist. At present 13 such practitioners have settled down to practice, apparently with considerable success, and arrangements are being made to extend this scheme and obtain more medical men on these terms. In time it is hoped that by this arrangement modern medicine will be brought within the reach of a greater part of the population, at present dependent on the indigenous Burmese medical practitioners who, as in almost every country, have a large following. Government has devoted its attention to this type of practitioner and schemes for training have been originated which will enable him to bring to his indigenous theory of medicine at least the principles of cleanliness, asepsis and the application of antiseptics.

## THE CENTRAL PROVINCES AND BERAR

### 1. GENERAL FEATURES AND NATURAL DIVISIONS.

The administrative area known as the Central Provinces and Berar is probably the most difficult to describe of all the provinces of India. The tracts comprising it differ widely from each other in circumstances, people and language, while each has its separate history. It has been well said that it was a veritable territorial puzzle that was pieced together in 1861 when the Central Provinces came into existence, and an administrative puzzle was added with the transfer to the same administration of Berar in 1903.

The combined provinces are situated in the centre of the Indian peninsula and comprise a large portion of the broad belt of hill and plateau country which separates the Deccan from the plains of Hindustan. The area of British territory is 82,109 square miles in the Central Provinces and 17,767 in Berar. The following account excludes the fifteen Indian States with an area of 31,176 square miles, within or bordered by British territory.

The combined provinces fall into five natural divisions. In the north-west, the districts of Saugor and Damoh lie on the Malwa plateau, rising sheer from the Narbada to a general elevation of from 1,500 to 3,000 feet. The surface of the country is undulating and broken by frequent low hills covered with a growth of poor and stunted forest.

South of this plateau comes the long and narrow valley of the Narbada, about two hundred miles long and twenty broad. The soil is alluvial deposit of extreme richness, excellently suited to the growth of wheat, but scoured by the numerous rapid streams pouring from the Satpura Hills to the Narbada.

The third division lies south of this valley, being composed of the Satpura Hills which stretch right across the province. The greater part consists of an elevated plateau, broken into volcanic hills, bare stony ridges, and narrow fertile valleys in which the soil has been deposited by drainage. The steep slopes to the plains on either side are traversed in all directions by narrow deep ravines covered with forest. The general elevation is 2,000 feet but several of the peaks rise to 3,500 and 4,000 feet. From this range of hills rise the Narbada and the Tapti rivers which flow westward into the Arabian Sea and the Wardha and Wainganga which flow eastward to join the Godavari.

South of this range lies the great plain of Berar, Nagpur and Chhattisgarh. To the west is found the rich black soil which makes this the great cotton-growing tract of the province. Further east is an area of greater rainfall which is mainly rice-growing. It is distinguished by its numerous tanks for the irrigation of rice. Further east again, comes the open country of Chhattisgarh, almost treeless and divided between expanses of small embanked rice fields and ridges of unculturable laterite.

South again, lie two expanses of hill and plateau. To the west are the rugged hills of the Ajanta range rising in the Bombay Ghats, eastwards commences a vast area of hill and jungle; the dense forests and precipitous mountains and ravines formerly made an effective barrier to invasion or immigration and were shown in the old maps as the Great Wilderness. It has isolated stretches of culturable land, some of good quality and others, capable only of yielding the poorest rain crops, and all inefficiently cultivated and inhabited by primitive Ghonds and other forest tribes. Formerly the wildest and least known part of the whole peninsula, it is now being opened up in all directions by good roads.

Practically the whole of the Central Provinces lies in the catchment area of the rivers Nerbada, Tapti, Godavari and Mahanadi, whose sources and catchment basins lie at a considerable height above sea level; owing to the rapid fall of level, they have cut out for themselves deep beds many feet below the surface of the country. In the rainy season, they become swift torrents; in the dry they dwindle to chains of almost stagnant pools.

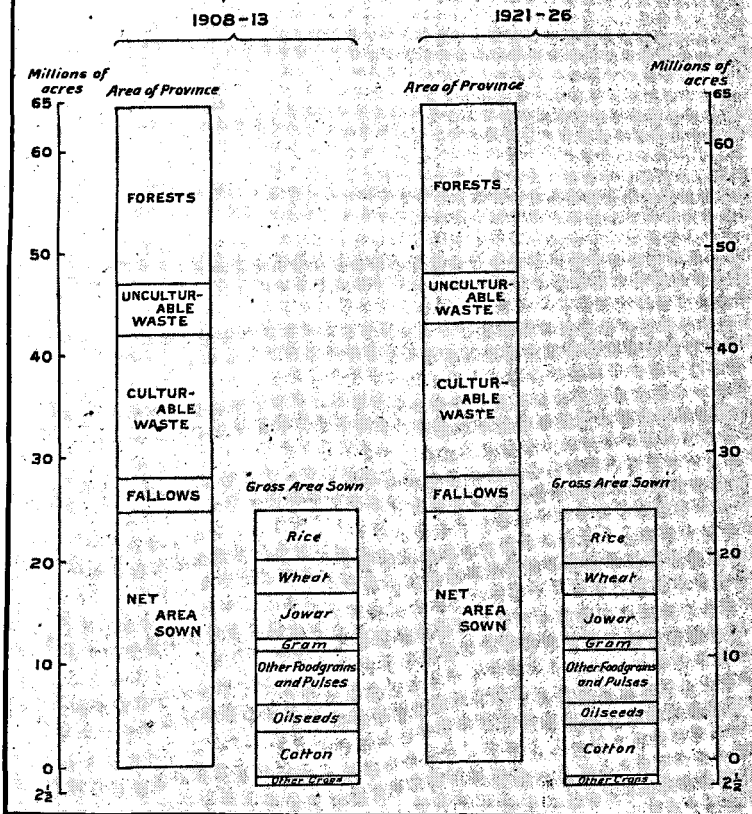
The widespread flows of volcanic rocks, known as the Deccan Trap, occupy nearly the whole of Berar and eight districts of the Central Provinces. Features of the trap area are the prevalence of long grass, the paucity of large trees, and the deciduous character of almost all the bushes and trees. The majority of the rivers are bounded by strips of alluvium. Manganese, coal, iron, bauxite, steatite, red ochre, limestone, and dolomite which makes excellent building stone are found.

Roughly speaking, four distinct kinds of agricultural land may be distinguished. The first is the heavy black soil which covers the Nerbada Valley and the open and level portions of the Vindhyan and Satpura plateaux. It is either alluvial, formed by the deposit of decayed vegetable matter, through the agency of rivers and streams, or has resulted from the decomposition of trap or basalt rock, or from a combination of both agents. This land is suited to the growth of wheat, linseed, gram and other cold weather crops, which are dependent upon the moisture remaining in the ground from the monsoon rainfall and on the showers received during the months of December and January. Water is usually found only at a great depth from the surface, and irrigation is consequently little employed. Embankments to save erosion and hold up water and careful tillage are the main requisites for cultivation. The second class of land consists of shallow black soil, lying in a thin sheet over the surface of the basaltic rock from which it has been decomposed. It is suited for the growth of cotton, *juar* and other autumn crops requiring only light rainfall. The soil responds readily to manure and the application of industry largely increases the outturn. The third class of land includes the light sandy and stony uplands of the Vindhyan and Satpura ranges and the hilly country in the south where the soil is either very shallow or contains a large proportion of gravel mixed with boulders. Lands of this description are the poorest in the province; they require long resting fallows, and the cheap millets which they produce, constituting the main food grain of the aboriginal cultivators who raise them, are entirely dependent on the rainfall of August and September.

## CENTRAL PROVINCES AND BERAR

### CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 Year Averages)

*NOTE:- The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.*





The last kind of land consists of yellow and sandy soil, formed from metamorphic or crystalline rock. It is the principal feature of the rice lands of the province, where the rainfall is heavy. This land, although of little natural fertility, responds readily to manure and irrigation.

In Berar, the soil in the valleys is a light brown alluvium, usually rich and suitable for wheat; the central valley contains a deep rich black loam, exceedingly fertile and often of great depth. The plateaux are covered with fairly rich soil.

The districts north of the Satpuras produce, principally, cold weather crops such as wheat and gram. Of those south of the Satpuras, the eastern ones produce principally rice and the western ones cotton and *juar*. In the Satpura districts, the inferior soil is chiefly devoted to minor millets.

The climate of the more elevated and more northerly districts differs from the rest in that the mean temperature is lower, and the cold season is longer and more marked. The average rainfall in the Central Provinces is 48·5, and in Berar 32·3 inches. The highest rainfall is at Pachmarhi, where it amounts to 81·5 inches. Three-fourths of the annual total is received in the monsoon months of June, July and August, and a further nine to ten inches in September and October. Isolated falls may be received in November and December, while in January and February slight storms may occur, especially in the north.

**2. PROVINCIAL INCOME**  
**GOVERNMENT OF THE CENTRAL**

(Figures are in  
*Revenue and Expenditure*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue .. ..	265	255	238	226	221	233
Excise .. ..	105	126	131	150	157	135
Stamps .. ..	50	58	67	68	71	61
Forests .. ..	41	47	51	52	50	53
Other heads .. ..	16	9	10	10	8	9
Irrigation .. ..	—3	2	2	1	1	2
Debt Services—Interest ..	4	8	5	3	3	3
<b>Civil Administration—</b>						
Administration of Justice ..	4	5	5	6	7	6
Jails and Convict Settlements .	2	2	2	3	3	4
Police .. ..	..	3	2	2	1	1
Education .. ..	2	3	4	5	5	5
Medical .. ..	..	1	1	1	1	1
Public Health .. ..	1	1	1	1	1	1
Agriculture (including Co- operation and Veterinary) ..	2	3	3	3	3	3
Industries .. ..	..	..	..	..	..	..
Other departments .. ..	2	..	1	1	..	1
Civil Works .. ..	4	4	5	4	5	5
Miscellaneous .. ..	8	11	11	12	9	8
Miscellaneous adjustments between Central and Provincial Governments .. ..	..	..	..	..	2	..
Extraordinary receipts .. ..	..	..	..	..	..	1
<b>Total, Revenue Receipts ..</b>	<b>503</b>	<b>538</b>	<b>539</b>	<b>548</b>	<b>548</b>	<b>530</b>

## AND EXPENDITURE.

## PROVINCES AND BERAR

lakhs of rupees)

*charged to Revenue*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
Direct Demands on the Revenue—						
Land Revenue .. ..	38	45	40	24	25	27
Forests .. ..	28	30	31	33	35	40½
Other heads .. ..	12	12	15	12	25	22
Capital outlay on Forests charged to Revenue .. ..	..	..	..	..	2½	..
Irrigation—Revenue Account ..	21	22	24	26	25½	27½
Irrigation—Capital Account charged to Revenue ..	19	12	..	..	2	1½
Debt Services—Interest ..	4	4	3	2	2	..
Civil Administration—						
General Administration ..	50	50	48	68	69	70
Administration of Justice ..	31½	32	31	31	32	32½
Jails and Convict Settlements ..	11	9	10	9	9	10
Police .. ..	58	57	57	58	58	60
Education .. ..	49	54	49	50	53	62
Medical .. ..	13	14	14	12	14	17
Public Health .. ..	6	4	2½	3	5	4
Agriculture (including Co-operation and Veterinary) ..	14	13	14	15	16	16
Industries .. ..	3	6	3	2	3	3
Other departments .. ..	2	2	1	2	2	1
Civil Works .. ..	65½	63½	68	65	70½	102
Miscellaneous .. ..	72	60	77½	70	78	78½
Provincial contribution ..	31	22	22	22	13	22
Miscellaneous adjustments between Central and Provincial Governments .. ..	..	½	..	1	..	½
Extraordinary charges ..	..	..	..	..	..	..
Total, Expenditure charged to Revenue ..	527	512	516	511	545½	597

## GOVERNMENT OF THE CENTRAL

(Figures are in

*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Receipts</i>						
Revenue Surplus .. .. .	..	26	23	37	2½	..
Famine Insurance Fund .. ..	..	36	45	44	42	46
Appropriation for Reduction or Avoidance of Debt .. .. .	..	..	1	2	..	..
Other appropriations .. .. .	..	..	..	..	3	3
Loans and Advances by Provincial Government .. .. .	37	57	33	23	12	7
Loans between Central and Provincial Governments .. ..	511	29	31	27	13	32
<b>Total, Capital Receipts .. ..</b>	<b>548</b>	<b>148</b>	<b>133</b>	<b>133</b>	<b>72½</b>	<b>88</b>
Opening Balance .. .. .	-413	..	78	172	245	229
<b>Total .. .. .</b>	<b>135</b>	<b>148</b>	<b>211</b>	<b>305</b>	<b>317½</b>	<b>317</b>

## PROVINCES AND BERAR.

lakhs of rupees)

*and Expenditure*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Expenditure</i>						
Revenue Deficit .. ..	24	..	..	..	..	67
Famine Insurance Fund .. ..	..	5	4	3	4½	10
Loans and Advances by Provincial Governments .. ..	91	5	3	2	21	7
Loans between Central and Provincial Governments .. ..	5	42	6	28	25	8
Forest Capital Outlay .. ..	..	1	1	1	11	7½
Capital Outlay on Stationery and Printing .. ..	..	..	2	..	..	..
Construction of Irrigation Works..	15	17	23	26	27	26
Miscellaneous .. ..	..	..	..	..	..	4½
<b>Total, Capital Expenditure ..</b>	<b>135</b>	<b>70</b>	<b>39</b>	<b>60</b>	<b>88½</b>	<b>130</b>
<b>Closing Balance ..</b>	<b>..</b>	<b>78</b>	<b>172</b>	<b>245</b>	<b>229</b>	<b>187</b>
<b>Total ..</b>	<b>135</b>	<b>148</b>	<b>211</b>	<b>305</b>	<b>317½</b>	<b>317</b>

### 3. REVENUE ADMINISTRATION AND LAND RECORDS.

The combined provinces are divided into five divisions, each under a Commissioner, and twenty-two districts, each under a Deputy Commissioner. The districts are divided again into tahsils, of which there are 83. Each tahsil is divided for purposes of land records into *patwari's* circles which comprise several villages, and are grouped into three or four revenue inspector's circles per tahsil. Revenue inspectors are supervised by assistant superintendents of land records under a district superintendent of land records who is under the Deputy Commissioner. The head of the Land Records Department is the Director who is also Commissioner of Settlements.

The Deputy Commissioner is the official head of his district, the district representatives of other departments being for the most part his advisers in matters concerning their departments, and corresponding through him, so that he watches over and co-ordinates all government activities in his district and safeguards the interests of the general public. He is, amongst other duties, in charge of the administration of revenue law and the maintenance of land records, and must give constant attention to the state of the crops, the economic condition of the people, the need for remissions or suspensions of land revenue and to any symptoms of approaching scarcity. The forests in his district are under his general control. He was formerly largely responsible for the maintenance and planning of roads, the spread of education, the general public health of the district, and the prevention and stamping out of cattle disease. But latterly these duties have been handed over to representative local bodies and his responsibilities have to this extent been reduced.

The organisation of a suitable land revenue system in the tracts which are now included in the combined provinces was a task of unusual difficulty. Prior to the advent of the British administration, the chief characteristic of the system, or lack of system, was the ruthless rackrenting which swept aside any existing rights and customs which stood in the way of the demand of the rulers of the time. Villages were farmed out to the highest bidder; the cultivator held no security; no rights of occupancy were recognised, and hereditary rights were not admitted, although, in practice, land often passed from father to son so long as the rent was paid. But fresh engagements were made from year to year and the previous tenant was ousted if he were outbid. In the Nagpur country, engagements for the government demand were taken from the village *patels* at the beginning of the agricultural year, but the amount for which they were to be responsible was not fixed or announced to them until sufficient time had elapsed for the character of the season to become apparent. No trace of fixed assessment or even assessment rates existed, and the demand from the village constantly fluctuated. As the *patel* did not know what sum he had to collect, each field was given a rent-paying value, or *ain*, and the demand, when known, was distributed over fields according to their *ain* value. In Chhattisgarh, the revenue-paying capacity was measured not by the field but by the

plough, and any inequality of assessment was corrected by increasing or diminishing the area of holdings. A first instalment of revenue was collected based upon the demand of the previous year ; then, later, when the character of the crop was determined, a second demand was made. As most villages had four kinds of soil, and these kinds were scattered, it was considered necessary for each "plough" unit, to have samples of each soil in proper proportion. Thus a "plough" consisted of a great number of small, often tiny, plots scattered all over the village. Where the distribution of the land amongst "ploughs" was found to have become uneven, owing either to increase of cultivation or increase of cultivators, there was a system of *lakhabatta* whereby the inequalities were re-adjusted. The excessive fragmentation of holdings in Chhattisgarh is largely due to these causes.

The British found that the poverty of the people and the precarious condition of their agriculture precluded anything more permanent than yearly settlements until information was gathered on which longer contracts could be based. But as conditions became more determined, it became possible to extend the periods. The position of the *patel vis-à-vis* the cultivators or ryots was the subject of long consideration, and in 1868 the Government of India agreed to a proposal to accept the *patel* as *malguzar* with proprietary rights, subject to various restrictions on his right of transfer and also to the recording and maintaining of the rights of the cultivators or ryots. The latter thereby declined to the position of tenants of the *patel*, and subsequent legislation has been aimed at protecting their rights in the land. The result is a somewhat complicated series of tenures, with legal restrictions on ejection, enhancement of rent, acquisition of new rights, and power of transfer. The major portion of the land is cultivated by tenants whose rent can only be enhanced at settlement and once, under certain conditions, during the currency of a settlement which is ordinarily in force for thirty years, and who are exempt from ejection so long as they pay this rent.

In the cotton tract the average holding is about thirteen acres, in the rice tract it is seven acres and in the wheat tract nine. But this does not represent the actual area cultivated per cultivator, as brothers may share in one holding, and the same man may cultivate in more than one holding in his own and neighbouring villages.

In Berar, the system is different : eighty-eight per cent of the area is held directly from Government. The greater proportion of the ryots have full rights of occupancy, transfer and alienation, subject to payment of the revenue. The land revenue system of Berar is founded on that of Bombay.

#### 4. THE CULTIVATOR.

The Central Provinces and Berar, while in area the sixth, is in population the seventh in order amongst the provinces of India. The total is nearly fourteen millions, and the density, while considerably greater than that of Australia or America, is much less than in the more populous parts of India, Egypt or Japan. The mean density, 122 persons per square mile, is the lowest in British India, except Burma. The cotton

tract is the heaviest, and the plateau division, the lightest in density. The density of population approximates to that of the less developed parts of southern Europe. Generally, there is every variety of caste and tribe mixed up together. Repeated incidence of widespread scarcity, following upon failure of the rains and the influenza epidemic in 1918, have retarded the increases of population which were recorded last century, and the effect has been enhanced by emigration due to the attraction of labour to the coal mines, the Tata works at Jamshedpur, the Assam tea gardens, etc.

No less than ninety-one per cent of the population live in villages, of which there are 47,576, the average distance between each being less than two miles. The cultivator very rarely lives on his fields or outside the *abadi* or site for dwelling places; but sometimes, as a result of the caste system or of congestion, small hamlets are formed which may be some distance away from the main village. Every cultivator has a right to receive house space free of charge from the head of the village, and it is only where non-agriculturists and traders are found that house sites attain any value. Most villages are small, their average population varying from 227 in the plateau to 399 in the Maratha plain.

Nearly five-sixths of the population are Hindus. There is a large number of Animists, the line between whom and the Hindus is not well defined. The two million members of the Animist community are almost confined to jungle tribes who venerate different deities at different times. They form one of the more serious problems before the administration.

Of the total population, over three million are forest or hill tribes, of which the most important are the Ghonds who now are mostly engaged in cultivation; the next largest group is one of hereditary cultivators, numbering less than three millions. The chief caste is the Kunbi, who with the Kurmi and the Kolta are the traditional tillers of the soil. Nearly a million persons are recorded as graziers and dairymen, amongst whom the Ahirs are the most numerous. The care of cattle and the sale of milk is their chief occupation. Other large sections are the weavers and leather workers. The principal landholding caste in the Central Provinces is that of the Rajputs.

Over 74 per cent of the whole population are occupied in agriculture, the next in order being industries (9 per cent) and commerce (5·6 per cent). Women work freely, there being 812 females for every 1,000 males amongst workers; they are employed in almost every occupation. In agriculture, they are employed as field labourers, cultivators and farm servants; there are actually more women workers than men in all mines except coal, in cotton spinning, in the small rope and wool industries, food industries, grain grinding, lime burning, stone cutting and dressing, and in labour on roads and bridges. In all occupations, the proportion of dependents to workers is 42 to 58. Of the total population, the proportions of males and females under fifteen years is 42·6 and 40·6 respectively, so that practically every person over fifteen is recorded as a worker.



The province possesses three sharply divided classes of rent receivers, rent payers and labourers, very few in any one of these classes appearing amongst the others. Similarly, very few of the rent receivers have any other source of income; very few engaged in other labour follow agriculture as a secondary occupation, and even the graziers do not practise agriculture; generally, the hereditary occupations keep distinct even from others closely akin to them.

There does not appear to be any shortage of labour for the type of agriculture in vogue, but, on the other hand, there are large portions of the province in which the *kharif* crop, which is reaped at the end of the rains, is the only crop of importance that is grown, and, when this crop is harvested, there is a scarcity of employment until shortly before the break of the next monsoon. The heavy seasonal demand, such as occurs at the time of cotton picking in Berar or in the north by the wheat harvest, is met by a corresponding movement of labour.

The simple needs of the ordinary villager require a blacksmith and a carpenter, who may sometimes be combined in one person, for their agricultural implements, a potter to supply them with inexpensive earthenware, and a shoemaker. In many parts, the blacksmith and carpenter are still village servants paid by a grain cess at the time of harvest, and there is always a supply of shoes and pots to be obtained within a few miles of the village at the weekly bazaars. Cottage industries are not important and have great difficulty in competing with the machine-made products. Weaving is universal and has recently received a temporary impetus from the movement in favour of country cloth or *khadi*. Silk-bordered weaving attains a high standard of efficiency.

One of the most striking things about the ordinary village is the scarcity of shops of any kind. The vast majority of the inhabitants depend upon the weekly bazaar for the supply of any commodity which they do not grow or make themselves. Few villages are situated more than eight miles from a bazaar village, and as each bazaar supplies the petty needs of all the villages for which it caters, it is self-contained and does not compete with neighbouring bazaars, but one dealer has a circuit and travels round from bazaar to bazaar, the days for which permit of arrangement of a tour. As a rule, transactions are in cash, but, where, as in the case of cloth, credit is sometimes allowed, payments may be made in grain. The village bazaars do not act as collecting centres for produce except in so far as payment is made in grain. There are more important centres where the cultivator may purchase cattle, sell grain, cotton or timber, or make his larger purchases of cloth. There are usually several cattle markets in each district which are held weekly, and during the more important religious festivals.

Although 74 per cent of the population are shown as dependent on agriculture, only 47 per cent are cultivators, the remaining 27 per cent being farm servants or labourers. Of the 6,600,000 cultivators, only 2,850,000 are usually regarded as cultivators by caste, the rest being jungle and hill tribes, etc. It is dangerous to attempt a picture of the "average" cultivator, but it may be said that he lives in a village with about 300

other people in sixty houses. Half of these houses will be found inhabited by cultivators. The net cultivated area will be round about 500 acres, or about ten to thirteen acres for each male cultivator over twenty years of age. For the work of tillage, he will have a pair of oxen. He is surrounded by other villages, there being nearly 400 of these to every town. He is far from a metalled road, and usually several miles from the nearest bazaar. Thus, except in the cotton tract, he tends to produce for his own consumption and sells enough to pay his land revenue, which is about fourteen annas per cultivated acre per annum.

He lives free from the strain of congested districts. He could, if pressed, cultivate 56 per cent of the province, but finds 34 per cent ample for his needs. There are large tracts which could be cultivated with profit if there were any pressure on the food supply; he is not yet faced with the law of diminishing returns. He does little double cropping and avoids intensive cultivation. His methods are primitive; he employs little capital; in many villages he has no field work to do between the end of the *khariif* harvest in one year and the beginning of the monsoon in the next. He is illiterate, and prefers his boy's labour to his education; in his defence, he can plead that there is only one primary school for eleven villages, and distances are apt to be too far to send a boy every day. He is almost entirely dependent upon the monsoon, and has bitter experience of the cruel scarcity that befalls when the rains fail.

##### 5. THE AGRICULTURAL DEPARTMENT.

The first movement towards improving the agriculture of the province began with the attempt to introduce exotic cottons in the years following the American Civil War. The effort ended in failure, although traces of the work are still in evidence in the distinct percentage of Upland Georgian cotton which persists in the cotton mixtures of the Wardha district. The farm which had been opened at Wardha was closed down in 1872 and a "model farm" was established at Nagpur. In 1882, this farm gave place to the Nagpur "experimental farm" under the control of the Land Records and Settlement Department. The activities of the farm, however, aroused no general interest, and, during the next twenty years or more, attempts at development were confined mainly to the setting up of various classes of instruction in agriculture at the farm school. It may seem strange, in the light of subsequent experience, that any attempt should have been made to initiate classes of instruction in the total absence of expert teachers and before all but the veriest beginning had been made in the application of modern scientific methods to Indian agriculture; yet the school was not without effect in that it turned out men with a smattering of agricultural knowledge, however inaccurate, who became the assistants of the subsequently recruited technical officers.

The construction of the department, as it exists today, began in 1905 with the recruitment of a technical deputy director. The old farm class gave way to the Agricultural College in 1906, and by 1907 the expert

staff had been strengthened by the addition of a second deputy director, a principal of the college, a chemist and a botanist; and five experimental farms had been opened. A review of the whole organisation in 1910 led to the creation of a Provincial Agricultural Service and to the division of the Subordinate Service into two cadres, an upper and a lower. A third deputy director was recruited in 1913 and a new and well equipped research institute was opened in 1915.

Unfortunately, just at the stage when a rapid advance might confidently have been expected, the war broke out and progress, if it did not stand still, at any rate received a very marked check. Four officers were released for military duty and the general control of the recently created Provincial Service devolved for some time on one officer only for the whole province. Not only so, but two of the officers took up appointments in other countries after demobilisation. Both were men who could ill be spared, but the loss of one, in particular, was the more unfortunate in that it left the province for a number of critical years without the services of a fully qualified economic botanist.

With the close of the war came rapid expansion both of the personnel and of the activities of the department. The expert staff at the beginning of 1928 consisted of eleven officers.

The province is divided for administrative purposes into four circles, each in charge of a deputy director, while one circle has a subdivision under an assistant director, thus making practically five circles. The headquarters staff consists of the principal of the college, the agricultural chemist, two economic botanists, a mycologist and a deputy director in charge of animal husbandry. The post of agricultural engineer is at present vacant, the former incumbent having resigned. The Provincial Service cadre has sixteen posts, nine of which are connected with district work under the deputy directors and seven are in connection with research and teaching under the specialist officers. The Subordinate Service has seventy-one posts in the Upper Division cadre and sixty-four in the Lower Division. These men are employed as farm and assistant farm managers, in district work, and as assistants in the teaching and research sections. Below the Subordinate Service is a grade of vernacular speaking men of the status of superior ploughmen called *jamadars* and *kamdars*, who number in all 148. The strength considered necessary in the Provincial Service and in the grades subordinate to it has not yet been attained and expansion will doubtless take place as funds permit.

The activities of the department may be dealt with under the following heads:—

- (a) Research and investigation.
- (b) Demonstration and propaganda.
- (c) Livestock improvement.
- (d) Agricultural education.

(a) *Research and Investigation*.—Research is carried out at the Research Institute and the experimental farms connected with it—the College farm

and the Akola farm under the principal of the college and the economic botanist respectively ; at the five experimental farms under the deputy directors of agriculture ; and, to a limited extent also, at most of the thirteen so-called seed and demonstration farms in the charge of deputy directors. For a long period in its history, central research was handicapped by the lack of suitable laboratory accommodation and of staff. The necessary buildings and equipment were provided only in 1915, and shortly afterwards the only two specialist officers then on the cadre went on war service. The other specialists, the deputy director in charge of animal husbandry, the mycologist, the second botanist and the engineer were not recruited till after the war and their work is only now beginning to bear fruit, while the entomological section is a minor one in the charge of a single assistant of the Provincial Service grade, much of whose time is taken up with teaching duties in the college.

The investigation of cotton was taken up by Dr. Clouston more than twenty years ago and the common mixture of cottons known as *jari* was isolated into the six common types of cotton prevalent. The testing of these resulted in the separation of *roseum*, the characteristics of which are a short coarse staple, a high ginning percentage and a high yield. The distribution of this variety on a large scale has been a subject for criticism but the fact remains that it is still the most paying cotton which the cultivator, whose land is free of wilt, can grow.

Another of the earlier examples of selections is found in the *juars*, two varieties of which, selected very early in the history of the department, still stand out as the best in common use. Similar work on rice in the north and east of the province has produced several varieties of paddy which are now generally grown in these areas ; and the work on wheat has left a distinct mark on the character of the crop grown in the north of the province. Early work on sugarcane led to the isolation of the hardy *khari* variety which has practically entirely replaced all the other local varieties. Of late years, the products of the Coimbatore cane-breeding station have also been under comparative tests on different farms of the province and there is little doubt but that *khari* will shortly give way to some of the new varieties.

The field work connected with the research of the specialist officers is done on portions of the college farm set apart for the purpose, and besides this the first botanist now has the Akola experimental farm under his direct control. Plant breeding by the botanical section was taken in hand seriously in 1921, chief attention being paid to cotton, groundnut and *juar*. The earlier attempts to improve cotton were, as we have seen, successful in the direction of selection for high yield rather than in improving the staple. The Indian Cotton Committee's Report, however, had pointed to the advisability of devoting more attention to the problem of finding a variety with a better staple and it is to the solving of this problem that the main efforts of the first botanist have been directed since 1923. The work is being assisted by the funds of the Indian Central Cotton Committee. The aim is to find a cotton which will give an

improved staple without at the same time losing its economic advantage by reason of low ginning percentage and low or uncertain yield. The problem is by no means an easy one, complicated as it is by the conditions under which cotton is grown—the short growing season and the general absence of irrigation facilities. The improved cotton, when it comes to be given out, will find a strong competitor in the short staple, hardy, high yielding *roseum* which at present holds the field. Nevertheless, it is understood that promising strains have been isolated and are now being grown on a field scale. The rest of the activities of the first botanist and his staff are concerned with crops which form a suitable rotation in the cotton tract.

A second botanist was appointed in 1925. His research operations deal mainly with the breeding of local wheats and pulses, and he has begun an investigation into the fodder and grass problems of the province.

The mycological section came into existence at the end of 1920. Active work began with the appointment of the present officer in charge in 1922. The principal research work in hand is a study of cotton wilt financed by the Indian Central Cotton Committee and investigation has been made into *juar* smut. The causes leading up to loss by foot-rot in wheat have been examined, and various other crop diseases are under investigation.

A great deal of the work of the chemical section is in the nature of team work with other branches of the department. The section is steadily carrying out a full analysis of the soils typical of different parts of the province and different crops. Recently an investigation has been made into the formation and loss of nitrates in the soil and this work will form an interesting complement to similar work in process in other provinces.

Such time as the entomological assistant has at his disposal for research work has been devoted to the problems of the sugarcane-borer, the cotton boll-worm, cotton leaf caterpillar, pests affecting rice, *juar*, and various fruit trees.

The engineering section was started in 1920. Much work in connection with implements had previously been done by the deputy directors and the principal of the college, the most outstanding result from which is to be seen in the large numbers of improved ploughs, manufactured by British and Indian firms, which have come into use in the province, especially during the past half dozen years. Types suitable to each tract now find a ready demand. Among machines, the most successful introduction has been the three-roller cane-crushing mill manufactured in the Punjab, and water-lifts from the same province are beginning to make their appearance. Since the engineering section was formed, the design of simple implements capable of being manufactured locally has received attention, and the engineer, in collaboration with the principal of the college, has carried out detailed trials of tractors and small power plant suitable for use on the larger holdings. An important function in the engineer's section is the class of instruction in tractors

and oil engines held every year, for the benefit of the sons or servants of such agriculturists as own these plants.

It is unnecessary to go into details of the investigations which have led to improvements in the methods of growing the staple crops. Such problems as seed rates, spacing, sowing methods, the character of cultivation best suited to different crops under different conditions, the limitations within which deep ploughing is advisable, water requirements, etc., have all received attention on the experimental farms. One of the most difficult problems to solve is the question of manure. It has been satisfactorily met as regards sugarcane and the more valuable garden crops, but the manuring of dry wheat has been found to be impracticable except through another crop or by means of leguminous rotations. The benefits of green-manuring on paddy land have been proved, but the difficulty remains of applying the system in the peculiar conditions of the paddy tract. Top dressing of cotton with artificials has given good results with the superior cultivation practised on government farms, but whether it will pay under the cultivator's field conditions and under the downward tendency of cotton prices remains to be proved. Steps have been taken for the better conservation of such farmyard manure as remains for agriculture after the requirements for fuel have been met.

(b) *Demonstration and Propaganda*.—The organisation by which the results of research are brought to the notice of the cultivator is under the control of the deputy directors. At present, each circle is divided into two sub-circles each under the charge of a Provincial Service officer, and consisting generally of two or more revenue districts. Under the Provincial Service officer, are a number of agricultural assistants belonging to the Subordinate Service; when numbers permit, the aim is to have one such assistant for each tahsil. In general, each assistant is given one year's training or more on a farm, after completing his college course, before he is entrusted with district work.

The main centre of interest in the circle is the experimental farm which is under the direct control of the deputy director. The staff generally consists of a superintendent, a couple or more of trained assistants and one or more assistants under training (all members of the Subordinate Service). In addition, there is the farm clerk and the menial staff. Part of the farm is devoted to detailed experimental work which consists of the investigation of local cultivating problems, the testing of varieties selected or bred on the farm or imported from outside the circle or province, the trial of new varieties from the botanical section or of a particular variety which the mycologist or entomologist wishes to try out with reference to immunity to disease; or it may be that a manurial problem is being worked out in collaboration with the chemist. The rest of the farm is taken up with trials, on a field scale, of the results emerging from the detailed experimental work. These trials determine the suitability of a particular variety or a particular method of cultivation for inclusion in the general agricultural practice of areas which are similar in conditions of soil, rainfall and temperature to the conditions existing on the farm.

A circle is a big area, however, and it does not follow that a variety or method which has proved suitable on the experimental farm will prove of equal merit elsewhere. To provide for this, seed and demonstration farms have been established, at least one of which is located in each sub-circle under the general supervision of the Provincial Service officer in charge of the sub-circle, and in the immediate charge of an experienced agricultural assistant. The object of these farms is to test the experimental farm varieties as regards their suitability to local conditions and, when that has been established, to produce seed for distribution. Another important function they discharge is the stocking of implements, machines and manures suitable for the tract, financed by a permanent advance from Government for the purpose. They are supposed to be purely commercial in character but they do not differ in any marked respect from the less intensive experimental portion of the headquarters farm. For this and other reasons it is not always possible to run them on a paying basis.

All the seed grown on the experimental or seed farms, except that of discarded varieties, is handed over to the agricultural assistants engaged in district work for distribution for sowing. Their business it is to bring it to the notice of the cultivator and to persuade him to adopt it. Comparatively few cultivators, except those within a narrow radius of the experimental and seed farms ever take the trouble to come and see for themselves and so improvements have to be demonstrated at their doors and at fairs and festivals where they congregate. The demonstrator assistant's life is a strenuous one; he tours from twenty to twenty-five days in the month the whole year round, according to a programme laid down by his superior officer. His activities vary according to the season. When he is concerned mainly with implements he organises ploughing matches, he carries a plough about with him, works it for a day or two in a village, collects orders and passes on to another village. For seed distribution he depends largely on the private grower to whom he supplies fresh seed from the government farm on condition that the grower will do his best to keep it pure and will sell as much of it as he can to his neighbours for sowing. When he is concerned with a complicated demonstration of a new crop or a new method, a plot is leased for him for a period of five years or less and put in charge of a resident *jamadar*; if the demonstration is a simple one he carries it out on the cultivator's own fields.

The purely departmental propaganda agency is supplemented by various non-official agencies. Chief among those, leaving aside the individual seed growers already mentioned, are the district and tahsil or taluk agricultural associations. Under a scheme recently put into operation in the north of the province, these associations are financed by Government to enable them to purchase a stock of seed from approved seed farmers. This they lend out to the members of the association on twenty per cent interest, *i.e.*, on the return of the lent seed stock and twenty per cent added at harvest. From the new stock the association repays, each year, ten per cent of the original capital advanced by Government

and ten per cent interest on the balance of capital still outstanding. The rest of the seed is lent out to members on the same terms the following year. After the scheme has been in operation for ten years, the association will thus have repaid the government advances in full and will have in its possession seed stock equal to the value of the original loan, plus an additional reserve, on account of the diminishing interest charges, which it will be able to cash and utilize for other forms of agricultural improvement. In Berar, several taluk associations have taken up implement as well as seed distribution, maintaining their own implement stores from which ploughs and machines are sold or given out on hire. Smaller organisations than those of the tahsil or taluk are the unions of seed growers who supply improved seed to the public, and the circle and village associations, all concerned mainly with seed distribution.

Although several successful associations are in existence there are many others which have failed to be of any great practical utility, and even the best of them are indebted for their success more to the efforts of a few individuals rather than to the joint efforts of the members. Perhaps the reason for this may lie in the method of their development. The district associations were the first to be formed, then the tahsil. Originally, membership was built up by the haphazard selection of the bigger men without very close regard to their interest in agriculture; of late the tendency has been to develop the smaller unit, the revenue inspector's circle association, with the intention of building up the tahsil association by election of representatives from the lower unit, and the district associations in like manner from the tahsil associations.

It remains now to consider to what extent the activities of the department are reflected in the agricultural practice of the province. There is no detailed information as to the total areas on which seed originating from government sources is sown, but the published figures show that in 1926-27 private seed farms, of which there were 8,770, supplied over eight thousand five hundred tons of improved seed of the ordinary staple crops. It was estimated that half a million acres were under improved cotton, 135,000 under wheat and 104,000 under paddy. These figures must be regarded as approximations only, for the department has no means of ascertaining accurately the areas sown from the natural spread of seed issued in previous years. As an indication of the probable accuracy of the estimates, it may be noted that, in the wheat tract, the sample now being offered in the principal markets is about ninety per cent pure compared with sixty to sixty-five per cent pure ten years ago, and a hybrid wheat issued to the public in 1923 is coming into the market in sufficient quantities for commercial purposes and separate shipment, and has already acquired a trade name. Other examples of definite progress are the introduction of groundnut which was practically unknown in the province fifteen years ago and which extended to over 44,000 acres in 1926; the almost complete replacement of the old varieties of sugarcane by an improved indigenous variety, and the introduction from Nagpur into the north of the province of a variety of sesamum which is now in general cultivation there.



Better cultivation in all tracts has followed on the extension of the use of the inversion plough. In the cotton and wheat tracts its value in cleaning the land is widely recognised and even small cultivators come forward to hire the use of a tractor when unable to do the work with their own bullocks. Ploughing in Berar a dozen years ago was a matter of rare occurrence; now it is coming into general practice. In 1925-26, when the cotton crop was poor and the prices low, between four and five thousand ploughs were sold and in each of the two previous years, when better economic conditions prevailed, the sales approximated 8,000. A three-roller iron cane-crushing mill has replaced the old inefficient wooden mill and an improved type of *gur*-boiling furnace has been adopted which requires no fuel except that which the crop itself provides.

Examples of better methods of technique are to be found in the adoption of line-sowing in the north of the province in place of the former universal system of broadcasting all *kharif* crops, the substitution of the single or double seedling practice in the transplanted rice areas in place of bunches of eight or ten, and the prevention of smut in *juar* by treating the seed with copper salts.

Estimates of the financial advantages which have attended the efforts of the department must be largely speculative for, though it is possible to gauge them with tolerable accuracy on a carefully managed government farm, it does not follow that the same results are obtained on an indifferently cultivated private holding. The departmental estimate puts the extra value of improved wheat and paddy seed at five rupees an acre, *roseum* cotton at seven to ten rupees, sugarcane at thirty to fifty rupees. To the profit resulting from planting the improved cane has to be added the economy effected by the substitution of the new type of *gur* furnace as well as the higher yield from better cultivation and manuring. Improved methods must have had their effect in raising the profits from other crops as well but these are more difficult to compute.

(c) *Livestock Improvement*.—The province carries a population of approximately twelve million head of cattle and buffaloes, chiefly the former. Other kinds of livestock are relatively unimportant; the indigenous pony is comparatively worthless, so worthless that attempts to improve it have been abandoned; goats and sheep are bred in fair numbers by the professional shepherd castes, the former for food, for milk, which Muhammadans and low-caste Hindus drink, and for offerings to the deities, and the latter principally for their wool. Buffaloes are kept mainly for dairy purposes; male buffaloes are not used for draught except in the rice tracts, which absorb the young male stock bred in other parts of the province.

Except in one or two localities, for example the home of the Gaolao breed in Chhindwara district and part of Wardha district, the indigenous breeds are of very poor quality. The popular belief is that the quality is steadily deteriorating and that the deterioration is due to the expansion of cultivation and the consequent contraction of the areas available for grazing. If this is true, it is true only in a small degree for the cattle are at their best in the cotton tract where grazing is scarcest. The real reason appears

to be that economic considerations affect the cattle policy of the ordinary cultivator only to a very small extent, if at all. He does not, as does the farmer in western countries, take stock of the food resources of his holding and limit the number of his herd accordingly. Every animal that is born into his herd is allowed to live on, irrespective of whether it is likely to be of any economic value or not; similarly, when a cow ceases to produce calves or milk or when a bullock is past work, it is allowed to linger on in the herd, eating up the food which is all too scanty for the proper maintenance of the more useful animals. The cultivator's main argument for maintaining large numbers is that they provide him with manure, but he forgets that the total amount of manure produced is governed entirely by the amount of food available, and that a given amount of food will produce as much manure when eaten by a smaller number of well-nourished animals as it will when divided among a larger number of under-nourished ones. The results are seen at their very worst in the Chhattisgarh division where every village owns a large herd of miserable looking, undersized animals which produces only a fraction of the number of bullocks required for cultivation, and whose only other main economic use is the production of fuel and of the small proportion of the dung reserved for manure. Apart from rice straw and perhaps a little grain for the bullocks at busy working seasons, the cattle depend for their livelihood upon what they pick up on the common grazing grounds and rice *bunds*. From August till January they fare well enough, but they are in a state of semi-starvation right through the hot weather and large numbers fall a prey to disease. Conditions are somewhat better in the wheat country, and very much better in the cotton-*juar* tract where the limited grazing necessitates stall feeding with *juar* and cotton-seed.

Cattle improvement has not kept pace with the other activities of the department although breeding herds began to be established as long ago as 1901. The slow progress has been ascribed, in part, to the fact that these herds were in the charge of deputy directors already overburdened with other work and unable to give that close attention which breeding work demands. Other factors which retarded progress were the difficulty experienced in settling down to a definite comprehensive policy, and the very restricted scale on which operations have been, and even now are being, carried out. The general problem before the department was, firstly, to improve such pure or approximately pure breeds as existed; secondly, to improve the nondescript stock of such areas as possessed no particular breed; and, thirdly, to introduce better milking qualities into the pure and mixed breeds alike. Where work has proceeded with a single definite aim in view, a measure of success has been attained. One example is the pure bred Gaolao herd at Garhi which is being improved in the direction of draught qualities alone, another the Malvi herd at Powarkhera with the same objective, and a third the Montgomery herd at Telinkheri, the object of which is to provide a breed which will increase the milk supply in urban areas. Less success has apparently attended efforts in the direction of evolving a dual purpose animal. On several farms, an attempt has been made to achieve it by breeding pure Montgomery bulls

on to the local stock, a policy which, while it certainly improves the milking capacity of the female does not so certainly improve the draught qualities of the male. Two more attempts at arriving at the dual purpose animal are represented by the Malvi-Montgomery herd at Adhartal where cross-breds will be mated with cross-breds and the college dairy herd where a more intricate hybrid is being evolved, namely a cross which is to be half Montgomery, quarter Ayrshire and quarter Hansi. Here again cross-breds will be mated to cross-breds. Both of the last named herds are purely experimental and the work has not yet reached a stage at which its ultimate value can be estimated. No attempt has yet been made to improve the milking capacity of the cattle of the Chhattisgarh division. The local cows have been crossed with pure Malvi bulls with the object of producing a better draught animal. The resulting first cross was an improvement on the local cattle as regards size and bone but the country is too poor to maintain a big animal such as would result from further use of pure Malvi blood, and the second generation of crosses bred to crosses are no bigger than the original Chhattisgarhi animal.

The scale on which operations are being conducted is sufficiently indicated by the fact that the most important cattle farm in the province carries a stock of only sixty cows of breeding age, and that none of the remaining ten farms are capable of carrying more than thirty cows. The total number of breeding bulls of all kinds which the department issued from all its farms in 1926-27 was sixty-three, a number of these being cross-breds of doubtful ultimate value. The merits of the bulls apart, however, it is obvious that at this rate of progress many years must elapse before any general improvement can be effected. That the local Government is alive to the needs of the situation is shown by the appointment, in 1923, of a whole-time officer for cattle breeding and by the schemes for rapid extension which are now maturing. Proposals are under consideration for the transference or extension of some of the present breeding farms to larger areas, for the provision of two forest areas each of which will support a large herd of selected local cows to be graded up by the use of pure-bred bulls, and for the conversion of certain of the existing small breeding farms into sale depôts. Till the stock on the proposed large breeding areas reaches the requisite standard of purity, the males will go on to the market as bullocks, while the bulls from the already established pure-bred herds will continue to be utilized for meeting the demands of the existing "premium bull" scheme. When a condition of sufficient purity is reached in the grade herds, it is hoped that it will be possible to put out three hundred bulls per year and that number will make it possible to concentrate on the improvement of the cattle population, area by area, as is now done in the Punjab.

The fodder problem is almost more difficult than the breeding one. A number of new fodders have been tried, of which the best is *berseem*, but it can be grown only under irrigation and seed is both expensive and difficult to provide for large areas. Heavy yielding fodder sorghums have been isolated and their cultivation extended and efforts have been made,

by the introduction of fodder-cutters, to make the existing supplies go further. Attempts are being made to encourage the preservation of monsoon fodders and grasses in the form of ensilage, and experimental work in connection with the improving of grass lands has recently been started.

(d) *Agricultural Education.*—The first attempt at imparting instruction in agriculture began in 1886 with the establishing of a two-year course of study at the Nagpur farm, its main object being the training of subordinate revenue officials. A normal class for village schoolmasters was undertaken in 1899 and was subsequently abandoned, and a like fate overtook a vernacular one-year course intended for the sons of influential landholders which was in existence between 1901 and 1910.

With the general movement on the part of the Government of India in 1904 towards the improvement of agriculture, the need for a higher and more scientific course than that given in the original farm class became apparent, and the old class was replaced by the college in 1906. The original college course was one of three years, the entrance standard being the university matriculation. After sundry changes the college settled down in 1921 to two courses, one of four years' duration leading to the college diploma and the other of two years leading to the college certificate. The former was steadily developed so that, in 1925, it was able to be affiliated, with but a few minor changes, to the Nagpur University as a B.Sc. degree course. The two-year course still continues.

In the degree course, instruction is given in agriculture, surveying, mathematics and English. The first elements of the sciences bearing on agriculture are introduced towards the end of the first year and increasing attention is devoted to those in subsequent years. A feature of the second year is the amount of attention given to practical agriculture. A block of ten to twelve acres of the college farm is worked co-operatively by the students under the supervision of an assistant, and the profits of cultivation go into their own pockets. In the third and fourth years, mathematics and English are discontinued. Training in field experiment work is given to the third year class, and the fourth year students are each allotted a simple subject for investigation on which they are required to produce a thesis.

The two years' course concerns itself mainly with practical agriculture. Except that direct science is almost entirely omitted, it follows, on the whole, the lines of the first two years of the degree course and includes, in addition, first aid, carpentry and blacksmithy.

The college also gives short courses in animal husbandry and dairying.

Since 1916, the certificate has been awarded alike to men taking the two years' and the four years' course on the results of the intermediate examination at the end of the second year, and only those who have attained a first class certificate have been allowed to proceed further.

The college is strictly residential; the hostel provides accommodation for 115 students and is fully occupied. Candidates for admission

require to be of good physique, they must belong to families directly connected with agriculture, and they must be reasonably well educated. In the past, the better educated students have been attracted more to professions like law and medicine than to agriculture, and even a degree in arts is held to confer a social status superior to that of the licentiate of an unattached college. Now that a degree course has been established, a higher standard among the candidates for admission may be hoped for.

Service in the Agricultural Department is still the goal most desired. A few of the four-year men are recruited annually to the Upper Subordinate Service, and some of the two-year men find posts in the lower cadre. A few are given appointments in the agricultural departments of other provinces, some are managing private estates and some have gone back to manage their own land. It is unlikely, however, that the expansion of the provincial departments will keep pace with the output of qualified men, and more and more of them will be forced to adopt agriculture as a profession.

Certain attempts have been made to meet the demand that definite agricultural instruction should be imparted in rural schools. The most important of these was the opening of two schools in the year 1918-19, one in the wheat tract and the other in the rice tract. These schools were originally designed with the idea of taking, from the upper standards of the middle school, sons of cultivators who in normal conditions would, on leaving the middle school, return to their land and of giving them a finishing education largely agricultural but including some general education on lines applicable to their profession. At first, there seemed to be a future for these schools and with the aid of a vast amount of propaganda a certain number of boys came forward, but attendance soon fell away and interest declined. The school in the rice tract is now closed. The one in the wheat tract has been gradually changed from a vocational to a pre-vocational school and is now, to all intents, a vernacular middle school, taking boys from the fifth to the eighth standard, and providing a course which replaces elementary science, drawing and history by agriculture and surveying and gives the boys two hours' practical work per day on the farm. In this form, it shows signs of proving popular among the better class cultivators and landowners in its locality.

Finally, an attempt has been made to give the pupils of an ordinary rural vernacular middle school three or four hours a week in practical agriculture on a departmental demonstration plot near the school. This simple form is about to be extended, where possible, in co-operation with the Education Department.

## 6. THE VETERINARY DEPARTMENT.

The Veterinary Department was founded in 1901 when a Superintendent was appointed to work under the Director of Agriculture. The two departments have since been separated, and veterinary work is now under its own technical head. There is no college; students from the veterinary colleges at Madras, Bombay and Lahore are recruited, and students from the provinces are given stipends from Government for training at the

Bombay college. The personnel of the department, in 1926-27, consisted of 2 superintendents, 6 deputy superintendents, 16 inspectors, and 131 veterinary assistant surgeons. The cadre is not full. There are dispensaries at all headquarters of districts and in most tahsils, making a total of 94, and 33 of the veterinary assistants are in charge of travelling dispensaries, visiting villages and rendering such aid as they can to the cattle there. The staff, although on the increase, is still insufficient for the work to be done, but the people are displaying more and more appreciation of the advice, and help available and the number of cases treated has increased eightfold in the last twenty years.

The incidence of contagious diseases is high, and the province suffers from the import of infected cattle from surrounding Indian States for sale at the various fairs; the local Government have power to exclude, from fairs, animals suffering from contagious diseases, but this hardly touches the main problem. There is not the staff required to detect and control disease-bearing herds, and little can be achieved without the co-operation of neighbouring States and provinces.

Castration work with the Burdizzo instrument is rapidly expanding, and should lead to considerable improvement in quality and a lower incidence of pasturing on overstocked forest and village lands. Cattle breeding is not undertaken by this department.

A central veterinary laboratory at Nagpur, which the department shares with the agricultural staff, performs useful functions in the correct diagnosis of disease from smears sent in by district officers. Nearly 20,000 cases were received in the last year reported on, and preventive measures are thereby facilitated. The staff have little time for research; a scheme for a properly equipped laboratory for research in local problems is under consideration.

## 7. IRRIGATION.

In the Report on the Administration of the Central Provinces for the year 1881-82, there appears the following item:—

“2. Canal Revenue.

7. There are no canals in the province.”

Since that date, considerable development has taken place. The chief irrigation systems at the present time are: the Mahanadi Canal which draws its supplies from the Mahanadi river and the Maramsilli reservoir; the Tandula Canal which is fed by the reservoir at Adamabad; and the Wainganga Canal which takes off from the river of that name. These three systems, between them, supply water to about two-thirds of the area irrigated from government sources. In 1926-27, there was assessed a gross area of 423,040 acres, and realisations of revenue amounted to Rs. 12·91 lakhs. The change was forced on the administration by a succession of disastrous famines due either to a deficiency in rainfall or to the early cessation of the monsoon. Early schemes were rejected on the ground that they would prove financial failures; but the cost of famine relief in 1899-1900 amounted to nearly six crores of rupees altogether, and the need for irrigation works for

protection against the recurrence of similar disasters on a comparable scale was brought prominently to notice. Within the famine period, there was expended forty-five lakhs of rupees on the repair of private tanks and wells, and about five lakhs of rupees on the construction of eleven new government works ; so that it may be said that the construction of State irrigation works began then. The Report of the Irrigation Commission of 1901-03 resulted in the adoption of a new policy.

Conditions for irrigation works in these provinces present greater difficulties than in some others. Although the rainfall is less subject to variation than in other parts of India, it is apt to be very unevenly distributed, especially during the latter months of the monsoon, when the time is critical for both *kharif* and *rabi* crops. The average annual rainfall over the provinces is about 41·5 inches ; it varies from 30 inches in the Berar plains to 75 inches in the Pachmarhi hills.

A deficiency of twenty-five per cent is injurious to crops, while one of forty per cent leads to serious scarcity. In the critical month of September, a deficiency of twenty-five per cent occurred in 19 years out of the 33 preceding the sittings of the Irrigation Commission. The problem is to ensure a good crop by making up any deficiencies of rainfall in September and October. But when the rainfall is adequate, there is no demand for water ; and even in bad seasons, the cultivators hope that rain may yet fall and spare them the expense of canal water. As hope fails, when already the crops have begun to deteriorate, a sudden demand springs up ; everyone wants water at the same time from channels designed to give it by rotation. The time involved in supplying the needs of the fields means delay for some and a consequent loss of revenue. Where a normal rainfall is sufficient to ripen a crop, a system of irrigation based upon a supply only where there is a demand is not suitable. To meet the difficulty, cultivators in each village are encouraged to enter into long-term agreements whereby payment is made whether water is actually taken or not, the rate being reduced for those who enter into the agreement. This system is proving successful and much facilitates the work of distribution. A further difficulty arising from the lack of water-courses from the government irrigation channels to each field can only be solved by the action of the cultivators themselves.

The scope for beneficial irrigation is less than might at first sight appear. Wheat is more likely to suffer from an excess of moisture than from drought ; the black cotton soils have been regarded as unsuited for irrigation as they are apt to be too retentive of moisture, while large areas are on undulating ground. In other places, there is no source of supply even if the soil were suitable. The light upland soils do not require irrigation even if they could be commanded. The rice areas, however, offer prospects of success, and have, in consequence, received most attention. The Irrigation Commission recommended an expenditure of three crores of rupees in twenty years, which they estimated would suffice for the irrigation of 450,000 acres ; actually, five-and-a-half crores have been expended and the average area irrigated in the last six years has been 423,330 acres. It

is expected that the schemes which have been completed or are at present under construction will eventually irrigate about 900,000 acres.

Rice is the main crop dealt with. Irrigation for *rabi* crops is not popular, and a reasonable rate for water for wheat seems to be only obtainable in a tract in the Saugor district. The new canals are designed only for rice irrigation.

From the above, it will be seen that the problems facing the administration are peculiarly difficult. Famines have been too frequent and too severe to permit of any neglect of measures that promise a remedy, but in between these years of scanty rainfall, there is little need for canal irrigation. Thus it became necessary to decide whether to irrigate a small area thoroughly and make this safe from the vagaries of the monsoon or whether to spread the irrigation over a much larger area, thus affording promise of enhanced prosperity in the normal majority of years but involving the risk of bad years. It was eventually decided to adopt the latter course; it held out a prospect of greater benefit over a series of years and so seemed more likely to assist the people to resist a time of acute distress.

With a few minor exceptions, the works are not productive; the highest figure for revenue has reached only 2·02 per cent on cost, and it is not expected that a return of 2 per cent will be exceeded for some years to come. On the other hand, the value of the works as a protection against scarcity in areas which have suffered from frequent failure of crops in the past and as a means of increasing the produce in normal years should be very great. In the report of an economic survey in Chhattisgarh made by Mr. J. C. McDougall, Deputy Director of Agriculture, it is related that in two groups of ten and seventeen villages irrigated by the Pindraon tank in the Raipur and the Khapri tank in the Drug district, the population increased between 1911 and 1921 by twenty per cent and forty-five per cent respectively, against an increase of only six per cent in the Raipur district as a whole and a decrease of four per cent in the Drug district. Although much has been accomplished under great difficulties, a very great deal more remains to be done before the provinces can be regarded as adequately protected against scarcity.

In the three rice-growing divisions of Chhattisgarh, Nagpur and Jubbulpore, the area under rice is about five million acres; of this less than nine per cent is irrigated by private works, and about another nine per cent by government works. When those government works which are contemplated or under construction are completed, it is estimated that about eighteen per cent of this area will be irrigated from government works. The most precarious districts have little private irrigation, and therefore the more need for public canals. But in these districts, comprised in the Chhattisgarh division, the cultivators are said to be lazy and unenterprising; they do not transplant the rice, and excessive fragmentation of holdings restricts progress. The need for new canals is acknowledged, but it is difficult to justify their construction until further experience is obtained of results from the Mahanadi Canal and of the willingness of the people to renew their agreements when the first period



has expired. Elsewhere, the soil where rice is grown is light, and, without manure, becomes exhausted to a point which permits of little benefit from irrigation. Thus, irrigation is not likely to secure full appreciation until the manure question is solved.

In other districts, the expansion of irrigation must wait upon the willingness of the people to enter into the agreements. With a sequence of good years, progress in this direction is apt to lag, while one year of short rainfall would considerably influence the rate of acceptance.

The obstacles to extension of irrigation are many : cost is high where storage has to be provided ; the difficult nature of the country to be traversed adds to this ; when a fair crop is obtainable in good years without irrigation, the people are naturally unwilling to pay for water which they can do without, and this leads to great uncertainty as to the financial results ; the fact that irrigation is not wanted for the spring crop and so is confined to the autumn one, makes the maintenance expensive. The poor standard of cultivation necessitates low rates for water, while the shortage of manure detracts from the full benefit of irrigation. Thus, it cannot be said that there is undue delay in constructing new works and much must be done before better financial results can be expected. It is also worthy of mention that the economic position of the people has much improved since the Irrigation Commission made their inquiry, and the need for further irrigation is not so acute as it was. It seems practically impossible to devise a scheme that would be productive, so that the case for further irrigation depends upon the need for protection against famine. At present, the works just about pay running expenses without counting interest charges.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

Government forests cover 19,677 square miles, or about twenty-four per cent of the total area of the province ; in addition there are large areas of privately owned forests. It is the policy of Government to assist the agricultural classes by providing grazing facilities at rates which are purely nominal for small holders and which only approach the commercial value of the produce removed in the case of large herds.

Every genuine cultivator is allowed to graze four cattle for each working plough, at rates varying with the locality from one to three annas ; thus a man with four cattle pays not more than one day's wage per year for grazing. If he possesses more cattle than allowed by the scale, he pays ordinary rates up to the limit prescribed for commercial rates. The value of the concession due to privileged rates is estimated at ten lakhs of rupees a year.

Of the total area under Government, only 3,164 square miles, or about one-fifth, is closed to grazing and even this is open to cutting ; 3,921 square miles is open to all animals, and the remaining 12,488 square miles is open to all except browsers. The closures are arranged so as to preserve to the local population adequate facilities in areas conveniently situated, and care is taken to secure a separate scrutiny by the Revenue Department which consults the people affected. That the facilities are freely enjoyed

is indicated by the fact that while the total number of cattle, sheep and goats is about thirteen million, over three-and-a-half million are grazed in the forests. The average revenue realised is about six annas per head. The number of cattle on privileged rates is just below 1,900,000, while 973,012 pay higher rates.

In addition to facilities for grazing, the department is also attempting to place at the disposal of cattle owners the grass in areas closed to grazing. Experiments in the supply of baled grass for stall feeding were not successful owing to the absence of any demand, although the bales were offered at cost price. Licenses to cut grass at low rates are available but, except for thatching, little is removed in this way. The system of permitting contractors to purchase in auction the right to cut grass for sale is somewhat more popular in some tracts, and is being continued where the people display no preference in favour of cutting for themselves under license.

*Bona fide* agriculturists are permitted to take dry firewood, timber, etc., at special low rates, and attempts are made to supply the local demand from areas of forest adjoining. A scheme to place at the disposal of the people cheap firewood from fuel depôts at convenient centres in order to remove the need for burning cowdung has not met with encouraging results. The continuance of this immemorial custom with firewood stacked almost at the door suggests that it is not lack of firewood which robs the soil of valuable manure.

In other ways, every effort is made to meet the legitimate demand for forest produce, such as leaves, fruits, etc., and it is claimed with reason that the forests in these provinces are being worked primarily for the benefit of the agricultural population. Where land is suitable for cultivation, it is given up to agriculture, and in this way nearly 2,500 square miles have been disafforested in the last twenty years. Few, if any, areas remain which could better be devoted to crops. If there were any room for complaint it would be that grazing has been permitted to an extent which endangers the continuance of the source of supply, and attempts are being made to limit the number of animals by negotiating grazing settlements. As has been already intimated, low rates for cutting grass or for grass cut by contractors do not relieve the pressure.

There does not appear to be any present danger from erosion as a result of disafforestation; there is an old rule forbidding the cutting of trees within twenty yards of either bank of a stream.

## 9. GENERAL EDUCATION.

The task of combating illiteracy in the provinces presents much the same difficulties as are found elsewhere. The poorer classes refrain from sending their boys to school; of those who attend the infant class, few survive through the whole course, and, of those who pass through, a considerable number lapse into illiteracy. Between the census period 1911-21, the number of persons returned as literate increased from 521,187 to 661,553, or about 14,000 per annum. In the same period, the number of pupils of all grades increased from 289,157 to 333,303 or 44,146

in ten years. The departmental report for 1926-27 shows a total of 399,289 pupils, of whom 341,614 are in the primary stages. Of these latter, however, forty-six per cent are in the first or elementary class, and only 50,854 in the fourth class. The last figure may be taken as representing the annual addition to the literates of the province; if 15,000 be assumed to be required to cover loss from deaths, then there should be an annual increase of literates of nearly 36,000. Anything less than this must be largely due to the lapsing into illiteracy and this wastage is clearly considerable. "It is a fact" says the Census Report for 1911, "that many who go through the primary schools in youth lapse into complete illiteracy at a later age, this being specially the case in the cultivating classes, who have little stimulus to keep up their education after leaving school." In the Census Report for 1921, it is suggested that "the tendency to relapse into illiteracy which is very prevalent among the cultivating classes is, if anything, on the increase." The management of primary schools is mainly in the hands of local bodies, and of these, while some evince active interest, others are apathetic. Many of their teachers are untrained; their prospects are poor, and they have little inducement to exert themselves. The only remedy for the disparity between the numbers in the first class and those in the fourth, and also for irregular attendance, is compulsion wisely applied; but compulsion without courage in its application is apt to give an attendance not much better than in voluntary schools. On the whole, present experience of the application of compulsion in the 66 villages in which it is tried is encouraging. Where this is applied, education in the primary course is entirely free; elsewhere a very small fee is levied, but there is some expenditure on books. Unfortunately, such progress as has been gained has been more marked amongst those classes who are not engaged in agriculture. Most rural schools have garden plots, but these are apt to be too small; and although efforts are being made to introduce nature study, it is found extremely difficult to get satisfactory teachers in this subject.

Agriculture was tried as a subject for the matriculation but it was purely a text-book study and was found to be of no value and therefore omitted. Adult education is not regarded as of major importance.

From the foregoing it will be realised that, while progress is steady, it is not rapid. The aboriginal section of the population is as yet scarcely affected; the higher castes amongst the Hindus and the urban Muslims show satisfactory figures, but the predominantly cultivating classes are not taking readily to the opportunities offered by the 4,523 primary schools in the provinces. One remedy suggested is concentration on the more flourishing institutions. "Some schools" it is said "exist only in name to carry on a lingering existence. The continuance of these schools is a sheer waste of public money. Well established schools suffer from want of accommodation or equipment and a great deal of money is absorbed by these nominal schools which serve no good purpose." It is also said that the poor attendance is due to the withdrawal of the active intervention of government officials and the local self-government

bodies seem, unable to find an adequate substitute for the influence exercised by the revenue officers.

The teacher question is not free from difficulty. The district councils unfortunately confirmed a large number of untrained teachers, with the result that no posts can be found for those who pass through the normal schools, and the yet further result that candidates for normal schools are falling in number.

#### 10. CO-OPERATION.

The co-operative movement has not made such satisfactory progress in these provinces as in some others, and is at present undergoing a process of re-organisation and drastic pruning. It was inaugurated in 1904, and, as in other provinces, experience has to be gathered by the painful process of trial and error. From the start there seems to have been lacking faith and confidence in the ability of the cultivator class to manage their own societies, and in consequence the control was centralised to an extent not usual in India. The Provincial Bank was registered in December 1911 and soon came to occupy too large a part in the movement. The central banks gathered to themselves too much power and the village societies declined to the state of mere agencies, lacking that vigorous individuality which is born of responsibility. The concentration of reserves and fluid resources at the centre afforded opportunity for misunderstanding of the financial position. The considerable increases in the number of societies, from 3,727 in the beginning of 1918-19 to 4,885 at the end of 1919-20, placed a strain upon the financial resources which they were unable to bear. The difficulties were apparent in 1919 and warnings were issued; in the following year it became clear that the expansion in the number of societies had outstripped the growth of banking credit enjoyed by the provincial and central banks, and the standard of fluid resource fell below that recommended by the MacLagan Committee on Co-operation. By October 1920, in attempting to meet the heavy demands of new societies for extra capital, the Provincial Bank had exhausted its fluid resources held for the protection of the credit organisation as a whole and was no longer able to finance the central banks. The reserve fund had been used in ordinary business and was thus not available to perform its proper function; severe crop failure and consequent scarcity intensified the crisis and the breakdown of the whole movement was only averted by the grant of government help. This took the form of Rs. 19 lakhs as advances to members of co-operative societies for cultivation expenses, and Rs. 17 lakhs as a guarantee of the cash reserve to promote public confidence in the banks.\* The latter served its purpose without being drawn upon to any considerable extent, and in several central banks there was more money offering than could be utilised. Since that date, efforts have been made to subject the whole fabric to detailed critical examination and to remove all elements of weakness. Unfortunately, however, the financial prosperity of the

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\* *Vide* paragraph 6, Report of the Committee on Co-operative Societies in the Central Provinces, 1922.

provincial and central banks had distracted attention for too long from the internal workings of the village societies. Amongst these latter, sufficient teaching in the principles and objects of co-operation had not been given to members; the principle that the whole movement exists for the benefit of members of the primary societies was not that dominating factor in central bank policy which it ought to have been. The central banks proved unable to devote sufficient attention to the requirements of the village societies and came to regard them as little more than agencies through which their surplus funds could find employment. A series of bad seasons led to the accumulation of arrears of land revenue, rent and *taccavi*, which had to be paid before the instalments of the loans from co-operative banks. The strain proved too much for organisations never strong and never properly trained; many have collapsed and more are moribund. There has been a decrease in the number of societies and members; a large proportion are taking no new loans; nearly one-third are being retained merely for the purpose of securing repayment of old debts. It is expected that nearly 1,200 societies will have to be put into liquidation. The situation is better and the outlook more promising in Berar than in the Central Provinces, and it is hoped that new life may be instilled into the movement through the labours of officials and a devoted band of active and public-spirited gentlemen.

The total number of societies of all kinds, in 1926-27, was 4,124 with a membership of 140,644. Primary credit societies numbered 4,007. With sustained effort, it is hoped to bring more than half of these into a state of efficiency, and, with a hard lesson well-learned, the prospects for the movement should improve.

## 11. COMMUNICATIONS AND MARKETING.

Of the Central Provinces, it was said in 1861 that "of all the matters under the cognisance of this administration, road-making is the most ultimately important, the most immediately pressing, and yet the most backward. Of roads completely made there is not one." Since then, much progress has been made, more especially since 1900. The length of metalled roads, in 1926, was 4,629 miles, and of all kinds 8,398. A further large programme is in hand and will, it is hoped, prove of great value to the agricultural population. The need for expansion and development is admitted, and in particular some bridges over rivers even on the main lines of communication are still required. Financial considerations and the difficulty in securing local labour restrict progress. In times of acute scarcity, the latter difficulty is overcome, as road-making is often the only means of subsistence.

In 1861, the total mileage of railway contemplated was 365 miles; in 1926, 2,535 miles were completed and there is a large programme of new construction urgently wanted for the further development of the province. The enormous benefit to the agriculture of the provinces is indicated by the great expansion of trade with other areas.

Hitherto, agricultural produce has not been brought to market or rail-head in any considerable quantity by motors, and the type of road in existence is not suited to heavy lorry traffic. There will thus arise the choice between restricting the use of such lorries and the reconstruction of the main roads on more modern lines.

The cultivator with surplus produce to sell has usually a choice of methods. He may himself carry it to market or sell it to another cultivator who collects from several neighbours until he has a sufficiently big load. Or he may take it to the village *bania* in lieu of money or grain advanced; then there are itinerant purchasers who move from village to village, generally in the more distant areas, and sell what they have bought in district markets to bigger traders. In tracts of a more advanced character, the grower brings his crops to the big markets on the railway, or to the main central market at Nagpur.

At the big markets, where there is considerable competition, sales and purchases are effected through brokers and commission agents, and although the grower gets a better price he is subjected to a series of charges, each perhaps petty in itself but amounting to an appreciable tax on trade; moreover, he is apt to suffer from unfair deductions on the score of quality, or from a ring of brokers. The interests of the cultivators are not properly represented on the controlling authority, which, on the other hand, is apt to be drawn from the same classes as the brokers and commission agents. In order to secure for the grower a better chance of a fair price, the formation of co-operative sale societies is being attempted.

The Berar markets are better organised, and on paper at least they are well regulated. If the rules could be strictly enforced, the grower would be protected from much of the fraud which is prevalent. But the grower is apt to be ignorant of business methods and leans on the middleman, so that much in practice depends upon the extent to which the latter seeks to serve the cultivator's interest. The custom in some big markets is for the maximum daily rate to be settled by the purchasers, so that the grower is up against a settled fact from the start. In other places, the cotton is auctioned freely from the cart and here the grower usually gets a higher price.

There is considerable diversity about the weights and measures in use, and the grower suffers from his ignorance and from the keener wit of the purchaser. Standardisation, however, presents difficulties which are not easily surmountable.

## 12. LOCAL SELF-GOVERNMENT.

The Central Provinces and Berar are divided into five divisions, each under a Commissioner, and twenty-two districts each under charge of a Deputy Commissioner. For each district there is a district council (or district board in Berar) constituted originally under the Central Provinces Local Self-Government Act of 1883 and the Berar Rural Boards Law of 1885. A new Act was passed by the old provincial Legislative

Council in 1920, and was applied to Berar in 1922. The new elections are being held under this enactment, and all the districts in the province now have councils constituted under the new Act.

Each district is divided into groups of circles and for each group a local board is established, subject to the authority of the district council. A local board consists of representatives, one or more in number, elected for each circle, together with other persons, not being government officials or exceeding in number one-fourth of the local board, appointed by the Commissioner. The local Government may declare any local board to be an independent one, in which case it exercises within its own area, so far as may be, the functions of a district council. The qualifications vary according to the circumstances of the different parts of the province.

For district councils, the local boards elect from their own number two-thirds of the members prescribed by law; these select one-sixth from amongst persons resident in the district and qualified as voters. The remaining one-sixth are appointed by the Commissioner, and must not be government officials. No official may be a member of a district council unless elected chairman or vice-chairman by that body.

The main source of income is a cess at  $6\frac{1}{4}$  per cent on the land revenue in the Central Provinces, and of 18 pies in the rupee on the assessment of each survey number in Berar. An additional cess may be imposed for educational purposes, and, on occupants of houses, buildings or lands, a special rate may be levied if the village benefits from any school maintained by the council within it. Certain other fees, tolls, taxes, and rates may be imposed. Unless they are indebted to Government, district councils may pass their own budgets; they usually devote their income to roads, hospitals, markets, water works, wells, management of fairs, supervision of sanitation and vaccination, the diffusion of education, and other measures of local utility calculated to promote the health, comfort or convenience of the public.

In important villages or groups of villages, village *panchayats* under the Central Provinces Village Sanitation and Public Management Act, 1920, or the Central Provinces Village Panchayat Act, 1920, may be constituted. The members are elected. Under the former Act, only sanitation is dealt with; under the latter, petty civil and criminal cases may be disposed of. The income is derived from a house tax. Little use has yet been made of these Acts; the Village Sanitation Act has been applied to 114 villages.

In the opinion of the local Government the district councils evince little interest in rural sanitation, veterinary dispensaries, or other rural matters, but lack of funds is ascribed as the reason. The principal object kept in view in framing the new Local Self-Government Act was to extend the functions and increase the sphere of usefulness of district councils by granting to them increased powers of taxation. With the exception of fees and tolls on markets, the councils do not appear to have made any adequate use of these new powers.

### 13. PUBLIC HEALTH AND SANITATION.

The province possesses the highest birth rate in British India and the second highest death rate. The latter is somewhat lower in rural areas than in towns, but it reflects the general ignorance of the people on sanitary matters. The province as a whole is intensely malarious and fevers account for fifty per cent of the deaths. Malaria is endemic in a very large part of the forest areas (which comprise a considerable proportion of the whole) and is markedly more fatal in rural areas than in urban.

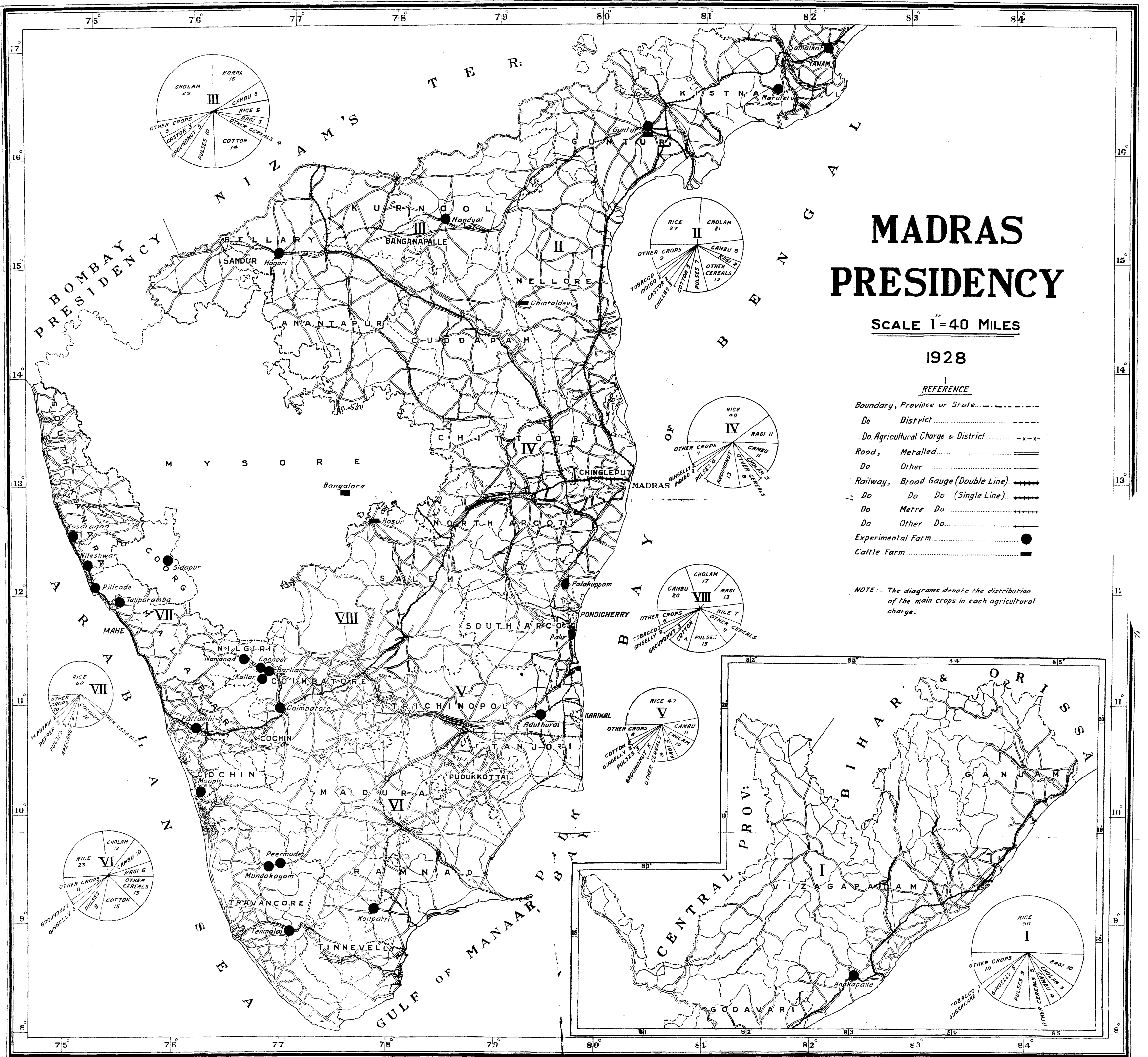
The old Sanitary Board was replaced in 1910 by a Public Health Department with a Director, to which were added later an assistant director and a chief plague medical officer; but, unfortunately, the war and the financial stringency that followed have enforced severe restrictions on activity. There are thirty touring dispensaries under the charge of assistant medical officers, and there are two health publicity officers who tour with magic lanterns and give lectures.

An experiment is being made in the training of vaccinators in epidemiology in order to increase their usefulness and schoolmasters are being taught the technique of vaccination. Owing to the opposition to vaccination against small-pox that still occasionally appears in some areas, Government are considering the advisability of making this measure compulsory.

The touring dispensaries appear to be popular and afford relief to large numbers of sick; the lectures by the publicity officers are well attended and seem to be appreciated by the people. But until more funds are available, progress must be slow. Time is required before any visible effects on the health of the people can be expected. Health officers for the larger districts where the civil surgeons are too busy to do full justice to this part of their duties are needed; but lack of funds is the obstacle. Teachers are being trained in hygiene and use is made of rural schools to inculcate the elements of health.

There is a Village Sanitation Act which is applied to a few villages and funds are collected and spent on cleaning village sites, wells, etc. But no schemes of an extensive nature can be carried out.





# MADRAS PRESIDENCY

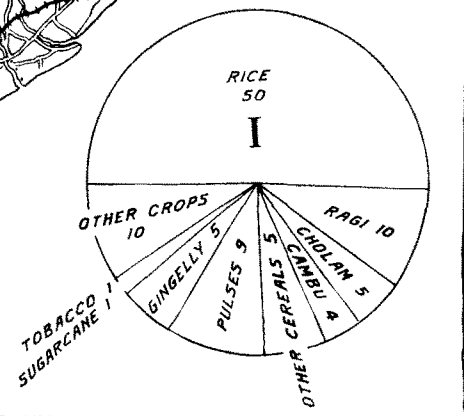
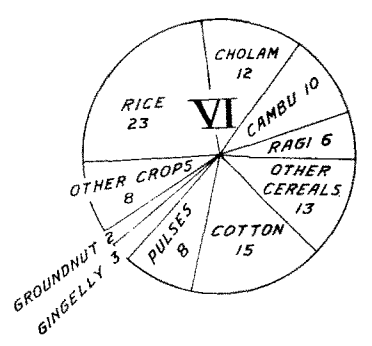
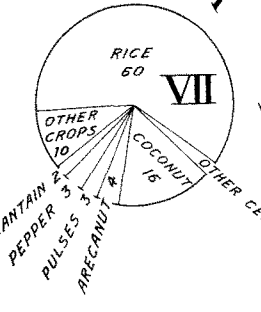
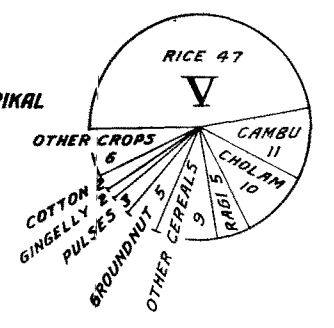
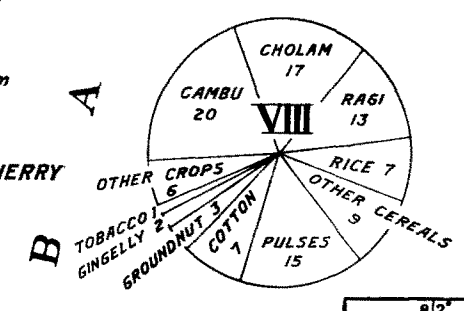
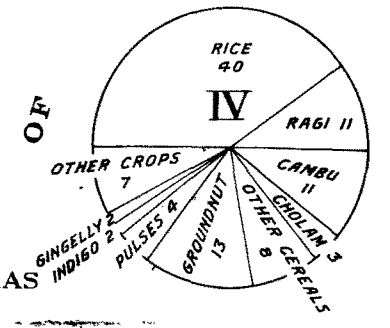
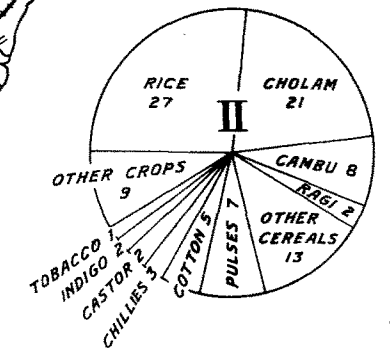
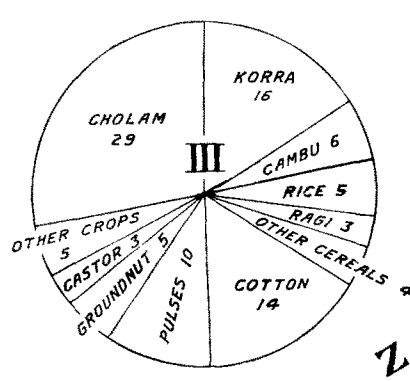
SCALE 1"=40 MILES

1928

REFERENCE

- Boundary, Province or State.....
- Do District.....
- Do Agricultural Charge & District.....
- Road, Metalled.....
- Do Other.....
- Railway, Broad Gauge (Double Line).....
- Do Do Do (Single Line).....
- Do Metre Do.....
- Do Other Do.....
- Experimental Farm.....
- Cattle Farm.....

NOTE:— The diagrams denote the distribution of the main crops in each agricultural charge.



## MADRAS

### 1. GENERAL FEATURES AND NATURAL DIVISIONS.

The Madras Presidency, together with the five Indian States which fall within its bounds, the State of Mysore, the small British province of Coorg, and the small French possessions (Pondicherry, Karikal, Yanam and Mahe) occupies the whole of the southern portion of the Indian peninsula. The west coast is washed by the Arabian Sea and the east by the Bay of Bengal. The northern boundary has been formed by the accidents of history and consists, from east to west, of Orissa, the Central Provinces, the State of Hyderabad and the southernmost districts of the Presidency of Bombay. The area of the presidency proper is 141,705 square miles, or 20,000 square miles more than the area of Great Britain and Ireland. Of its 90·5 million acres, 57·5 millions are classed as 'culturable,' 13 millions are under forest, and 20 millions are 'barren and unculturable.' The culturable area, which is about 62 per cent of the total, includes a net cropped area of 33·26 million acres, the remainder consisting of cultivable waste and current fallows. Irrigation, from government and private sources, is available for slightly over 9 million acres and, if the new schemes sanctioned or under consideration are all executed, water will be provided for an additional 800,000 acres in the near future.

The presidency contains two well-defined hill systems. The Western Ghats run steep and rugged and at an average elevation of 4,000 feet, in an all but unbroken chain along the whole length of the western coast, at a distance from the sea varying from 50 to 150 miles. Along the eastern coast, but further inland, runs the much less prominent and more broken range of the Eastern Ghats. These two systems converge, towards the south, to form the plateau of the Nilgiri Hills. To the north of this plateau lies an elevated table-land, from 1,000 to 3,000 feet above sea level, which includes the area bordering on the State of Mysore. Outliers from the two main chains are found in the Nallamalais of Kurnool district and in the Anaimalais of Coimbatore and Travancore. Besides these there are several isolated blocks of hills, the Shevaroyis in Salem, the Panchamalais and Kollamalais in the same district and in Trichinopoly, and the Javadi Hills in North and South Arcot.

The key to the river system of the presidency is the conformation of its hills. The Western Ghats form an impregnable barrier to the passage of rivers in a westerly direction and there is, therefore, no drainage into the Arabian Sea, except that which is shed from their western slopes. With this exception, the whole trend of the drainage is from west to east into the Bay of Bengal. There are four great rivers, the Godavari, the Kistna, the Cauvery and the Pennar. The first two rise in the Bombay Presidency within fifty miles of the Arabian Sea, the third in the Western Ghats in Coorg and the fourth in the Mysore plateau. In the early part of their courses, these rivers flow rapidly in deep beds but the pace slows down as they approach the coast, and it

has, therefore, been possible to harness them all for irrigation purposes. The deltas are covered with wide expanses of irrigated crops which rarely fail, even in the severest droughts.

The presidency possesses 1,700 miles of coast line. The full advantage which such an extensive sea-board might be expected to confer is not secured for the reason that, in all its length, there is not a single natural harbour capable of accommodating ocean-going vessels. The various ports, except the Port of Madras which possesses an artificial harbour, are merely open roadsteads where ships can lie at anchor and discharge their cargo into small surf boats. The building of artificial harbours at Vizagapatam and Tuticorin on the east coast and at Cochin on the west coast is now under contemplation and these projects if carried out, will go far to provide all that is required in this connection.

The presidency falls into six natural divisions. The Agency division in the extreme north, which is a sparsely populated area, consists almost entirely of fever-stricken jungles and low hills covered with inferior forest growth and patches of bamboos. The higher portions are inhabited by aboriginal tribes such as Khonds, Savaras and Jathapas who depend upon sporadic or *podu* cultivation, while a few Oriyas and Telugus—the civilised races of the plains—occupy scattered areas in the lower portions in which they carry on fruit gardening and terrace cultivation, growing rice, gram, vegetables and other garden crops. Between the Agency and the coast, and extending to the south as far as the Nellore district lies the East Coast North division which includes the prosperous deltas of the Godavari and Kistna rivers. This tract is favoured with a fertile soil, adequate rainfall and extensive irrigation facilities. In the middle of the peninsula, which gets the full benefit of neither monsoon, is the Deccan division. Here Nature compels the peasants to work hard for a living. Their prosperity is almost immediately affected by even a small shortage of rain and the Deccan districts are seldom free, if not from the reality, at least from the apprehension of famine. Passing south from the Deccan, from the Telugu to the Tamil country, we come to the East Coast Central division, where the rainfall is more abundant, the soil more fertile and the peasants more industrious. The general air of prosperity which characterises this tract becomes still more evident in the East Coast South division which contains the densely populated deltas of the Cauvery and Tambraparni, and the cotton fields of the Madura and Tinnevely districts. Finally, there is the West Coast division where the abundant rainfall enables a teeming population to extract a living from a soil not naturally over-fertile, with but little exertion.

It is not always realised how vastly conditions change in passing from one side of the presidency to the other, or from one end of it to the other. If we travel from east to west, as we pass through the famous gap near Coimbatore and reach the west coast, we come immediately into a different world, as different as, say, England is from Italy. We find a different race of people, referring to the Tamils we have left behind as "foreigners," a race with an entirely different language, with a different religion,

different customs, and different dress. Not only has the contour of the country changed from vast plains to rolling hills intersected by rivers and backwaters, but the climate has changed from a dry one to one of moist heat and frequent rains. The very type of village houses has changed and the temples are of a different design. On all sides, we find coconuts, pepper vines and areca palms, while the valleys are so fertile and well watered that, in some places, they yield three paddy crops in the year. Equally great and marked are the changes experienced as we pass from south to north and get into the Telugu country and find a different language and a different race of people.

The chief rain bearing current is the south-west monsoon which blows from the Indian Ocean from the end of May to the end of September. Much of the moisture conveyed by this current fails to cross the Western Ghats, with the result that the main precipitation (which may be anything from 100 to 180 inches) occurs between the top of the Ghats and the west coast. The districts on the other side of the range, except in a tract corresponding roughly to the Agencies in the north, generally speaking, receive less than 25 inches, and in many parts only 5 inches or less during the south-west monsoon period. The south-west current dies away in September and is replaced, normally in October, by the north-east monsoon current. The date of arrival of the latter is somewhat uncertain and it is often cyclonic in nature, sometimes coming with terrific force and causing considerable damage. The fall due to this is heaviest along the strip of coast lying between the Pulicat lake to the north of Madras city and Point Calimere in the Tanjore district. In this tract, the average rainfall is over 25 inches. The current gradually weakens as it passes inland towards the Eastern Ghats and in areas to the west of that range, such as the Deccan, the fall is less than 10 inches. Rain continues to fall at irregular intervals from January to May, the average precipitation during this period being about 6 inches. For the year as a whole, the heaviest fall in the presidency occurs on the west coast in the inland parts of South Kanara, where it is about 180 inches. The central and southern table-land comprising ten of the largest districts, gets, with exceptions, only a moderate rainfall, varying locally from 38 inches in North Arcot to 23 inches in Bellary. Moreover, it is in these areas where the rainfall is least abundant that it is most capricious both in amount and distribution and they are, therefore, the areas which are most susceptible to famine.

The climate throughout the plains of Madras is warm throughout the whole year, with a very varied humidity depending on the influence of the two monsoons. There is a general rise in temperature during February and March; April and May are the hottest months; from June till October, the climate is warm and humid in the regions of heavy precipitation from the south-west monsoon, but just outside this rain zone the humidity is lower and the temperature is modified by the wind. The eastern and south-eastern districts remain dry and hot during this period but, with the onset of the north-east monsoon at the end of October,

the situation improves. Generally, conditions are comparatively cool from November till the end of January. The climate of the Nilgiris and other high elevations is uniformly good. Cuddapah, where the mean temperature rises as high as 106° in May, is considerably the hottest station in the presidency.

The most general type of soil existing in Madras is derived from the gneisses and schists of the Archaean system and varies greatly in consistency, depth and fertility. In general, the upland soils are poor, thin, gravelly and light-coloured, and from these intermediate variations are found up to the rich, deep, dark-coloured loams of the lowlands. As a rule, the soils of this type are deficient in nitrogen, phosphates and humus, but potash and lime are sufficient. They respond readily to suitable manurial treatment, and irrigation can be employed with great advantage.

Black cotton soil covers extensive areas in the drier tracts of the presidency, in the Bellary, Cuddapah, Kurnool, Tinnevely and Coimbatore districts and, to a less extent, elsewhere. This is a dark-coloured, often black, soil, probably derived from the ferruginous schists by weathering under arid conditions. It is exceedingly sticky when wet and difficult to work, but is very retentive of moisture and can yield excellent crops even where the rainfall is scanty. It is particularly suited to the cultivation of cotton and millets and possesses many of the cultural characters of the Deccan trap regions, though it never attains the depth of soil associated with the trap area. Phosphoric acid, nitrogen and organic matter are generally deficient but potash and lime are not. The larger rivers, the Godavari, Kistna and Cauvery, have formed extensive deltas consisting of deep, rich, alluvial loams, which produce heavy crops of rice under irrigation. They vary in character according to the nature of the upland soils from which they are derived, but all respond to manurial treatment, particularly in regard to nitrogen and phosphates. The soils of the areas of high rainfall are of lateritic origin and in this class can be included the ferruginous clay soils of the Nilgiris and other planting districts. These soils are the product of excessive weathering and are usually very deficient in potash, phosphates and lime and therefore respond readily to manuring. The almost complete absence of lime gives them an acid reaction.

The total area sown in 1926-27, including double cropped land, was 37·36 million acres. Of this, 29·35 million acres were under food crops and 8·01 millions under non-food crops. The most important cereal food crops were :

Rice	.. ..	10·8 million acres.
Cholam ( <i>Andropogon sorghum</i> )	.. ..	4·2 " "
Cumbu ( <i>Pennisetum typhoideum</i> )	.. ..	3·1 " "
Ragi ( <i>Eleusine coracana</i> )	.. ..	2·3 " "

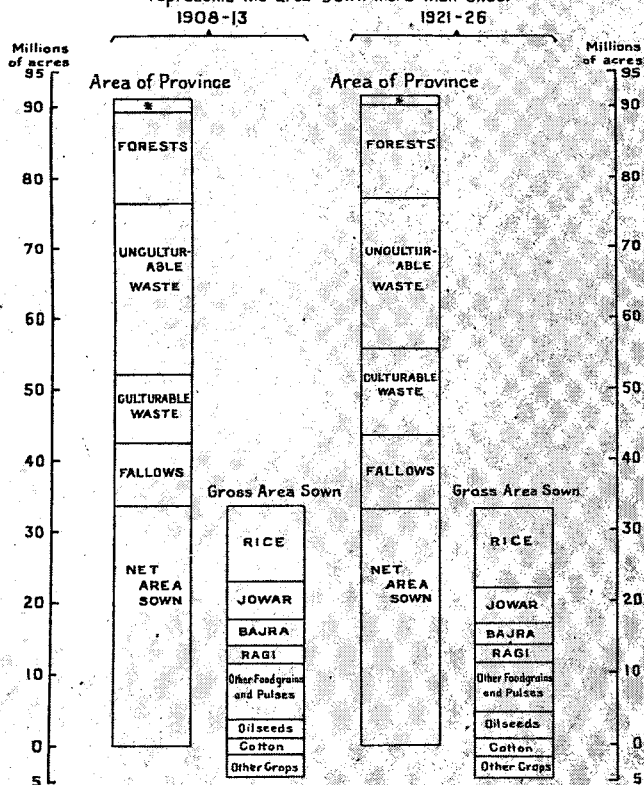
Of food crops other than cereals the most important were :

Pulses	.. ..	2·7 million acres.
Fruits and vegetables	.. ..	313,000 acres.
Sugarcane	.. ..	114,000 "

# MADRAS

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 Year Averages)

NOTE: The difference between the Gross Area Sown & the Net Area Sown represents the area sown more than once.



\* The areas marked with an asterisk represent the difference between the total area of the province according to the Professional Survey and the total area according to the Village Reports, the latter being the source from which this diagram was constructed.

The chief non-food crops were cotton (2·2 millions) and groundnut (2·7 millions). Smaller in extent, but yielding crops of high intrinsic value, was the area under "drugs and narcotics":

Tobacco	..	..	232,000 acres.
Arecanut ( <i>Areca catechu</i> )..	..	..	97,000 "
Coffee	..	..	51,000 "
Tea	..	..	55,000 "
Betel-vine ( <i>Piper betel</i> ) ..	..	..	27,000 "
Rubber	..	..	12,000 "

A quinquennial census of livestock is taken. The last four of these do not show any very definite increase in the number of cattle, especially if some allowance is made for understatement in the earlier reports. The figures were:—

1910	..	..	..	20·1 millions.
1915	..	..	..	21·8 "
1920	..	..	..	22·3 "
1925	..	..	..	22·1 "

At the last census the classification was:

Bullocks (including bulls)	..	..	7·3 millions.
Cows	..	..	5·5 "
Male buffaloes	..	..	1·4 "
She buffaloes	..	..	2·6 "
Young stock	..	..	5·3 "

In general, the cattle are poor in size and quality, though notable exceptions are to be found. There is, for example, the Ongole (Nellore) breed which provides the best milkers in the presidency and the males of which make good heavy-draught animals of a quality which will stand comparison with any in the world; there is the Allambady which is considered to be closely related to the famous Amrit Mahal of Mysore, and there is also the compact Kangayam which can trot up to seven miles an hour. The only other numerically important classes of stock are sheep (11·2 millions) and goats (8 millions). Horses, mules and donkeys are of little account and their numbers are on the decline.

## 2. PROVINCIAL INCOME

## GOVERNMENT

(Figures are in

*Revenue and Expenditure*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue .. .. . (a)	726	730	(d) 714	740	(e) 771	754
Excise .. .. .	488	490	519	490	494	510
Stamps .. .. .	190	220	234	241	245	252
Forests .. .. .	49	53	54	56	52	56
Other heads .. .. .	36	36	48	39	43	45
Irrigation .. .. .	(b) -27	-26	-25	-36	-35	-41
Debt—Interest .. .. .	6	10	11	13	16	21
<b>Civil Administration—</b>						
Administration of Justice .. .. .	11	16	16	14	12	13
Jails and Convict Settlements .. .. .	9	8	6	8	9	8
Police .. .. .	7	13	9	9	10	10
Education .. .. .	7	7	7	6	6	7
Medical .. .. .	3	3	4	4	4	5
Public Health .. .. .	1	3	1	..	1	1
Agriculture (including Co-operation and Veterinary) .. .. .	4	3	4	3	3	3
Industries .. .. .	10	14	12	14	11	10
Other departments .. .. .	3	3	5	4	4	4
Civil Works .. .. .	7	8	7	6	10	8
Miscellaneous .. .. .	11	12	13	15	18	17
Miscellaneous adjustments between Central and Provincial Governments .. .. .	2	3	9	1	1	..
Extraordinary receipts .. .. .	..	..	..	..	18	..
<b>Total, Revenue Receipts ..</b>	<b>1543</b>	<b>1606</b>	<b>1648</b>	<b>1627</b>	<b>1693</b>	<b>1683</b>

(a) Includes and (b) excludes land revenue due to irrigation.

(c) Excludes contra-adjustments under revenue and expenditure on account of income-tax which were

(d) The low actuals were due to adverse seasonal conditions.

(e) Includes a special credit of 13 lakhs for *ayacut* inclusion fees in the Kistna and West Godavari

(f) Excludes and (g) includes interest on irrigation works.

(h) Includes repayment of debt which was met from borrowed funds in the years 1921-22 to 1923-24.



## AND EXPENDITURE

## OF MADRAS

lakhs of rupees)

charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
<b>Direct Demands on the Revenue—</b>						
Land Revenue .. .. .	129	133	41	38	39	39
Forests .. .. .	52	48	47	43	48	50
Other heads .. .. .	61	58	58	59	78	75
Irrigation—Revenue Account .. .. .	(f) 40	35	39	40	47	50
Irrigation—Capital Account charged to Revenue .. .. .	(g) .. 44	(h) .. 55	(h) .. 63	1	1	..
Debt Services .. .. .	..	..	..	68	81	89
<b>Civil Administration—</b>						
General Administration .. .. .	135	132	217	222	227	230
Administration of Justice .. .. .	95	96	94	96	96	96
Jails and Convict Settlements .. .. .	30	39	31	29	30	28
Police .. .. .	200	204	201	196	188	183
Education .. .. .	143	155	164	171	187	199
Medical .. .. .	58	56	57	58	60	66
Public Health .. .. .	27	11	12	32	33	31
Agriculture (including Co-operation and Veterinary) .. .. .	26	27	27	27	30	32
Industries .. .. .	21	18	18	18	17	18
Other departments .. .. .	11	12	15	16	19	20
Civil Works .. .. .	122	107	104	81	100	115
Miscellaneous .. .. .	89	89	95	90	92	91
Provincial contribution .. .. .	(c) 348	348	348	348	222	155
Miscellaneous adjustments between Central and Provincial Governments .. .. .	21	..	..	1	..	..
Extraordinary charges .. .. .	..	..	..	23	..	..
<b>Total, Expenditure charged to Revenue ..</b>	<b>1662</b>	<b>1623</b>	<b>1629</b>	<b>1657</b>	<b>1595</b>	<b>1582</b>

abolished with effect from 1922-23 by modification of Devolution Rule 15.

districts.

In the subsequent years the expenditure is met from ordinary revenues.

GOVERNMENT

(Figures are in  
*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital and Debt Head Receipts</i>						
Revenue Surplus .. .. .	..	..	19	..	98	101
Famine Insurance Fund .. ..	..	6	7	5	7	8
Loans and Advances by Provincial Govern- ments .. .. .	10	37	22	22	38	34
Loans between Central and Provincial Governments .. .. .	115	66	61	..	..	..
Advances from Provincial Loans Fund ..	..	..	..	130	89	202
Appropriation for Reduction or Avoidance of Debt .. .. .	(a) 10	(a) 14	(a) 17	21	30	34
Suspense .. .. .	..	..	..	..	2	7
Depreciation Funds .. .. .	..	..	..	..	..	2
<b>Total, Receipts ..</b>	<b>141</b>	<b>123</b>	<b>126</b>	<b>178</b>	<b>264</b>	<b>388</b>
<b>Opening Balance ..</b>	<b>59</b>	<b>..</b>	<b>9</b>	<b>13</b>	<b>31</b>	<b>144</b>
<b>Total ..</b>	<b>200</b>	<b>123</b>	<b>135</b>	<b>191</b>	<b>295</b>	<b>532</b>

(a) Includes repayment of debt which was met from borrowed funds in the years 1921-22 to 1923-24.

OF MADRAS  
lakhs of rupees)  
and Expenditure

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital and Debt Head Expenditure</i>						
Revenue Deficit .. .. .	109	17	..	30	..	..
Capital outlay on Forests .. .. .	..	..	..	8	1	1
Construction of Irrigation Works .. .. .	7	6	10	10	28	77 <sup>2</sup>
Civil works not charged to Revenue .. .. .	11	..	4	6	9	7
Other Capital outlay not charged to Revenue .. .. .	..	6	2	-6	2	14
Famine Insurance Fund .. .. .	..	..	..	3	..	..
Loans and Advances by Provincial Governments .. .. .	63	71	60	88	79	81
Loans between Central and Provincial Governments .. .. .	10	14	40	21	30	34
Suspense .. .. .	..	..	..	..	2	8
Depreciation Funds .. .. .	..	..	..	..	..	..
<b>Total, Disbursements .. .. .</b>	<b>200</b>	<b>114</b>	<b>122</b>	<b>160</b>	<b>151</b>	<b>222</b>
<b>Closing Balance .. .. .</b>	<b>..</b>	<b>9</b>	<b>13</b>	<b>31</b>	<b>144</b>	<b>310</b>
<b>Total .. .. .</b>	<b>200</b>	<b>123</b>	<b>135</b>	<b>191</b>	<b>295</b>	<b>532</b>

In the subsequent years the expenditure is met from ordinary revenues.

In 1921-22, as the result of famine, the non-co-operation movement and the Malabar Rebellion, there was a large decrease in revenue, while the same causes also led to increased expenditure, with the result that there was a deficit in that year of Rs. 109 lakhs. In 1922-23, the Government made every effort to balance the budget. Additional taxation was imposed under stamps and court-fees, registration fees were enhanced, and severe retrenchment in expenditure was undertaken. In the result, in the year 1922-23, the deficit was only Rs. 17 lakhs, which was turned in 1923-24 into a small surplus of Rs. 19 lakhs. The heavy floods and cyclone of 1924 again disturbed the financial position in 1924-25, but a remission of Rs. 126 lakhs in the provincial contribution saved the situation in 1925-26. A further sum of Rs. 57 lakhs was remitted in 1926-27. These remissions have enabled the Government to undertake a progressive policy of expanding elementary education by the opening of new schools, to incur additional expenditure on other development services and to build up a balance as a reserve against unforeseen contingencies.

### 3. REVENUE ADMINISTRATION AND LAND RECORDS.

The land revenue systems of British India have been broadly classified into two main divisions: *ryotwari* and *zamindari*. Both systems are in force in Madras, the former over about four-fifths of the presidency, and the latter in the permanently settled estates. Most of these estates are in the northern districts but large tracts are held under the *zamindari* tenure in some of the central and southern districts.

The *ryotwari* settlement is based on a cadastral survey, field by field, of the area to be settled. A separate map is prepared for each village, in which are shown the separate fields which make up the holding. In addition to the village map, each field is separately mapped and the subdivisions, if any, are shown. All these are bound up together to form an atlas known as the "Field Measurement Book". Upon the basis of the cadastral map is prepared a ledger of holdings, the primary object of which is to show from whom the assessment of each holding or field or subdivision is to be realised, and the amount due in each case. The record is corrected every year at the annual settlement of accounts known as the *jamabandi*, when any changes in the holdings and any remissions under the rules are ascertained and recorded. The registered occupants of each field deals directly with Government and is entitled to hold the land so long as he pays the assessment. Subject to that provision he cannot be ejected by Government though he himself may increase or diminish his holding or entirely abandon it. There are no restrictions imposed by the legislature on inheritance, transfer, mortgage, sale and lease. A settlement ordinarily runs for a period of thirty years, after which a resettlement is effected.

The *zamindari* system differs from the *ryotwari* in two important respects: in the first place, the settlement is a permanent one; in the second, the revenue is imposed, not on each individual landholder, but on an individual (zamindar) owning an estate and occupying a position identical with, or analogous to, that of a landlord. The permanent

settlement was carried out without any detailed survey and record, and even now such a survey is only undertaken at the express wish of the zamindar. Government have bestowed upon the zamindar the right to collect the revenue on the condition that he hands over a certain portion of that revenue to the State. The amount payable to the State has been declared to be fixed and unchangeable for all time.

As regards the method by which the *ryotwari* settlement is carried out, the soils are divided into series, the most important of which are black (*regur*) and red ferruginous, and these again are divided into classes according to their chief constituents, clay, loam or sand. A further subdivision occurs according to quality and according to whether the land is 'wet', that is irrigated, or 'dry', land irrigated from purely private sources being classed and assessed as 'dry'. The outturns are then valued at a commutation rate which is below the average of the prices of the previous twenty non-famine years, and from this valuation deductions are made for differences between market and village prices, for vicissitudes of season, for unprofitable areas, and for cultivation expenses which are estimated according to soil. The balance represents the value of the net produce, of which one-half forms the nominal assessment. The rates thus obtained are then applied to the respective soils. Further allowances are made according to the position of groups of villages in relation to communications, markets, etc., and according to the nature of the sources which supply irrigation. In general, the existing classification of soils is not altered at a resettlement unless for very strong reasons.

In the period anterior to British rule, it was a favourite device, whilst leaving the land revenue nominally at a fixed proportion of the produce, to add to it very considerably by the addition of *abwabs* or cesses. The only cess that is now levied is the local rate, the proceeds of which are devoted to local objects such as roads, schools, dispensaries and sanitation and are administered by local boards. The amount of the cess is fixed at six-and-a-quarter per cent on the land revenue assessment *plus* water rate, if any, in the case of lands held direct from Government on *ryotwari* tenure, and on the annual rent payable to the landholder, in the case of lands held on any other tenure. In the case of *inam* lands or lands held wholly or partially free from assessment, the cess is levied on the full assessment *plus* water rate, if any, which such lands would bear, if they were not *inam*. In addition, district boards can levy an extra tax not exceeding three pies in the rupee, and the taluk boards can levy up to a similar amount. On the other hand, deductions from the full settlement rate are frequently allowed. There are, first of all, deductions which are of a permanent nature as in the case of *inam* and *muafi* lands. These are a legacy from the ancient custom of granting land either revenue-free or at a reduced revenue for religious or charitable purposes, or as a reward for service to the State, or as part of the emoluments of village officers and servants, and grants so made in the past were in general respected and continued. Again, all improvements, whether effected by the cultivator entirely from his own resources or with the help of a loan from Government, are exempted in perpetuity from assessment. Care is taken

that a proposed enhancement at a resettlement shall not press too heavily. The enhancement which may be imposed immediately is limited to twenty-five per cent, the balance being imposed by annual instalments not exceeding twelve-and-a-half on the original assessment and, if the enhancement is proposed on the basis of a rise in prices only, it must not exceed eighteen-and-three-quarters per cent. Finally, deductions are made by granting remissions of revenue in seasons of crop failure.

The assessment on wet land is wholly remitted if the land is left waste or the crop is totally lost owing to failure of water in the irrigation source, but suspension and remission of assessment on dry land are only granted in very exceptional circumstances, such as the occurrence of widespread calamities, such as famine, or of local calamities, such as floods or hail storms. Whether the assessment is suspended or remitted depends on the crop history of the tract in the years immediately preceding that in which the calamity occurs. Where remission is granted for loss of crop on dry lands, it is given at a uniform rate calculated with reference to the average loss for the whole of the affected tract. If the yield is one-sixth or less of the average, the remission is seventy-five to one hundred per cent; if it is between one-third and one-sixth, the remission is from fifty to seventy-five per cent; and if it is between one-half and one-third, the remission is from twenty-five to fifty per cent.

Remissions are not granted in the permanently settled tracts as their revenue is light.

Until twenty years ago, the relations between landlord and tenant, both in the permanently and temporarily settled tracts, were regulated by the provisions of an Act of 1865. Since 1908, the permanently settled parts of the province have come under the operation of the Madras Estates Land Act, based on the tenancy legislation of other provinces, more especially that of Bengal. Occupancy rights were conferred on ryots who, at the time, were in possession of land other than the private land of the proprietor. A non-occupancy ryot can obtain occupancy rights by the payment to the landlord of a premium equal to two-and-a-half times the annual rental. Rents can be increased by mutual agreement or by order of a revenue court, but the enhancement cannot exceed more than two annas in the rupee and the rent cannot again be enhanced for a period of twenty years. An occupancy tenant cannot be ejected for arrears of rent but his property (including movable property, with certain exceptions), can be attached and sold, in the proprietor's interest, by a properly empowered officer. In the *ryotwari* areas where the land is cultivated to a much larger extent by the landholders themselves and where, consequently, rents are far less prevalent, tenancy legislation has not so far been found necessary. The only provisions of the Estates Land Act which apply to these areas are those in regard to the recovery of rent. These give landholders in such areas the same powers in this respect as are possessed by landlords in the permanently settled areas.

We come now to a description of the agency by which the land revenue is collected and by which the records on which its collection is based are

maintained. The unit of administration is the village. Each village has an official headman. His primary duty is the collection of the revenue and to that are added the duties of petty magistrate and registrar of births and deaths. The other official of the village is the accountant or *karnam* whose office, like that of the headman, is hereditary in certain districts of the presidency. His duties are to keep the village account of revenue payments, to look after the village maps and registers and keep them up-to-date, to make inspections from which to fill up the statistical returns for which he is responsible, to maintain a record of all changes of ownership, and to report any unusual occurrences such as epidemics of human or animal disease. Both the village headman and the *karnam* are paid a fixed salary.

From the village we pass to the *frka*, the circle of the revenue inspector whose duty it is to supervise a number of *karnams*. Six or seven revenue inspectors' circles go to form a taluk, the officer in charge of which is known as the tahsildar. Under him there is an establishment for the purpose of receiving the local land revenue and sending it on to the district treasury, but revenue work by no means exhausts the list of his duties. Above the taluk comes the division under a divisional officer who is a member of the Indian Civil Service or the Provincial Civil Service. Above the division comes the district, the fundamental administrative unit, at the head of which is the Collector, and which contains on the average between six and seven thousand square miles and nearly two million inhabitants. The powers and duties of the Collector embrace almost every subject which comes within the functions of modern government. In fact, in the eyes of the cultivator, he is the supreme authority, the *ma bap* (literally, mother and father) who is expected to interest himself in all that affects the well-being of the people under his control. In all provinces except Madras, there is one more territorial unit—the division with the Commissioner at its head—but, in Madras, matters relating to revenue administration pass direct from Collectors to two of the three Members of the Board of Revenue or, in cases of special importance, to the Board as a whole. Finally, there is the Governor, his Executive Council and his Ministers.

#### 4. THE CULTIVATOR.

The peoples of Madras belong almost entirely to the Dravidian race and therefore typify pre-Aryan India. Nevertheless there are great differences between them. The 1921 census distinguished some 120 castes, tribes, etc., of all degrees of civilization and enlightenment, from the Brahmins, the heirs to systems of religion and philosophy which were already old when the Romans invaded Britain, to the Khonds of the Agency tracts, who, within human memory, practised human sacrifice to ensure plentiful harvests. The striking similarity of the word 'rice', which came into the English language through Latin, to the Tamil word *arisi* gives some support to the claim that the original inhabitants of south Madras were the pioneers of rice cultivation. It may be claimed, with less uncertainty, that they were the pioneers of

irrigation engineering. The study of the crops and agricultural methods of the people of south India is for these reasons profoundly interesting and it is fitting that, within modern times, Madras, by its important deltaic irrigation schemes, should have shown the way to the utilisation of the vast resources of the Himalayan rivers which has changed the face of many an arid waste in northern India.

The Oriyas of the Ganjam and Vizagapatam districts in the north of the presidency who number 1·57 millions deserve special mention as a race of non-Dravidian origin. Their language resembles many other Indian vernaculars of Aryan descent, and the influence of Sanskrit on it is very marked. They came down as conquerors from the north in the sixth and seventh centuries A.D. and in the year 1434, under Kapileshwar Deva, one of the Ganga kings of the Solar line, spread as far south as the Pennar River. Relics of the sway of their rulers in the form of temples and large tracts of *inam* land are still to be found in the northern districts of the presidency.

The total population of the presidency, at the census of 1921, was 42,794,155 and of this seventy-one per cent were returned as making a living directly from agriculture. Tamils and Telugus between them made up 787 out of every thousand; the remainder consisted of Malayalees, Oriyas, Kānarese and Muhammadans. Of Hindus there were 887, of Muhammadans 67, and of Christians 32 per thousand. 124 in every 1,000 were urban dwellers; the remainder were distributed over 52,708 villages.

The census village, as a rule, is not a residential but rather an administrative unit. These units vary greatly in size from district to district. They are smallest in population in the Agency, where they contain, on the average, 116 souls and largest in population as well as in area on the west coast where the average population is as high as 1,344. They vary in type as greatly as they differ in size. Characteristic of the Agency is the "tiny temporary affair containing only a couple of huts and a cattle byre," which can be shifted elsewhere as occasion arises. Then there is the old fortified type, common in the Deccan, around which the ruins of the old walls and circular towers are still in evidence, and where the square, flat-roofed houses are crowded close together and the streets are narrow and tortuous. The ordinary village of the Tamil country will contain three or four broad streets, flanked by the tile-roofed, solid masonry houses of the well-to-do, behind or interspersed with which will cluster, in a shapeless mass, the mud houses of the poor. The west coast village, again, may cover a wide area in which each house, however humble, stands in its own compound amidst luxuriant vegetation. These are the characteristics which (in the words of the Census Officer) "give the whole of Malabar the appearance of a beautiful garden, where live a race of prosperous lotus eaters, each family nestling under its own pepper vine and jack tree."

In an average village, 810 out of every 1000 people would be engaged directly in agriculture; the remainder would be craftsmen, shopkeepers, village servants, etc. If every thousand of those supported by agri-



culture were divided by occupation, the result on the average would be as shown below :—

Non-cultivating landowners	..	..	..	56
Cultivating do.	..	..	..	398
Non-cultivating tenants	..	..	..	32
Cultivating do.	..	..	..	240
Farm servants and casual labourers	..	..	..	274

The typical abode of the well-to-do cultivator is fairly commodious and is built of stone or brick and mortar. At the back of the compound are the thatched huts of the labourers and the cattle sheds. A distinguishing mark of the men of means is the large granary. The rich ryot never markets his produce immediately after harvest and never to the village trader, preferring rather to hold it over in the hope that prices will improve. The furnishings of his house are simple and inexpensive, consisting of a few benches and stools and desks, rudely fashioned by the village carpenter from wood grown on the holding. His fare, though simple, is markedly superior to that of his humbler brethren; rice is his staple food; millets rarely, except in the Deccan districts; milk and milk products form an important item; his garden supplies him with vegetables, supplemented by what he purchases at the weekly market. His wealth consists of his land, his livestock, his family jewels and the principal which he has lent out. He is no great believer in bank accounts; moneylending and investment in land, in the order named, appeal to him much more. Socially, he aspires to connection with townspeople and, for that reason, marriage and other social obligations cost him dear. The dignity of manual labour does not appeal to him. His day's work consists of a walk of inspection round his fields after breakfast, and a second round in the evening when he gives instructions for the following day's work. He devotes his leisure mainly to law suits, to pilgrimages and visits to the towns. He holds a high position in the estimation of his fellows and is freely consulted in matters which concern their daily life.

The home of the cultivator who, though not in easy circumstances, lives well above the subsistence margin, is on a much less commodious scale. His granary is small for he has to part with most of his produce at harvest time. He is not encumbered with over-much furniture; his friends, when they visit him, squat on a mat on the *pial* (verandah); his evening meal generally consists of rice, dal and vegetables, with fish or meat occasionally if he is not of a caste to which these are forbidden; in the morning he breakfasts on what was left over from the evening before, or perhaps on *kanji* (millet gruel), vegetables and curd, and at midday he again has *kanji*; milk products enter into his diet but sparingly; his savings, if any, he invests much in the same way as does his wealthier brother; his means do not encourage him to form marriage ties with the cities but nevertheless his expenditure under that head is heavier than he can really afford, and more than he would be inclined to incur if he were unfettered by caste obligations. He does his cultivation with the help of one or more permanent servants. After he has marketed his produce,

made his house watertight against the monsoon and given all the attention that he considers necessary to his holding, he has ample leisure before the business of the next cultivating season claims his attention.

The house of the poor cultivator who ekes out a bare subsistence consists of mud walls and a thatched roof and the same roof shelters his family and his cattle ; furniture there is none ; his cooking utensils are of earthenware instead of brass ; he does not require a granary, for his chronic need of money compels him to sell his crops to the village merchant and moneylender even before he is in a position to sow them ; he buys his clothing from itinerant vendors who refuse cash down if it is offered to them ; millets form his staple food, rice rarely ; milk and *ghi* are luxuries which he can seldom afford ; his children are taken away from school at about eight years of age, to help on the holding or to tend the cattle of the village ; in the slack season he plies his cart for hire if he has one ; when conditions get too hard for him he emigrates, but with the firm intention of returning to his village as soon as he has made a little money.

The labourer, if he is a caste man, lives in the village proper, often in the compound of his master ; if he is a member of the depressed classes he has to resort to the segregated area allotted to those classes. The casual labourer is generally paid in grain, at the rate of eight to ten annas a day for a man and four to six annas for a woman. The farm servant is paid in a variety of ways ; a few rupees in cash *plus* a fixed quantity of grain, and clothing for himself and his family ; or a definite share of the produce *plus* clothing. Generally he gets into his master's debt by taking an advance for a special purpose, such as a wedding, and nominally the loan is to be repaid by service. Cases are not unknown where the master takes care that the loan shall not be worked off, the man is attached compulsorily for life and sometimes his sons inherit the debt. Emigration to the rest of India, and to Burma, Ceylon and Malaya however, is steadily making its influence felt. Statistics show that while, in 1901, there were 270 working labourers for every 1,000 persons supported by the other agricultural occupations, the proportion in 1921 had fallen to 212, and that, between 1911 and 1921, the presidency had suffered a net loss of a million-and-a-half labourers by excess of emigration over immigration. This must mean that the labourers who stay at home are in greater demand and, in fact, wages show a continuous tendency to rise. Of late years, too, Government have started an organisation to deal specially with labour problems and, so far as may be possible, to improve the conditions under which the labourer works.

The villager enjoys little in the way of social amenities. His chief relaxation is to gather round the village tree and gossip, or to listen to recitals and religious discussions. Occasionally, the monotony is varied by the arrival of a travelling circus or cinema show, or by the exhortations of the officials of one or other of the departments which are concerned with showing him better ways of doing things. He is easily

satisfied, for his knowledge of the outer world is but scanty. The children are taught the "three R's" in the village school, or as much of the rudiments as they can pick up in two or three years, which is all the time that is usually devoted to school life by all except the children of the well-to-do. Their parents are illiterate, and in consequence they soon forget what little they have learnt. The position with regard to literacy is dealt with in the section on 'General Education.'

That Madras is a province of small holdings is clearly brought out by a study of the figures supplied by the First Member of the Board of Revenue, at page 304,\* which refer to the *ryotwari* areas. Lands in these areas are held under *patta* (a document showing the area of land held under it and the revenue payable). A 'patta' may be in the name of a single individual or jointly in the names of several. A man may hold more than one *patta* and a joint *pattadar* may in addition have a *patta* or *pattas* standing in his name alone. The total number of *pattas* is not, therefore, the same as the total number of holdings but the figures are sufficiently close to enable inferences to be drawn with some certainty from the figures of *pattas* as to the average size of a holding. The Tables show that the total number of single and joint *pattas* in 1925-26 was 5.4 millions. Over a million *pattas* paid, in revenue, Re. 1 or less; nearly three million paid between Re. 1 and Rs. 10; and just under one million paid between Rs. 10 and Rs. 30. Thus, roughly, ninety-three per cent of the holdings pay Rs. 30 in revenue, or less; and seventy-four per cent pay an amount not exceeding Rs. 10. Turning from terms of revenue payment to terms of the amount of land held by each of the three groups already mentioned, the average area of the land held under the *patta* which pays Re. 1 or less is about two-thirds of an acre; that held under the *patta* which pays between Re. 1 and Rs. 10 is just over three acres, and that of the third group is seven-and-two-thirds acres. In the light of these figures, there appears to be ample justification for the view expressed that many holdings have become subdivided to a point at which they no longer provide an adequate standard of living. Unfortunately, too, there appears to be clear evidence that subdivision is still proceeding apace in the fact that whereas, in 1921, the total number of single and joint *pattas* was 4,861,745, by 1926 the number had increased to 5,415,745. The position is rendered still worse by the prevailing system of fragmentation, under which an individual holding consists not of one compact block, but of a number of small plots scattered all over the village area. The experiment of re-arranging holdings by consent has been tried in Trichinopoly district, but without success. No attempt has yet been made to deal with the problem by means of legislation.

Recent censuses point to a steady increase in density of population and that in spite of the many diseases and other factors which at present take a heavy toll of human life. The question, therefore, obtrudes itself: How is Madras to accommodate the natural increase in the population of the future? The progress of medical science and the preaching of the elementary principles of sanitation may be trusted to make the

\* *Vide Evidence Volume III—Madras.*

toll taken by disease lighter and lighter as the years go by, so that an acceleration in the present rate of increase may be expected. Will a complete solution of the problem of the surplus population be found in emigration, in the expansion of industry, in bringing under cultivation the large areas which are described under the somewhat vague term 'culturable' but are not under crops, in increasing the productivity of the areas already under cultivation? When all these possibilities have been exhausted, the main solution will probably still have to be found in restriction of the population rather than in expansion of the material resources of the presidency.

Some idea of the extent to which indebtedness prevails is given in the Table on page 309.\* As regards the four distinct areas in the Tanjore, Kistna and Godavari districts (for which the figures are more or less complete), it will be seen that, out of 3,740 cultivators examined in 125 villages, 1,697 were free from debt. The total debt in these four areas amounted to Rs. 27·8 lakhs, that is Rs. 1,360 per cultivator indebted, and Rs. 743 per head for the total number of cultivators examined. In two of the areas, debt incurred for "ordinary family expenses" has not been disentangled from debt incurred for purely productive purposes such as purchase and improvement of land and purchase of livestock and implements, but, in the other two areas, it would appear that forty to fifty per cent of the borrowings were for purposes which would not ordinarily be classed as productive. That marriage ceremonies are responsible for a large proportion of the unproductive debt is shown by the figures for nearly all the districts mentioned in the Table.

In a country of the size and diversity of the Madras Presidency, including, as it does, areas of copious rainfall as well as semi-arid tracts, fertile deltas and stony uplands, and cultivation at all altitudes from a few feet above sea level up to 7,000 feet, it is not unnatural that agricultural practices should vary very widely. How wide the range may be within the limits of a single crop can be seen from a glance at the methods by which the chief crop—rice—is grown. For instance, in areas irrigated from the Godavari, enough water is frequently available to mature a second crop, the area of second crop for which water is available being decided each year by the Collectors after consultation with the Irrigation Advisory Board. In the Kistna delta on the other hand, as in almost all the rice-growing areas in the northern part of the province, there is not enough water for a second crop and therefore the ryot grows a single crop of a late-maturing variety, followed by a pulse or a green-manure crop, the seed of which is broadcasted in the standing rice crop just before the latter is harvested. Again in the Cauvery delta, broadcasting is common, whereas, in the Godavari and the Kistna deltas, transplantation is the rule. In the Cauvery delta, where transplantation is practised, a variation from the ordinary method of managing nurseries is found in the 'double transplanting' system—a device rendered necessary by the generally late arrival of the north-east monsoon. The nurseries are sown in early September but the rains rarely appear before early November, by which time, under the ordinary method, the seedlings

\* *Vide Evidence Volume III—Madras.*

would have tended to establish themselves too firmly in the nursery beds. They are, therefore, transferred to a second nursery bed where they remain until it is safe to plant them out. Another method known as *kar* and *ottadam* in the Cauvery delta and as *udu* in the Godavari delta, is the sowing of early and late-maturing varieties together, the seed being sown in the proportion of 2 early to 1 late. Under this system, when the early rice crop is harvested, the late variety is "topped" and the stubble of the early crop is left to rot and form a manure for the second crop. In the Agency division, where population is scanty and land plentiful, the outstanding feature is the prevalence of the practice of *podu* or shifting cultivation. A patch of jungle is set alight and the rice is simply broadcasted among the ashes, without any preparatory tillage or subsequent attention whatsoever. That particular patch is farmed until the land becomes exhausted. At harvest time, the whole of the straw is left standing, only the ears being cut off; a few days before the next season's monsoon sets in, the straw is fired and the seed is broadcasted among the ashes as before. Still another system locally termed *kaipad* is practised in sour lands on the west coast. After ploughing, the soil is heaped up into small mounds. When the rain sets in, the injurious salts are washed out and sprouted seed is broadcasted over the mounds. When the seedlings are old enough to withstand acidity, the mounds are scattered and the seedlings take root and establish themselves uniformly. Shifting cultivation is practised here too, on the low hill ranges of Malabar, and is locally termed *modan* (hill-rice) cultivation. Finally, there is the "semi-dry" system which is practised in the alluvial tract of the Coromandel coast, as a precaution against the over-vigorous onset of the north-east monsoon. The seed is drilled in, as in the case of an ordinary dry crop, and frequent intercultivation is given. Then, from the time that the tanks fill right up to harvest time, it is treated as a wet crop.

A very efficient system of dry farming is practised in the Deccan districts, where the rainfall is scanty at best and uncertain always, and the water table is so low that irrigation from wells is not practicable. All crops are drill-sown and the efficacy of intercultivation in conserving moisture is very well understood. Every fifth year or so, the land is ploughed in February-March, with a heavy iron plough drawn by a team of six or more oxen, the object being to kill off *hariali* (*Cynodon dactylon*) and other deep-rooted weeds by exposure to the hot-weather sun. The ryots in these dry tracts are very good farmers and have little to learn about the handling of dry soils.

Mention may be made, too, of the diversity of the systems practised in the different hill regions. In the Anaimalais, the Shevaroyes, the Palnis and the Wyannad, agriculture has become highly specialised and is practically entirely in the hands of the planters. In the Agency, there is, general agriculture and no planting, while in the Nilgiris both are practised.

Preparatory tillage begins about the middle of March. In some localities along the Ghats, showers received before the regular onset of

the south-west monsoon allow sowings to commence in May, but the bulk of the early monsoon crops are sown in the beginning of June, and of the late monsoon crops in October. Harvesting is over by the middle of January, when the ryot rests from his labours and indulges in the harvest feast or *pongal*.

The cultivator is by no means ignorant of the principles underlying the rotation of crops. He knows that certain crops exhaust the soil and that others have a recuperative effect and, when he can, he arranges his cropping accordingly. He is aware, for instance, that gingelly (*Sesamum indicum*) is a greedy feeder and therefore he follows it by a pulse crop, never by another crop of gingelly. Under wells in the Coimbatore district, a three course rotation of *cholam*, cotton and *ragi* is the rule. In the rice areas, a single crop of rice is followed by a pulse, or sometimes by *sann* hemp (*Crotalaria juncea*) or *dhaincha* (*Sesbania aculeata*) for fodder and green manure, or, when no other alternative is possible, late maturing varieties are followed by early varieties. Sugarcane, where grown, comes into the rotation once in every three or four years, and the same is the case with betel-vine and plantains (*Musa sapientum*). Where conditions are not favourable, and where holdings are small and subsistence farming the rule, regular rotations are replaced by a system of mixed cropping, or even by a combination of mixed cropping and rotation. Thus, a system common in the Deccan districts is to grow sorghum mixed with pulse and safflower (*Carthamus tinctorius*) and to follow those, the next year, by a mixture of *korra*\* (*Setaria italica*) and cotton. Elsewhere a cereal and a pulse are grown together, as, for instance, "dry" rice and red gram (*Cajanus indicus*), *cholam* and cowpea (*Vigna catieng*), *ragi* and field bean (*Dolichos lablab*); or shallow-rooted and deep-rooted crops like *korra* and cotton; or exhausting and recuperating crops like gingelly and red gram. The idea underlying the mixed crop system is that a season which is unfavourable to a cereal may be favourable to a pulse, and *vice versa*.

Of recent years, however, there has been a regrettable tendency to violate the old established rotations by a too persistent cropping with commercial crops like chillies (*Capsicum annum*), tobacco and groundnut. The very intensive system of cultivation under wells in Coimbatore, for instance, has been upset by the introduction of Cambodia cotton (*G. Hirsutum*). This is a phase which may safely be left to work itself out when the diminishing yield and the increased susceptibility to disease, which must inevitably follow too frequent cropping with the same crop, react on the profits.

The above account will serve to indicate what a large number of variables are present in this huge presidency in soil, climate and agricultural practice and how difficult it is for the Agricultural Department adequately to cover such a large and varied area, with its language and caste difficulties and its widely different territorial customs. The Agricultural Department must not only cater for these different conditions but must also study them in detail. Any improvement discovered

\* *Korra* is the Telegu name for this crop. The Tamil name is *tenai*.

in one locality under one set of conditions is not likely to prove equally good in another locality where an entirely different set of factors obtain. It is necessary, therefore, to establish experiment stations and plant breeding stations in each typical locality for the intensive study of crops under different conditions and, in an area so vast, it is difficult to lay down and start a sufficient number of such stations to cover the ground with thoroughness. The "range" of each station is limited and with the present facilities the "ranges" of the existing stations neither meet nor cover the whole ground. In these circumstances, the advice given by the Agricultural Department on many points can only be of a general and not of an intensive nature.

##### 5. THE AGRICULTURAL DEPARTMENT.

The need for introducing an improved system of agriculture in Madras was recognised as long ago as 1854, although the Mutiny prevented active steps being taken until 1863. The first beginnings were not very sound in conception. Not unnaturally, it was thought that the quickest road to progress was the wholesale introduction of western ideas and methods. Hence the placing of an order in England for a "steam plough, some harrows and cultivators, seed drills and horse hoes, threshing machines and winnowers, chaff-cutters and water lifts." Hence, too, the opening of a "model" farm at Saidapet on the outskirts of Madras city, at which the use of all these implements and machines, of artificial manures, and of western methods generally was to be taught to the ryots. The fundamental weakness of the scheme lay in the failure to recognise that an essential preliminary to model farming was the careful working out of the model to be followed and that model methods must, of necessity, be the fruit of an intimate knowledge of local conditions coupled with careful research and experiment on the multitude of problems which awaited solution. Nevertheless, the Saidapet farm continued to be the centre of agricultural activity for nearly forty years. For the first few years, it was controlled by a committee of management, with a superintendent in charge. In 1871, it was placed directly under the Board of Revenue and about the same time an assistant superintendent was added to the staff. Associated with its other activities was a class for the training of apprentices, with the object of fitting them to take charge of model farms and to act as demonstrators. Apparently this object was not achieved, for, when Government proposed to expand their activities by opening experimental farms in different parts of the presidency, the proposal fell through, mainly because there was no trained staff available to take charge of them. One result of this was that the problem of agricultural education came so much to the front that it obscured all the other equally important problems not only until an agricultural college was opened at Saidapet in 1876 under the control of the Education Department but for some years after. In 1885, an officer was appointed to the Board of Revenue as Commissioner of Revenue Settlement, Land Records and Agriculture. From that date the policy underwent a radical alteration. The Saidapet farm was abolished except for a small area

which remained attached to the college, and, up to the beginning of the present century, the energies of the department were devoted to the collection of statistics bearing on famines and to sporadic enquiries on agricultural or economic subjects in various parts of the presidency. Meanwhile, the "model farm" idea had been steadily retreating into the background in favour of the sound idea of establishing farms for experiment and enquiry, with distinct and definite objects. All that was needed to bring Government to a decision was the threatened extinction of the sugarcane crop in the Godavari district, due to the ravages of "red rot" (*Colletotrichum falcatum*) disease.

The history of Madras agriculture from 1863 up till the end of the century thus falls into three periods. The first witnessed the ascendancy of the idea of a model farm worked on western methods, the second was dominated by a barren discussion on agricultural education and, in the third, agricultural effort was blighted by the insistence on the importance of statistics. None the less, in spite of the difficulties under which they laboured, the work done by Mr. W. H. Robertson during his long tenure of office as Principal of the college and Superintendent of the experimental station at Saidapet and subsequently by Mr. C. A. Benson as Deputy Director of Agriculture left its mark on the development of the department after the reorganisation of 1905. In that development, former students of the Saidapet College played no inconsiderable part.

In 1901, Dr. Barber was allowed to lease, and in 1905 to acquire, land for research with the object of finding varieties of cane resistant to red rot. In the same year, two farms were opened for work on cotton, and similar farms were established for the study of pepper in 1902, and for work on groundnut and exotic irrigated cotton in 1904. Thus, by the time Lord Curzon's forward policy of agricultural development for the whole of India was initiated, the Madras department was already well under way. By 1906, ten farms had been established and a whole-time Director appointed. The expert staff, which up till then had consisted only of the botanist recruited in 1898, was strengthened by the addition of an agricultural chemist, and two deputy directors for district executive work. The college at Saidapet was transferred back to the Agricultural Department under a new principal and, in 1908, the students were moved to the larger and better situated college at Coimbatore. The expert staff was further strengthened, at intervals up till 1914, by the addition of a mycologist, a special officer for work in the planting districts, an entomologist, a second botanist and a third deputy director, and the various experts were provided with laboratories and facilities for research. Thus, by 1914, the department had reached a stage at which rapid advance might confidently be expected. It was tolerably well equipped in regard to fundamental research, investigation of local problems, education and propaganda. The immediate need was for more district officers of all grades to strengthen the link between the department and the cultivator. The non-gazetted staff was completely reorganised in 1916 and divided into two main sections, scientific and agricultural, each of which was subdivided into upper and lower divisions; and, by 1919, the number



of deputy directors' circles had increased to eight. Progress was to some extent retarded during and immediately after the war by the deputation of officers for duty in Mesopotamia, by the era of retrenchment which affected all departments, and subsequently by the fact that three of the most experienced officers in the department accepted posts elsewhere. The present strength of the department is—

Indian Agricultural Service officers	..	..	13
Madras Provincial Service officers	..	..	31
Officers on special contract	..	..	2
Subordinate Service—			
Upper	..	..	116
Lower	..	..	218

An indication of the rate at which the activities of the department are expanding is given in the fact that the departmental budget has increased from Rs. 7.73 lakhs in 1916-17 to Rs. 16.66 lakhs in 1926-27.

The research work is of two kinds. There is first of all the research into the fundamental problems underlying the practice of agriculture, which is carried on by a staff of specialists at the central institute at Coimbatore and at special stations. Linked up with that is the research carried on by deputy directors in charge of circles who have their own stations at which the discoveries of the central institute are tested for their suitability to local conditions, and who carry out investigations in connection with local problems affecting their circles. With the object of co-ordinating the experimental work carried on by district officers throughout the presidency, an advisory committee, consisting of the Director, the Agricultural Chemist, a crop specialist, the Professor of Agriculture and a senior deputy director has very recently been formed. Its functions are to review the experiments in progress at the district stations, to suggest new lines of enquiry and examine similar proposals put up by the deputy directors, to advise on the methods by which these should be carried out and to assist in interpreting the results.

The activity of the department centres in the estate attached to the Agricultural College and Research Institute, Coimbatore. The total area of the estate is about 500 acres. Of the 315 acres under cultivation, 45 acres are irrigated from the Noyil river, 124 acres are medium quality black soil, and the rest is red soil, partly under dry cultivation, and partly under garden crops irrigated from wells. A wide variety of crops is grown, including rice, sugarcane, cotton, wheat, millets, pulses, tobacco, linseed, garden crops and several fodders, and small plots of every crop in the presidency are grown for teaching purposes.

With the exception of the Paddy Specialist, who has a separate area away from the main farm, and the Livestock Expert whose headquarters are at Hosur in Salem district, all the investigations of the specialists are conducted on the Coimbatore estate. Considerations of space make it impossible to give more than a brief description of the more important lines of research now in progress or already completed.

An important activity of the Chemistry Section has been the conducting of soil surveys in several districts. The main result of these has been to show that phosphates are markedly deficient in all soils, although the deficiency does not appear to be quite so much in evidence in south Malabar which is the area at present under investigation. Of great potential importance in this respect are the mineral phosphatic deposits which are found in large quantities in the Trichinopoly district. These deposits are very insoluble, and the question of making them readily available as plant food and of the best combination in which they can be used is under investigation. A great deal of preliminary work has been done on the subject of the preparation of synthetic farm yard manure from straw and waste products such as groundnut husk and prickly pear, and the department hopes that it will soon be able to devise a simple method which can be demonstrated to the ryots. The only nitrogenous manure which has as yet found favour with the cultivator is ammonium sulphate, particularly when used in conjunction with superphosphate. Interesting work is in progress on the manner in which the manuring of a crop affects the vitality and the nutritive value of the grain; tests conducted by Colonel McCarrison, I. M. S., have shown that the nutritive value of wheat or *cholam* grown on a plot which received cattle manure was much higher than when the plot was manured with artificials only.

Other important lines of research, work on which has been completed or is still in progress, may be mentioned. The processes which take place in paddy soils during fermentation and nitrification have been studied, together with their bearing on manuring and cultivation of this crop. The great benefit due to green manure arose out of this piece of research. Improvement has been effected in the manufacture of coconut jaggery, an important cottage industry on the west coast. Ordinarily, the jaggery made from the juice of the coconut palm will not keep owing to the presence of chlorine which ultimately shows itself as calcium chloride, a very deliquescent product. A cheap and ready method has been evolved for the removal of the chlorine and good grade hard jaggery can now be made. A method on a practical scale has been worked out for malting *cholam* and preparing breakfast and invalid foods and this is now in a stage at which it can be taken up by private firms, though none have so far come forward to exploit it. A practical method has also been worked out for determining when sugarcane is ripe.

A bacteriologist has recently been added to the staff and a new sub-section to deal with animal nutrition problems is in process of formation. Apart from research, the section has a great deal of routine work to do. This consists mainly in making analyses in connection with the field research going on at the various experimental stations and, to a small extent, of soil and manure analyses for the public.

The Botanical Section has much systematic work to its credit, notably the herbarium collection on which the *Flora of Madras*, now under compilation at Kew, is based. Of chief interest however, from the economic point of view, is the work on the major crops. For rice there are now four breeding stations in the charge of the Paddy Specialist, the main

station at Coimbatore, and sub-stations at Aduturai, Maruteru and Pattambi, each serving different rice tracts. Economic work is also being carried out by deputy directors on the stations at Anakapalle, Samalkota and Palur. Four improved late-maturing varieties have been evolved and issued from the Coimbatore farm and seven early varieties from Aduturai, and it is estimated that at least a quarter of a million acres of the latter are now grown in Tanjore and Trichinopoly districts. The other two farms under the specialist have been started only recently and are not yet in full working order, although mass selection for the Godavari delta is being done on four varieties at Maruteru and single plant selection is also in progress. The new station at Pattambi is designed to serve the west coast districts of Malabar and South Kanara and will deal with single crop, double crop, treble crop and dry *modan* (hill) rices.

The Paddy Specialist is also making an attempt to improve the system of *udu* cultivation, a method under which the crops are grazed by cattle or cut to check excessive vegetative growth. His idea is to sow a mixture of short and long duration varieties in suitable proportions, so that when the early variety is harvested there will be plenty of room for the late crop. Other problems, too, are engaging his attention—questions of cultivation and manuring about which no definite conclusions have yet been reached, the effect of sowing at different seasons, the period for which seed retains its germinating power, and the cooking qualities of different varieties. Root systems are being studied in relation to soil conditions in different areas. Technical studies are concerned chiefly with the possibility of evolving, by means of hybridisation, varieties of rice which will be immune to disease. A typical example of the necessity for such work is the case of the *korangusamba* variety which is very popular in the Tanjore delta but is particularly susceptible to attack by the fungus *Piricularia oryzae*. The work is being done in close collaboration with the Mycological Section.

The Anakapalle farm, which serves the Vizagapatam district, is devoting attention to selection work and to manurial questions. Results so far obtained with the latter show that an application of about a ton per acre of *sann* hemp leaf to land well supplied with phosphate will raise the yield by fourteen per cent. This is encouraging as in that district it is possible to grow as much as 4·5 tons of *sann* hemp per acre, as a *punasa* (early) crop, in three weeks to a month. On the Samalkota station, selection work is in progress with intermediate season varieties of rice, as well as second-crop varieties, and comparative trials between these and Coimbatore varieties are being carried out. At Palur, a search is being made for improved long duration and short duration strains with a fair measure of success.

Work on cotton is now in the general charge of the Cotton Specialist. The area under this crop was about 2·2 million acres in 1927, practically all of which was medium staple. It is an important crop in four distinct tracts, the Deccan districts in the north, the Guntur and Kistna districts in the east, the Salem and Coimbatore districts in the centre, and the Tinnevely, Madura and Ramnad districts in the

south. The two common indigenous varieties grown are *Gossypium herbaceum* and *Gossypium indicum*, and are known on the market under various trade names. 'Westerns' and 'Northerns', which are grown in the Deccan districts consist of varieties of *herbaceum*, with a variable proportion of *indicum*; they have a staple of  $\frac{5}{8}$ " to  $\frac{7}{8}$ " and a low ginning percentage. Important progress has been made, as the result of work by the present Cotton Specialist when he was a district officer, by the introduction of a pure *indicum* type of 'Northerns' (Nandyal 14) and a selected 'Westerns' (Hagari 25), both of which command a premium over the ordinary crops which contain a mixture of red and white cotton. 'Tinnevellies', which are grown in the south of the presidency also consist of a mixture of *karunganni* (*indicum*) and *uppam* (*herbaceum*) in varying proportions. This mixture is being widely replaced by selections of *karunganni*, known as 'Company' cottons, evolved on the Koilpatti experimental farm; two strains in particular are favoured, No. 2 and No. 3; the first ripens unevenly and has a ginning percentage of 29 to 31; the second is a uniform ripener with a ginning percentage of 30 to 33; the length of the staple in both strains varies from  $\frac{7}{8}$ " to 1". The area under improved *karunganni* in the southern districts of Madura, Ramnad and Tinnevely is now something like 300,000 acres. It should, however, be mentioned that there is practically no pure *karunganni* grown except on seed farms; outside those farms, there is usually a small mixture of *uppam*. *Karunganni* still passes under the trade name of 'Tinnevellies'; with the exception of the Nandyal 14 variety which is grown on a much smaller scale, it is the best of the cottons indigenous to Madras, being regularly quoted and dealt in on the Liverpool market.

More remarkable still has been the success of the exotic cotton, Cambodia, an American type, the seed of which was obtained direct from Cambodia in 1905, by Mr. C. A. Benson, the Deputy Director of Agriculture in Madras. It was grown at the outset as an unirrigated crop on the black soil of the Koilpatti farm and, in such conditions, showed little promise. Its rapid extension throughout the southern districts of Madras was, in no small measure, due to the discovery by Mr. A. Steel, of the firm of Messrs. A and F. Harvey and Company, of its possibilities as an irrigated crop on red soils. At times it suffers severely from attack by the stem weevil (*Pempheres affinis*). A new strain, No. 440, which is vigorous enough to yield well despite attack has been isolated.

Cambodia is found chiefly in the Salem-Coimbatore area, and in Trichinopoly, Madura and Ramnad in the south. It has not replaced any indigenous cotton but is cultivated mainly on land which had previously yielded precarious crops of rice, on very favourably situated dry land, and as a rotation in garden land under well-irrigation. The best quality comes from Tiruppur in Coimbatore and from Bodinayakkanur in Madura. When grown as an irrigated crop, it is superior to all the indigenous cottons in yield and quality, with a staple of 1 to 1 $\frac{1}{8}$  inches and a ginning percentage of 33. The unirrigated crop is, however, apt to be inferior

and there is a tendency to grow it on unsuitable land. In such cases, an attempt is being made to replace it by 'Company' cottons. At present, Cambodia covers an area of about 410,000 acres, two-thirds of which is irrigated.

Although, as we have seen, the improved *indicum* strain (Nandyal 14) and Company strains have found favour, the ryot has a strong liking for *herbaceum* varieties on account of their early and uniform maturing qualities. For this reason, an intensive investigation has been undertaken with the help of funds supplied by the Indian Central Cotton Committee, the object being to evolve from the *herbaceum* constituent a strain in which will be combined the respective merits of both *indicum* and *herbaceum*. Arrangements have been made, again with financial assistance from the Indian Central Cotton Committee, for research into the relative susceptibility and immunity of various strains of cotton to damage by the stem weevil, and into the problems connected with bud, flower and boll shedding. These investigations will be undertaken as soon as the necessary staff is forthcoming.

Work on sugarcane is the parent of the research activities of the department. It began indeed many years before the department came into existence. Varieties from other cane-growing countries had been imported by the Board of Revenue as long ago as the early 'forties' of last century, and at later dates by Mr. Gillman, I.C.S., manager of the Vizianagram Estate, from Mauritius. The latter varieties were transferred in 1900 to the Samalkota farm which was established for the purpose of discovering canes capable of resisting the "red rot" disease then so prevalent in the Godavari delta. The work done on that farm led to the speedy replacement of the local canes by the Striped and Red Mauritius varieties. The former quickly succumbed to disease and the latter underwent deterioration and both were superseded by the Purple Mauritius variety in the Godavari area, though Red Mauritius is still a favourite in some localities.

A breeding station was started at Coimbatore in 1912, at which new canes are raised from seed. As the station is under Imperial control and was designed to meet the needs of northern India, attention has in the past been concentrated mainly on thin canes rather than on the thick canes suited to the Madras Presidency. The station has, however, recently been extended in order to provide space for work on thick canes. These, in the meantime, have been studied at Samalkota, Palur and Anakapalle, the last named of which is to be developed into a cane-testing station for the presidency, at which the seedlings evolved at the Imperial station will be tried out. Apart from Red Mauritius, the varieties which have been introduced in recent years are J247, B208, and Fiji B. Among others, J247 has achieved popularity owing to its disease and drought resisting qualities, although it has the defect of late maturing.

Work on millets has only been taken up in recent years. It is under the charge of a specialist who has a special staff and a breeding station at Coimbatore. Progress is being made rapidly with *cholam*

and *ragi* and it is expected that the Millets Specialist will be in a position to put out new and improved strains in the course of a year or two.

Coconuts are a very important crop on the west coast. Out of a total estimated area under this crop of 552,815 acres, 376,500 are situated in Malabar and South Kanara. Three special experiment stations have been established, one of which was an existing garden, the other two being planted *de novo*. A number of valuable discoveries have been made, chiefly concerning the benefits to be obtained from wide spacing and inter-cultivation. One of the most important relates to the method of planting this crop on high lands. It has usually been held by the cultivators that coconuts can only be grown if they can be watered during the hot weather. The department has shown that this is not the case, and that if wide spacing is adopted and the land is originally cultivated and drained, and if it is constantly inter-cultivated during the hot weather in order to maintain the soil mulch, watering is quite unnecessary. Two stations have been planted up on this dry system and the trees have not only grown very satisfactorily but have come into bearing much earlier than is usually the case in the district. This method has been widely demonstrated by the establishment of small plots in the compounds of travellers' bungalows, municipal and taluk office compounds, etc., and large areas of hitherto waste land are in consequence being planted up. It is estimated that some 500,000 acres or more might be similarly planted up.

Recently, work has been begun with the cross fertilisation of selected types of palm with the idea of evolving a high yielding strain. This will naturally take time and it is complicated by the fact that, in Madras conditions, the palm is always cross-fertilised.

The necessity for a Mycological Section was brought into prominence by a severe attack of bud-rot (*Pythium palmivorum*) on the palmyras of the Godavari delta. The disease was first investigated by the Imperial Mycologist in 1906, but it was not until 1913 that the fungus was isolated and proved to be fatal to coconuts as well as palmyras.

The preventive measures recommended are the cutting away and burning of all diseased tissue before the growing tip is affected. These measures have been applied with the help of legislation, to the Guntur, Kistna, and Godavari districts. This campaign has undoubtedly diminished the disease and brought it under a measure of control, but it still exists and there is little prospect of eliminating it altogether. Cyclones, which are of frequent occurrence in these districts, are a factor in its dissemination and, after one of these visitations, the disease always appears again with renewed activity. Another fungus which has been dealt with is that which causes "bleeding disease" in coconuts, the symptom of which is the exudation, from the stem, of a red viscous liquid. The remedy consists in cutting out the affected part, burning the wound so as to check the flow of sap, and then coating the cut surface with tar. *Mahali* disease, a form of phytophthora which affects the fruit of the areca palm, has been very successfully dealt

with by spraying with Bordeaux mixture and this practice is now adopted on millions of trees. The 'mildew' disease on grapes has been effectively dealt with in a similar manner.

Other instances are the protection of the *cholam* and *tenai* crops against smut by steeping the seed before sowing in a solution of copper sulphate and the prevention of red rot in sugarcane by introducing resistant varieties. Methods of preventing the spread of disease have been partially worked out in the case of paddy 'blast', 'fruit rot' in chillies, 'leaf rot' in ginger, 'scab' in lemons and limes, and various diseases affecting planters' crops. At the present time, the relative resistance of different varieties of paddy to 'blast' is being studied in collaboration with the Paddy Specialist with a view to finding a variety which is more or less resistant in the hope that it may be used for crossing with other varieties, and a similar investigation is in progress with regard to the mosaic disease of sugarcane and the wilt disease of groundnut.

The Entomological Section came into existence as a separate section in 1912. Until then attention had been devoted to the compiling of information with regard to the chief pests of all crops, a work which culminated in the publication of "Some South Indian Insects" by Mr. Bainbrigge Fletcher in 1914. No striking instance can be recorded of control methods being taken up co-operatively by cultivators over large areas at the same time, although the demonstration of simple and cheap methods of control has met with some local success. The section is handicapped by the fact that news of damage by a particular pest seldom arrives until the damage has already been done and by the fact that it is practically impossible to persuade ryots to co-operate to deal with a pest over a large area, however simple the methods recommended may be. In some places, the religious objection of the people to taking life is also a handicap to the entomologist.

Perhaps the most important work of this section has been the detailed research into the life histories of the pink boll worm and stem weevil, and the damage done to cotton by these pests. The loss to the crop was so severe that the aid of the Madras Insects and Pests Act was invoked to check it. The only method of control which has been discovered is to ensure a dead season between one year's crop and the next, so that no cotton will be left on the ground on which the grubs can feed. When the Act was first applied in 1920-21, it was laid down that all Cambodia cotton should be removed from the fields and destroyed by the 1st of August each year, thus ensuring a dead period of at least two months before the next sowings began. The Act, however, provided for notice of eradication being given and also allowed time for appeal, with the result that the cotton was seldom removed before the end of August. In view of the extreme unpopularity of the original Act, an amendment has now been introduced stipulating that no notice need be given and deferring the date by which removal must be complete till the 1st of September, but the opinion of the Agricultural Department is that the resulting dead period is insufficient for effective control

and that extension rather than curtailment of the period originally prescribed is essential.

A caterpillar pest introduced by rail a few years ago into the west coast districts has done a great deal of damage to coconuts. This pest exists on the coconut palms on the east coast but there it is comparatively harmless, a fact which was found to be due to its being kept under natural control by certain parasites. The pest was unfortunately introduced into the west coast districts without its controlling parasites and consequently it spread very rapidly and became a pest of major importance. The department have taken steps to control the pest biologically by breeding the parasites in large numbers and introducing them into the infected areas. This method has met with encouraging success but it is hampered to some extent by the presence of a hyper-parasite and also by the fact that the climate of the west coast is at certain times of the year detrimental to the parasites proper.

The Horticultural Section is concerned with the botanical gardens at Ootacamund, the pomological station at Coonoor and the experimental fruit gardens at Burliar and Kallar. The pomological station, which is about twelve acres in extent, was opened in 1920 for work on the different fruit trees suitable to the hills of southern India. Experiments in pruning and manuring as well as systematic testing out of different varieties are carried on. At the Burliar garden near Coonoor, a large number of varieties of tropical fruits and spices are grown. The Kallar garden, which is at the foot of the hills near Mettupalaiyam, was taken over from the Forest Department in 1900. It is planted with rubber, fibre-producing plants, teak, mahogany and tropical fruit trees. Experiments are being made with the valuable medicinal plant *Cephaelis ipecacuanha*.

The Engineering Section is in the charge of two gazetted provincial officers, one of whom is concerned solely with teaching work in the college. The whole time of the other is devoted to the upkeep of the estate buildings and equipment. A post of research engineer has been sanctioned and the appointment will be made in April, 1928.

For administrative purposes, the presidency is divided into eight circles, each in charge of a deputy director who has the help of an assistant director and of a number of qualified demonstrators. At present, the jurisdiction of each demonstrator extends over two or more taluks, but it is hoped that in the near future, the staff will be increased so as to allow one demonstrator for each taluk. The nature of the improvements which are being introduced is indicated broadly in the general account which has been given of the research work in progress. They consist in the use of iron ploughs and better methods of cultivation, the use of better *mhote* buckets and wheels, the growing of green manures instead of depending on the forest for leaf mould, better methods of making and storing cattle manure, economical methods of transplanting paddy seedlings, better strains of seed. In the cotton areas, demonstrations deal with new strains of seed which give bigger yields and a better quality of lint, drill-sowing and inter-cultivation with bullock power,



better methods of irrigation, clean picking, and co-operative ginning and marketing. In the sugarcane areas, deep cultivation, line planting, propping and wrapping, manuring, the use of iron crushing mills and McGlashan furnaces are demonstrated. Much attention is also given to protective measures against insect and fungoid pests.

With regard to ways and means of bringing improvements to the notice of the cultivator, past experience has shown that the experimental farm, in itself, has not exercised a very potent influence. The ryot is not easily persuaded to travel even short distances to visit experimental stations and, when he does, he is apt to think that the practices adopted there are not suited to his limited resources.

Exhibitions and demonstrations provided at fairs and religious festivals have to compete with many counter attractions for the cultivators' interest. Owing to the general illiteracy of the people, publications and leaflets have a very limited field; but where the people are able to read, use is made of them very freely. Departmental leaflets written in simple words and published in the various vernaculars are issued either free or at a nominal cost. Each year, the department issues, both in English and the vernaculars, what is known as "The Villagers' Calendar". This is a simple handbook in which the various activities of the department are explained and which contains a number of articles dealing with simple methods of improvement. Another publication of the department which has proved popular is that known as the "Monthly Digest of the Operations of the Department," a short summary in simple language of the current work of the department, both in the districts and in the research institute. It is also used as a medium of instruction in simple methods of general agricultural improvement. It too is published both in English and the vernaculars and is distributed free to people who are likely to benefit from it.

The method which has achieved the greatest success is the establishing of demonstration plots on the ryots' own land. A complete record of the cultivation expenses of these plots is kept by the demonstrator in charge and, wherever possible, the record is completed right up to the weighing of the produce. In all cases, the improved method is contrasted side by side with the method which it is desired to replace. Many hundreds of such plots are scattered all over the presidency. A variation of the "demonstration plot" is the "demonstration area" system of which three types are found. One method is to mark out an area on an experimental farm and devote it entirely to commercial farming. Another method is in use in No. 4 circle and is really the 'plot' system on a larger and more elaborate scale, the essential differences being that a larger area is taken and a profit and loss statement which includes the cost of all operations is published. The system has been further developed in No. 5 circle where a number of co-operative societies have started demonstrations of their own, under the guidance of departmental officers.

In the absence of reliable seed merchants, the question of the multiplication and distribution of seed, and of keeping it pure, is a very

difficult problem. In the case of cotton, the seed of a new strain which is desired to introduce is given out to selected ryots, on the understanding that they will carry out the cultivation on lines laid down by the department and will keep the seed pure. At harvest time, the department either buys the *kapas* (unginned cotton) outright, retaining the seed for future distribution, or it encourages the ryots to gin their *kapas* co-operatively, and merely buys the seed from them, offering a small premium over the market rate prevailing. An organisation on similar lines is in existence in the paddy areas. This "seed farm" system works very satisfactorily as far as it goes, but the quantity of seed obtained is limited by the amount of funds placed at the disposal of the department for the purpose, and is not nearly sufficient to meet the demand. A scheme is now under discussion with the Registrar of Co-operative Societies which contemplates the conversion of these seed farms into co-operative societies for the express purpose of producing seed in the paddy areas, and for combining seed production with co-operative ginning and selling in the cotton tracts.

We have seen that an attempt was made to impart some sort of training in agriculture in the very early days of the department and that the courses for apprentices at Saidapet were not very successful. From 1872 onwards, schemes for an agricultural college began to receive serious consideration, and the result was the opening of the Saidapet Agricultural College in 1876. The institution was attached to the Education Department; a three years' course was given and no fees were charged. The theoretical nature of the teaching imparted is sufficiently indicated by the fact that the lecturers were members of the staff of the Medical and Engineering colleges and that no laboratory accommodation was provided. Applications for admission came in very freely from places as far away as Ceylon, Bengal and the Punjab. Thirty students attended the first year's class.

In 1884, proposals were put forward that Saidapet should be developed into a central institution for the teaching of agriculture, veterinary subjects, medicine and forestry. These proposals were not fully accepted but, in 1886, the college was brought under the Technical Scheme of Higher Examination in Science and Arts. The tendency under this scheme was to make the course more and more theoretical and the central idea of agriculture appears to have been almost lost sight of. In 1890, a committee, charged with the revision of the curriculum, recommended that certain technical subjects should be abolished, but, even after the recommendation was carried out, the college was still teaching for ten different technical examinations. In 1902, as the result of the findings of another committee, much more attention began to be paid to practical agriculture and, in 1906, the control of the institution passed from the Director of Public Instruction to the newly organised Agricultural Department.

From the point of view of its direct effect on the agriculture of the presidency, the Saidapet College did not prove a success. It had many difficulties to contend with, chief of which was that it was in no sense

in touch with the agricultural population, nor did it possess any means of overcoming that obstacle. As has already been mentioned, the college was transferred from Saidapet to Coimbatore in 1908.

Originally, only one course was provided at Coimbatore and all students were put through it, whatever their capabilities or ultimate objects. Even so, it was an advance on the teaching given at Saidapet in that it was not an agglomeration of different courses of which agriculture was one, but a balanced course in which the agricultural aspect was given due prominence. In 1914, two separate courses were instituted, one leading to a diploma and the other to a certificate. The student on entering the college joined the certificate course and, if he attained a satisfactory standard in that course, he was allowed, if he so wished, to proceed to the diploma. The combined course lasted for three years.

In 1920, however, a differentiation was made in the qualifications demanded for admission to these courses, the object being to attract a better type of student to the higher course. A further development took place in 1922 when arrangements for the affiliation of the college to the University of Madras were completed and the diploma course gave way to a three years' course leading to the degree of B.Sc. in Agriculture, admission to which could only be obtained by those who had passed the university intermediate examination in groups I and II. Thereafter the attendance in the certificate course fell away to such an extent that it was abolished in 1924.

Some forty students are admitted every year. About a dozen scholarships are granted, some of which are reserved for members of backward communities.

The new arrangement still fails to attract the desired class, the sons of farmers who intend to earn their living by farming. This is due, in the opinion of the Director of Agriculture, to several causes, the expense of a five-year course—two years intermediate at the university and three years at the college—being one. There is also the desire to utilise a degree to get work other than farming, and the fact that few posts outside government service are open to graduates in agriculture.

Two agricultural middle schools were opened in 1922, one at Taliparamba and another at Anakapalle. For the staffing of these schools, four officers of the Agricultural Department were deputed to the Education Department for a six months' period of training in teaching methods. The students are given practical instruction in ordinary cultivation work on the school farm and are also taught reading, writing, arithmetic, geography, nature study, civics and chain-surveying, elementary entomology and mycology. The Taliparamba school is reported to be doing well, though the ultimate criterion of success will be how far the pupils who pass through it are absorbed in agricultural occupations. The Anakapalle school was closed at the end of last year. In 1927, an officer of the Education Department was deputed to study the Punjab type of agricultural education and a proposal is now under consideration to include agriculture as one of the subjects in higher elementary and middle schools.

The presidency possesses at least three breeds of cattle of recognised merit, namely, the Ongole, the Kangayam and the Allambady. The Ongole breed enjoys a reputation which is not confined to India alone. The males are fine heavy animals which in draught qualities can stand comparison with some of the best known breeds in the world; the cows too, are heavy milkers when judged by Indian standards. Large numbers were at one time exported to the East Indies and South America but the trade is now prohibited. The Allambady is primarily a light draught animal, long of leg and spare of flesh; it seems to be closely related to the famous Amrit Mahal of Mysore which is considered to be an excellent type of light draught animal. The Kangayam is a short, compact animal sturdy in build and handy to work. Notable in connection with this breed are the extensive breeding operations being conducted by the Pattagar of Palayakottai, whose cattle are in demand all over the presidency and whose solitary example might well be followed by other large landowners. Apart from the undoubted merits of these breeds the quality of the cattle in the presidency is, of course, largely dependent on the food supply and climatic conditions. Thus, in the Coimbatore Salem, North Arcot and Nellore districts where fodder is plentiful, the quality is well above the average; it is not so good in the purely rice areas where they are fed mostly on rice straw, while in the Deccan districts Malabar and Ramnad it is distinctly worse. In the Deccan districts, the rains are light and there is not enough water to grow purely fodder crops. In Malabar, the question of grazing grounds is not of pressing importance and all over the district there are thousands of acres of unoccupied dry lands and private forests where the cattle graze without let or hindrance. Hence the small area of government forest thrown open to grazing. In the monsoon, the cattle grow sleek and fat upon the new grass that springs up on the waste lands, but in the dry weather when the grass dies down they revert gradually to their normal half-starved condition. The remedy for this probably lies not in any extension of the already considerable grazing grounds but in the growing, by the ryots themselves, of fodder crops for use in the dry season, an idea hitherto unknown in Malabar but now beginning to receive attention.

The improvement of livestock is entrusted to an expert of the Agricultural Department who has three breeding farms in his charge, with headquarters at Hosur.

The Hosur farm was taken over in 1924 from the Army Remount Department, in whose hands it had been for 96 years. The farm is 1,635 acres in extent, of which 65 acres are irrigable and are under fodder crops; the remainder is pasture land of varying quality. Several lines of improvement are being attempted although none of them are on a very large scale. A small pure-bred Kangayam herd is being improved for the dual purpose of milk and draught. The calves are allowed to suckle but each cow is fully milked one day per week to ascertain the milk yield; the average for the herd is about six pounds (one-and-a-half Madras measures) per day. The so-called "Bangalore" herd consists of half-breeds, the result of mating an Ayrshire bull with pure Sindhi and

Sahiwal (Montgomery) cows. Half-bred is mated to half-bred, the object being to produce heavy milkers for the Madras milk supply. The possibilities in this direction, in so far at least as the first Ayrshire cross is concerned, are indicated by the fact that one cow has given over 12,000 pounds of milk in a lactation.

The "Coimbatore" herd is a mixed lot of cross-breeds, some being one-quarter Ayrshire, some three-quarters, seven-eighths, etc. On some of the cows pure country bulls, and on others half-bred bulls are used. The daily average production of milk per cow is about ten pounds (two-and-a-half Madras measures). It does not appear that the policy of breeding up to the Ayrshire is likely to be a success; the calves are weak and subject to a heavy mortality and, in future, the three-quarters and seven-eighths Ayrshire crosses are to be served by a pure country bull of the Sindhi and Sahiwal breed.

A dairy herd of pure Ongole cattle is in process of being built up, and here the prospects are much more promising. Several cows have given an average of thirteen pounds (three-and-a-quarter Madras measures) of milk throughout a lactation. The average for the whole herd in 1925-26 was over eleven pounds and this was considered to be satisfactory, most of the cows being first calvers.

A small herd of pure Sindhi cattle is also maintained with the object of breeding for the west coast area.

The farm at Chintaldevi comprises about 800 acres, of which 531 acres are under grass. It is situated 36 miles from the nearest railway station and was opened in 1918 for work on the Ongole breed. It carries a stock of about 150 animals. The yields of some of the young cows are promising.

The opening of the Guntur breeding farm dates back only to 1923. The main object here is to improve both the size and the milking capacity of the country buffalo by crossing with the Delhi bull. The farm is 150 acres in extent. This, with the dairy maintained at Coimbatore for teaching purposes, completes the list of institutions dealing with cattle. The department has as yet only touched the fringe of the problem of cattle improvement. Excluding the Coimbatore dairy, the total head of stock carried by the three farms under the Livestock Expert, at the beginning of the year 1925-26, numbered only 388, and the number of bulls sold in the year 1926-27 for breeding purposes was twelve. It is obvious that but little impression will be made on the twenty-two million cattle of the presidency by improved breeding unless and until the scale of the present-day operations is very greatly extended.

## 6. THE VETERINARY DEPARTMENT.

Thirty-five years ago, the only veterinary organisation that existed in the presidency was a hospital at Saidapet and a few stock inspectors attached to the Agricultural Department. The present Civil Veterinary Department originated with the appointment in 1893 of an executive veterinary officer and was under the control of the Board of Revenue

until 1916-17. The department to-day is independent, control being vested in the Veterinary Adviser to the Government of Madras who is directly responsible to Government. His staff consists of four Imperial officers. Of these, three are attached to the college and one is in charge of a circle. There are also five gazetted assistants in charge of circles and one attached to the college. The Subordinate Service is manned by 230 assistant surgeons, ten of whom are employed in the college and the rest are employed upon executive work.

The departmental budget in 1916-17 was Rs. 2,20,700 and in 1926-27 Rs. 7,54,900; these figures give some idea of the rate at which expansion has proceeded within the past decade.

The activities of the department can be broadly divided into (a) Education, (b) District Work and (c) Research. The college dates from 1903 although the present building was not occupied until 1905. The staff includes the professors of pathology and surgery and several lecturers and assistant lecturers. Ordinary and post-graduate courses are provided. The former leads up to a diploma and lasts for three years. The advisability of adding an extra year has been recognised but financial considerations have up till now stood in the way of this. Definite proposals to extend the course have now been made and are being examined. Forty students can be accommodated in each class. Fifteen stipends, of the value of fifteen rupees per month, are granted annually of which a certain number are earmarked for the backward classes; the general instruction is free to all students approved by the Selection Committee.

For administrative purposes the presidency is divided into six circles, each in charge of a gazetted officer. The district staff is divided into assistant surgeons in charge of veterinary institutions and touring assistant surgeons. Veterinary institutions are increasing in number year by year and are now about a hundred. Up till 1922, they were under a system of dual control by Government and local bodies, Government contributing part of the expenses of upkeep. The scheme did not prove successful and complete control of all but a few private institutions was taken over by Government. They provide veterinary treatment, free of cost to all *bona fide* cultivators who care to take advantage of the treatment.

The touring staff were originally engaged mainly in attending to outbreaks of contagious disease. The widespread prejudice against inoculation that existed in the early days required the assistants to be constantly moving about among the villages doing propaganda work, with the result that they were on tour for twenty days in the month. Of late, however, prejudice has given way to such an extent that systematic touring of this kind has been abolished, and when not actually attending outbreaks of contagious disease, this touring staff is employed in running camp dispensaries, which are shifted about every ten days or so, and during that time render whatever aid is required in surrounding villages. At one time, a mobile corps existed for the purpose of dealing with severe outbreaks of rinderpest wherever they occurred, but, the necessity for it having disappeared for the time being, it was disbanded and the staff

was strengthened in the frontier districts through which rinderpest mainly gains access to the presidency.

Administrative and teaching duties make such a heavy demand on the time of the staff that they have but little opportunity for pure research work. Nevertheless, at least two pieces of good research work have been turned out from the Madras College laboratory, one dealing with nasal granuloma, and the other with bovine lymphangitis in cattle.

A Cattle Diseases Act is in force to prevent movement of cattle from an infected area but strict enforcement of its provisions is often found difficult.

### 7. IRRIGATION.

In respect of area under irrigation, Madras stands second among the major provinces of India. The total area irrigated for the five years 1921-22 to 1925-26 averaged over 9·3 million acres, of which 3·8 million acres were under canals, 3·4 million acres under tanks, 1·7 million acres under wells and nearly half a million acres under 'other sources.' The irrigation sources of Madras present special features. Tanks occupy a prominent position, the area irrigated from them being nearly twice as great as in any other province, and over half the total area under tank irrigation in British India. The great irrigation systems, the Godavari, the Kistna, the Cauvery and the Pennar differ completely from those in the north of India. They are in the main deltaic, and the problem has been to regulate the supply rather than to extend it to new areas. The works consist of weirs by which a sufficient head of water is obtained to irrigate the lands of the deltas and of sluices and regulators by means of which the water is conducted over the land. The oldest of these is the Cauvery delta system in the Tanjore district, some two hundred miles south of Madras, which dates back some 1,600 years and, even before the improvements effected in the nineteenth century, irrigated over 600,000 acres. It now irrigates nearly a million acres of first and second crop. Of the modern systems, the Pennar River canals system, 100 miles north of Madras, irrigates about 200,000 acres of first and second crop and 100 miles further north again the great contiguous delta systems of the Kistna and the Godavari irrigate between them 1·8 million acres of first and second crop.

The only example of a great storage reservoir in the Madras Presidency at present is the Periyar system. The main feature of this system is the impounding by the construction of a large dam, 3,000 feet above sea level, of the waters of a river which would otherwise have flowed into the Arabian Sea, and their diversion to the other side of the peninsula through a tunnel bored through the main watershed of the country. This system irrigates about 180,000 acres of first and second crop, mostly in the Madura district.

The possibilities of the large systems fed from anicuts have now been largely exhausted and future irrigation schemes will probably have to be of the expensive reservoir type. Several storage projects have been proposed. The Mettur Reservoir, between the Salem and Coimbatore

districts, which is now under construction will secure and improve the water supply of an existing irrigated area of over a million acres in the Cauvery delta and will bring under irrigation for the first time a further area of 301,000 acres in the Tanjore district, a large proportion of which may be double cropped. On the Bhavani, a reservoir is proposed near Mettupalaiyam and the scheme provides for the irrigation of 110,000 acres of first crop and 60,000 acres of second crop in the Coimbatore district. The two other principal schemes in view are for reservoirs on the Tungabhadra and Kistna rivers. They have been the subject of prolonged investigation ; but both technical and financial difficulties have stood in the way of their execution. Attention is being concentrated at present on a revised scheme for impounding the waters of the Tungabhadra by the construction of a reservoir at Timmalapuram in the Bellary district. This would provide water for wide extensions of irrigation, mainly in the districts of Bellary, Anantapur and Kistna ; and would protect a very large area of dry cultivation in a tract liable to scarcity.

Some 28,000 tanks are controlled by Government and of these nearly ninety per cent are in the charge of the Revenue Department. They vary from large works irrigating thousands of acres by an elaborate network of channels, to small pools protecting a few acres in their immediate vicinity or serving to maintain the water level in neighbouring wells. For the last thirty years, an extensive scheme for restoring tanks which have silted up or otherwise fallen into disrepair has been in operation. The scheme covers an area of 102,000 square miles and, by March 1926, restoration over an area of 80,000 square miles had been made at a cost of 1.5 crores of rupees.

Wells, though not so important as either tanks or canals, irrigate nearly 1,700,000 acres or some 20 per cent of the total irrigated area. In certain districts, such as Anantapur on the northern borders of the Mysore State, the cultivator depends mainly on this source of irrigation. Wells are also specially important in the Chingleput, South Arcot and Coimbatore districts. In recent years, except from 1916 to 1920, when the work was temporarily transferred to the Agricultural Department, the Department of Industries has been responsible for the development of wells. Since the Department of Industries resumed charge in 1920 up to March 1927, 8,630 borings have been put down of which about sixty per cent have been successful. Two surveyors have been employed since 1914 on the work of connecting the levels of bore holes put down by the department with main sea level. These surveyors have so far been able to connect the levels of less than 4,000 out of 7,000 bore holes put down in the districts of Vizagapatam, Kistna, Guntur, Nellore, Chingleput, South Arcot, Tanjore and Trichinopoly. The work is in progress in the Tinnevely and Coimbatore districts. But it is only in the Chingleput and Kistna districts that any appreciable progress has been made and even here, many more borings will be necessary before it is possible to prepare a map of underground water currents. A systematic survey of the underground water supplies would be a very costly proposition.



It has, however, been decided that, as an experiment, an intensive survey of underground water should be made in fourteen villages of Bellary *firka*, a tract liable to drought. The services of a practical water diviner to minimise the number of unsuccessful borings will also be utilised in connection with this experimental survey.

The Table below gives the main particulars of the progress of irrigation in the presidency up to March, 1927, from the year 1908-09, the first year for which figures are recorded in the "Agricultural Statistics of India" in a fairly complete form :—

Year	Area sown.*	Percentage of increase or decrease over 1908-09	Area irrigated*	Percentage of increase or decrease over 1908-09	Percentage of area irrigated to area sown
1908-09	Acres 38,035,000	....	Acres 10,827,000	....	28·5
1914-15	39,091,000	+2·8	11,282,000	+4·2	28·9
1920-21	37,606,000	-1·1	11,177,000	+3·2	29·7
1924-25	37,924,000	-0·3	10,956,000	+1·2	28·9
1926-27	37,367,000	-1·8	10,570,000	-2·4	28·3

\*Areas twice sown and twice irrigated are counted twice.

The areas irrigated by canals, tanks, wells and other sources at the beginning and end of this period are as follows :—

Year	Canals	Tanks	Wells	Other sources
	Acres	Acres	Acres	Acres
1908-09	3,554,000	3,189,000	1,322,000	1,376,000
1926-27	3,928,000	3,073,000	1,570,000	437,000

Irrigation in the presidency is free from any serious problems arising from alkalinity or waterlogging. Here as elsewhere, however, damage to the soil has occurred in many irrigated areas owing to over-watering. Experiments have been made by the Agricultural Department with a view to determining the amount of water which crops require to give the best results and, on the basis of these experiments, propaganda work has been carried out among the cultivators. It is thought that the introduction of the volumetric system may probably prove the ultimate solution of the problem of securing an economical use of water but there appears no prospect of introducing the system until the cultivators on a branch distributary are willing to co-operate in the distribution of water. It is, therefore, the policy of Government to encourage the formation of irrigation *panchayats* with a view to creating a spirit of co-operation. Certain irrigation channels in the Godavari and Kistna deltas are already managed by *panchayats* and the majority of them are doing their work satisfactorily.

Irrigation advisory boards which, as their name implies, have no executive functions, have been constituted for the irrigated areas under the Godavari, Kistna and Cauvery.

The Government have decided to retain in their own hands the development of the hydro-electric resources of the presidency. The scheme for utilising the waters of the Pykara in the Nilgiris is the only important hydro-electric project which is under active consideration. The scheme is designed to supply the districts of the Nilgiris, Coimbatore, Salem, Madura and Trichinopoly in its first phases, besides supplying current for the electrification of two or three sections of the South Indian Railway. The estimated expenditure is between three and four crores of rupees for an installed capacity of 37,500 K.W. Ultimately this may possibly develop into a wider project with a capacity of 67,500 K.W. and a distribution system extending to Madras. Other schemes are being investigated also, the two chief being for the generation of power at Papanasam in the Tinnevely district and at Kolal in Vizagapatam.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

The forests of the presidency cover an area of about 19,000 square miles. They have been divided into two main classes, forests which are of provincial importance, as being either remunerative to the State or protective, and areas, mainly scrub jungle or grass reserve, which are of strictly local importance. In regard to the latter, Madras has broken away from traditional methods of forest administration in India by handing over large areas to *panchayats* working under the Board of Revenue and the District Collector. 3,360 square miles of reserved forest have been classified as ryots' forests, of which 3,264 square miles had been handed over at the end of January, 1928. The *panchayats* are supervised by a special Panchayat Officer who works under the Board of Revenue which fixes the rent to be paid for the *panchayat* area and the number of cattle which may graze in any particular area. All other details of management are left entirely to the *panchayat*. Where the area when under the management of the Forest Department yielded a net revenue, the rent fixed is always less than this. In some cases, no rent is levied and in others, it is charged for three years only. The ryots' forests mainly provide grazing and fodder but some of them are not unimportant as sources of fuel. In the Nellore district, for example, areas bringing in a revenue of some Rs. 40,000 a year, when worked for fuel, have been transferred to *panchayat* management, as have forests in the Coimbatore district which provide the Erode market with 500 tons of fuel annually. Many *panchayats* are attempting to develop the reserves handed over to them as sources of fuel supply and it is reported that there is a growing improvement in the protection of these reserves and in the interest taken by the villagers in limiting the number of cattle admitted to them, in enforcing the accepted grazing rates and in closing the reserves temporarily to improve pasture.

Speaking broadly, the large forest blocks in Madras are not so remote from close cultivation as they are elsewhere. The grazing in the forests which remain in the charge of the Forest Department is of great importance to the cultivator. In 1926-27, 15,769 square miles of these forests were open to grazing by all animals except goats, 849 square miles to all

animals except sheep and goats and 2,077 square miles were closed to grazing throughout the year. Occasionally, free grazing is permitted by rights under forest settlement or at the pleasure of Government; in other cases fees are levied, and may be charged at full rates or at privileged rates, or at enhanced or special rates, all of which again vary very considerably from district to district. The general policy is to charge twice as much for a cow as for a sheep, and twice as much for a buffalo as for a cow. The full rate for a cow generally falls between the limits of three and eight annas. A total of 1·81 million animals were admitted in 1926-27, mainly bullocks and cows and sheep, and the total revenue from grazing amounted to about 7·5 lakhs of rupees.

### 9. GENERAL EDUCATION.

Burma and Bengal are the only two provinces in which the proportion of literates is higher than it is in Madras. In the census of 1921, 21·4 per cent of the men and 2·2 per cent of the women in the Madras Presidency were returned as able to write a letter and read the reply to it. These percentages are for all parts of the presidency and, in estimating literacy in rural districts, allowance must be made for the comparatively high percentage of literacy in the city of Madras and other big centres of population.

The total expenditure on education in Madras was Rs. 453 lakhs in 1926-27, as compared with Rs. 217 lakhs in 1916-17 and Rs. 98 lakhs in 1906-07. The expenditure\* on primary education for boys and girls was :—

				Rs. (lakhs)
1906-07	..	..	..	28·83
1916-17	..	..	..	70·13
1926-27	..	..	..	170·51

Of the total expenditure in 1926-27, forty-five per cent was met from provincial funds, fifteen per cent from local and municipal funds, twenty per cent from fees, and twenty per cent from subscriptions and other sources. Ten years before, provincial funds had provided thirty-six per cent, and twenty years before, only twenty-six per cent of the total expenditure.

The total number of male scholars in recognised institutions in 1927 was 1,920,000 of whom 1,713,631 were attending primary schools. If the primary school age is taken as from five to ten years, and the figures of the 1921 census are used for that age period, the percentage of boys of primary school age in Madras attending school in 1927 was 60.

The total number of female scholars in recognised institutions in 1927 was 521,000 of whom 500,300 were attending primary schools.

Calculated in the same way as for male scholars, the percentage of girls of primary school age attending primary schools in Madras in 1927 was 17.

\* Excluding the cost of the inspectorate for which no separate figure for primary schools is shown

In addition to the figures given above, 81,000 males and 1,000 females were attending unrecognised institutions.

The following Table gives further particulars regarding male education in recognised educational institutions in the province :

Kind and number of institutions for males	Number of pupils	Percentage at each kind of institution	Cost per pupil.*
60 Arts colleges ..	12,200	0·6	184·3
10 Professional colleges ..	2,177	0·1	482·1
342 High schools ..	139,477	6·4	46·7
212 Middle schools ..	27,583	1·2	43·4
46,389 Primary schools ..	1,986,645	90·7	7·2
349 Special schools ..	21,797	1·0	171·2
47,362 Total ..	2,189,879	100·0	13·25

\*Based on direct expenditure only.

At the head of the Madras educational system stand the Madras and Andhra universities. The Andhra University, which was constituted as recently as 1926, serves the Telugu-speaking area of the presidency. Both universities have a teaching as well as an examining or external side but the latter is at present predominant. The Madras University was founded in 1857 and is thus one of the three oldest universities in India. It has a faculty of agriculture and grants degrees in agriculture to students of the Coimbatore Agricultural College.

From the point of view of general rural education, the primary schools are of much more importance than the colleges and the high and middle schools. Primary education has received much attention of recent years. The principle of compulsion at the option of local authorities was introduced by the Madras Elementary Education Act of 1920, though but little progress has so far been made in either urban or rural areas as the local authorities have been reluctant to submit schemes under the Act mainly owing to difficulties of finance. By the end of 1926-27, only 21 out of 80 municipalities had introduced compulsory education. Three taluk boards have also introduced compulsion in selected areas. In 1924, a comprehensive survey of the educational position in all the taluks was carried out and one of its results has been the provision of a large number of schools in villages of 500 inhabitants and over which were formerly without them. In 1926-27, three hundred schools were opened under *panchayat* management as an experimental measure. Most of these schools are single-teacher schools. In Madras, as in other provinces, the rate of wastage between the first and second classes is disturbingly high. At present, 60 per cent of the children never get beyond the first class. Several causes contribute to this wastage, the chief of which are the indifference of the parents and the inefficiency of the single-teacher school. The pay of the teacher was increased in 1922 but still remains very low. A teacher in a lower elementary school under government management is still only on a scale of Rs. 20-1-30 per mensem, if he is trained, and if

he is untrained he receives only Rs. 15 per mensem. For the higher elementary schools the salaries are Rs. 25-1-50 and Rs. 20 per mensem, respectively. Endeavours are being made not only to increase the number of trained teachers but to improve their quality and, in 1923, the Union Mission Training School at Vellore started training teachers on lines somewhat similar to those of the Moga training school in the Punjab.

The education of the girl is of equal, if not greater, importance for rural welfare. While there has been steady progress of recent years in university education for women, the same cannot be said of secondary and primary education. A feature of female education in Madras is the increasingly large number of girls attending elementary schools for boys. In 1926-27, 298,632 girls attended boys' schools or more than 50 per cent of the total number of girls attending primary schools of any kind.

Up to the present, educational policy has been directed chiefly towards developing general education in the rural districts and far fewer experiments than in some other provinces have been made in the direction of providing a special type of agricultural education. The agricultural middle schools at Taliparamba and Anakapalle have been described in connection with agricultural education where it has also been mentioned that the institution of an alternative agricultural course in higher elementary and middle schools on the lines of the agricultural classes in the vernacular schools of the Punjab is under consideration. Under the scheme for practical vocational training in secondary schools, instruction in agriculture is given in four such schools.

Now that the introduction of machinery into agricultural operations and the development of rural industries is being more and more canvassed, the excellent training given at the Government Trades School in the city of Madras in mechanical and electrical engineering deserves mention.

It would not be proper to close this review of education in the Madras Presidency, brief though it is, without a reference to the remarkable educational work now being done under the direction of the Commissioner of Labour for the depressed classes who number about  $6\frac{1}{4}$  millions out of a total population of 42·8 millions. Religious missions, philanthropic institutions and individual social workers all give their help and in the past five years no fewer than 783 schools have been started with a total strength of over 32,000 pupils.

Finally, whatever makes the country boy a better player as well as a better worker will also make him a better man and a better cultivator. It is, therefore, of good omen that the boy scout movement is steadily gaining in strength in the presidency and is now beginning to make its influence felt among the boys attending elementary schools in rural districts.

## 10. CO-OPERATION.

As in other parts of India, the co-operative movement in the Madras Presidency dates from the year 1904 when the first Co-operative Credit

Societies Act was passed by the Indian Legislature. But even before that date, the Government of Madras had realised the great possibilities of the movement and had, in 1892, deputed Mr. (now Sir Frederick) Nicholson "to study the theory and practice of the agricultural and other land banks in Europe and to suggest means by which a similar improvement may be popularised in India." The existence, in the presidency, of a number of successful indigenous institutions known as *nidhis*, which were similar to the Friendly and Building Societies of Great Britain, made the province a hopeful field for experiments in co-operation. Sir Frederick Nicholson submitted two reports of great interest and value in 1897-99 and, although no action on them was taken until the Act of 1904 was passed, they were instrumental in familiarising a number of people interested in the economic advancement of the community, with the ideas underlying the movement and the advantages to be derived therefrom.

The earlier rural societies were all credit societies formed for the purpose of giving the ryot financial accommodation for the purchase of agricultural requisites and of the necessaries of life and for the payment of government revenue. Progress was at first necessarily slow, as the work was more or less experimental. The ignorance and suspicion of the people, for whom the movement was started, prevented any great development in the organisation of societies. Another obstacle was the difficulty in getting the necessary funds to finance the societies. Most of the potential depositors lived in urban areas and could not be expected to have sufficient confidence in the newly formed village societies to entrust their money to them. The organisation of the Madras Central Urban Bank in 1906, and of four more financing banks during the next four years, led to the rapid growth of the rural credit societies in their neighbourhood. Reference is made below to the formation of additional central banks and to their influence on the acceleration of the rural credit movement in the presidency.

The growth of the agricultural movement is shown in the following statement:—

Year	Credit societies	Societies for purchase, production and sale	Other forms	Total
1904-05	8	....	....	8
1912-13	1,006	2	....	1,008
1917-18	2,271	19	....	2,290
1919-20	4,156	60	2	4,218
1921-22	6,206	79	4	6,289
1925-26	9,822	103	253	10,178
1926-27	11,000	132	304	11,436

(Note.—The majority of the societies of "Other forms" are societies for the acquisition or leasing of land for cultivation by members of the depressed classes.)

At the end of the year 1926-27, the co-operative movement, urban and rural, had a membership of about 833,000, of whom 497,940 were agriculturists.

These can be classified as follows :—

Non-cultivating landholders	..	..	..	52,650
Cultivating landholders	..	..	..	338,611
Tenants	..	..	..	63,378
Field labourers	..	..	..	43,301

It will be seen that the societies benefit not only ryots but also tenants and agricultural labourers. In the year 1926-27, the societies advanced to their members a sum of Rs. 236.5 lakhs, of which Rs. 144 lakhs was for productive purposes, Rs. 89.3 lakhs for reduction of prior debts and Rs. 3.3 lakhs for non-productive purposes. Analysing these loans further, we find that Rs. 39.5 lakhs were advanced for cultivation expenses, Rs. 16.3 lakhs for the purchase of cattle, Rs. 13.8 lakhs for the improvement of land, and Rs. 10.5 lakhs for purchase of land. During the last twenty-three years, a total sum of over Rs. 14 crores has been advanced by co-operative credit societies to agriculturists at reasonable rates of interest and on easy terms of repayment. Of that amount nearly Rs. 9½ crores were given for productive purposes. The saving to the agricultural population in the shape of interest which the co-operative movement has made possible can be gauged from the fact that the rates of interest charged by societies vary from 9¾ to 10 <sup>15</sup>/<sub>16</sub> per cent as against the 12 to 75 per cent charged by moneylenders.

As has been pointed out above, the progress of the primary credit societies was considerably accelerated by the formation of central banks which have been able to attract a large amount of capital from the public. The number of such central banks, including the Provincial Bank, is now 32 and their working capital over Rs. 6 crores. The deposits which these banks receive at present are more than sufficient to meet their requirements, and, at the end of last year, there were large surpluses in many of the district banks as well as in the Provincial Bank, though these have since been somewhat reduced. There has been no increase in the number of such banks since 1921, as one central bank is usually sufficient to serve the needs of a district. The first few banks consisted entirely of individual shareholders who subscribed substantial amounts of money as the share capital. Now all the banks are of a mixed type, in which primary societies as well as individuals hold shares and both are represented on the directorate. The Madras Central Urban Bank, Ltd., which was the first central bank organised, has been converted into the apex bank for the presidency and its membership is restricted to district central banks and to individuals. The bank finances central banks but it has lent a very small fraction of its working capital to individuals against their deposit, a privilege which other central banks also enjoy.

Neither the rural credit societies nor the central banks have enough long-term capital to enable them to give sufficiently long-term loans for the liquidation of old debts or for land improvement. To overcome this

difficulty and to bring more long-term money into the movement, it was decided some three years ago to form a number of co-operative land mortgage banks. Fifteen such banks have actually been organised. The operations of each bank which is formed on the limited liability basis are restricted to a compact group of villages situated not more than five to seven miles from the bank's headquarters. The bank issues debentures for sale to the general public on the security of the landed property which the individual borrowers pledge to it. As the scheme is still in the experimental stage, Government have agreed to buy a portion of the debentures so issued.

One unsatisfactory feature in the working of the primary societies in the Madras Presidency has been the increase in overdue arrears in the last few years. Owing, however, to lack of uniformity in the method of calculating overdues in different provinces, it is not possible to compare accurately the position in the presidency with that in other provinces. In the case of primary societies, the percentage of the amount overdue to the demand under principal has increased from 31 in 1920-21 to 46 in 1926-27. As the increase was causing anxiety and in view of other considerations, a committee was appointed in 1927 to review the whole position of the co-operative movement and it has recently submitted a report to Government.

On the passing of the Act of 1912 which allowed societies for non-credit purposes to be registered, the by-laws of all credit societies were amended so as to enable them to undertake joint purchase of the domestic and agricultural requirements of their members as well as the joint sale of their agricultural produce. The local supervising unions were also authorised to act as agents for their affiliated societies in the matter of joint purchase and joint sale. The work of purchase and sale was entirely based upon indents received from members, the societies merely acting as agents. At the same time special societies called trading unions, were started in some areas for joint purchase and sale and attempts were made to supply them with all the necessary information and to place them in touch with wholesale merchants in Madras. Owing to the inadequacy of the official staff and the great difficulty in organising non-credit work, progress in this direction was slow. A stimulus to this branch of the work has, however, been given by the reorganisation of the upper controlling staff in 1925, and more organised work is now being done for the development of agricultural supply and marketing. A recent development which has made considerable progress has been the function of special societies known as crop loan societies or loan and sale societies to advance loans on the pledge of agricultural produce. Such loans are also given by the ordinary rural credit societies. The special societies advance money on the pledge of produce deposited with them for safe custody and for eventual sale. In 1926-27, advances were made on the pledge of produce to an extent of Rs. 9·34 lakhs. In order to remove one of the chief obstacles in the way of the development of these societies, Government have agreed to give long-term loans to a few of them to enable them to procure suitable godown accommodation. Another class of societies which deserves mention is that which deals with the



preparation of agricultural produce for the market and for the manufacture of certain agricultural requirements, such as bonemeal and other manures. Societies have also been organised for the hulling of rice, its preparation for the market, for the crushing of sugarcane and manufacture of jaggery, for the crushing of bones and phosphatic nodules and for the decortication of groundnuts. A recent addition to the non-credit movement in the presidency has been the co-operative agricultural demonstration societies, now thirteen in number, of which the society at Lalgudi in the Trichinopoly district was the first. These societies are organised for the purpose of demonstrating to the local agriculturists the value of the improved methods of cultivation, appliances, seed, and manures recommended by the Agricultural Department. A plot of land is taken on lease and is divided into two halves, one of which is cultivated on the old and the other on the improved system. All the work is done by the members or their employees under the guidance of the local officers of the Agricultural Department. The results so far have been very promising. A reference may here be made to the co-operative labour societies which secure work for small agricultural landowners, tenant cultivators and agricultural labourers during their slack time, by taking contracts from Government and local bodies for works which require mainly unskilled labour. There were 57 such societies in 1927, which secured for their members contract work of the value of nearly 7.5 lakhs.

There were also, on 30th June 1927, 109 building societies with 3,383 members and with a total paid-up share capital of Rs. 6.8 lakhs. These societies are given loans by the Government, ordinarily for 20 years, at six-and-a-half per cent interest. They lend to members at seven to seven-and-a-half per cent for the construction of dwelling houses. On June 30th, 1927, the total amount of government loans outstanding with these societies was Rs. 13.5 lakhs and about 1,000 houses had been built.

A dozen milk supply societies have been organised in the Chingleput district in the neighbourhood of the city of Madras. A union for these societies has since been formed and milk and curd prepared by them are taken to the city of Madras regularly in a motor lorry.

Societies for the depressed and backward classes are a special feature of the co-operative movement in this presidency. Last year there were 2,578 of these societies with a membership of 120,093. Their share capital and reserve fund exceeded Rs. 8 lakhs, and borrowings Rs. 18.3 lakhs. 1,600 of these societies are in the charge of the Labour Department.

As regards the question of future progress, while the organisation of agricultural credit societies is now largely in the hands of non-official agencies, these have not yet reached such a stage of efficiency that they can be solely entrusted with organisation, supervision and finance.

The supervision of credit societies has been taken over, during the last few years, by local supervising unions which have been specially organised for the purpose. The vast majority of rural credit societies are now linked up with these unions of which there are 366 in the presidency.

Each union consists of twenty to thirty societies usually within a distance of seven to ten miles. These unions are on the whole progressing fairly satisfactorily and in the more progressive areas are developing a considerable sense of responsibility as well as efficiency and business-like habits. They are federated into district organisations, known as district co-operative federations which, besides co-ordinating and guiding the work of the unions, train the *panchayatdars* of the societies. Responsibility for the development of the non-credit movement remains to a very large extent with the departmental staff. There is also a Provincial Co-operative Union in addition to two other propagandist unions, the Andhra Sahakara Sammelanam at Rajahmundry and the Hood Co-operative Institute, Tanjore. These undertake the work of propaganda and training, but do no supervision.

The Director of Agriculture has in recent years attempted to treat the local supervising unions as his agents for the distribution of improved seed, manures and implements and has also used the co-operative movement for the multiplication and distribution of such seed, but with very limited success. Co-operation between the two departments is also secured by meetings of agricultural and co-operative officers in departmental and other conferences.

The staff of the Co-operative Department, excluding clerks and menials, consists of the Registrar, the Joint Registrar, 9 deputy registrars, 27 assistant registrars and 338 inspectors. In addition, the Labour Department has 67 inspectors doing co-operative work. The Joint Registrar, deputy registrars and 24 inspectors look after non-credit work. The cost of the department to Government last year was Rs. 7,29,636.

## 11. COMMUNICATIONS AND MARKETING.

The presidency is, on the whole, fairly well provided with transport facilities. Regular traffic along the coast is maintained by steamers between the chief ports, whilst on the east coast from Cocanada to Madras and further south, there is, for nine months in the year, an unbroken system of inland water carriage. As regards inland traffic, the area to the south of Madras is served by the South Indian Railway and to the north of Madras by the Madras and Southern Mahratta Railway. The open milage of railway during the year 1922-23 was, broad gauge, 1,718 miles; metre gauge, 1,993 miles; and narrow gauge, 123 miles. In addition to this, there are 275 miles of railway owned by the district boards of Tanjore, Kistna, Coimbatore, Guntur, Salem and Tinnevely. Further construction is in progress.

The total milage of roads maintained by the Public Works Department is 1,096, and by local authorities 27,279; of these 20,275 miles are metalled and 8,100 are unmetalled.

Roads are classified under four heads :

- (a) First class roads or trunk roads.
- (b) Second class roads.
- (c) Third class roads or other district roads.
- (d) Other roads or taluk board and village roads.

Trunk roads are those which were originally Imperial roads and were maintained out of Imperial funds, trade routes or lines of through traffic between one district and another, or roads required for military purposes. The Government determine which roads shall be so classified and, since 1920, meet the actual expenditure incurred by local bodies on such roads, subject to a maximum of Rs. 500 or Rs. 1,000, per mile, according as the road is maintained by a district board or a municipal council. The total annual provision by Government on this account is Rs. 16.45 lakhs. The length of trunk roads is about 3,150 miles. In addition to trunk roads, some hill roads and the roads in the Agency tracts are constructed and maintained by Government.

For second class roads, which are not of the same importance as trunk roads but serve more than local needs, Government make a grant of half the cost of maintenance in rural areas, subject to a maximum for the whole district. Each district board determines for itself which roads should be included in this class. The length of roads so classified is about 12,460 miles and Government contribute each year a grant of Rs. 15.53 lakhs, provided that the total expenditure is at least double the amount of the grant. Collectors are required to make an annual report on the condition of the roads and, if it is considered that any of these are being neglected, the government grant is liable to be reduced.

When the classification of roads was made, it was intended that third class roads and village roads connecting the villages with the district roads should be made and maintained by the local boards concerned from their own resources. Local boards, however, have been able to spare very little towards this purpose and, in fact, village roads are little more than fair-weather tracks and seldom receive any attention whatsoever, and during the monsoon are impossible for vehicular traffic of any sort. As the result of a special representation, Government, since 1925, have been allotting annual grants of several lakhs to district boards for distribution among local bodies for the improvement of village communications, subject ordinarily to the condition that the local boards in each district should contribute from their own resources an amount equal to that allotted to that district. District board works are carried out by a Local Fund engineering establishment, consisting of a district engineer paid from provincial funds and of a subordinate staff paid from local funds.

The methods by which agricultural produce passes from the producer to the ultimate consumer are far from satisfactory. The cultivator suffers from many handicaps : to begin with, he is illiterate and, in general, ignorant of prevailing prices in the markets, especially in regard to commercial crops ; again, he is often indebted to the village merchant and moneylender and, therefore, is not free to market to the best advantage ; further, as pointed out above, communications are often defective and this makes the cost of transport unnecessarily high ; and, finally, he is handicapped by the lack of standardised weights and measures and by the numerous deductions to which he is subjected, either in the name of

charity and religion or over and above what might be regarded as the legitimate recompense of the middleman.

The keynote to the system of marketing agricultural produce in the presidency is the predominant part played by the middleman. There are different grades of middlemen in the case of different crops and, on the whole, they play a larger part in the case of commercial crops such as groundnut, cotton and jaggery than in the case of ordinary food crops. Their part varies, too, according to the economic condition of the cultivator. The rich ryot who is unencumbered by debt, and who has comparatively large stocks to dispose of, brings his produce to the taluk or district centre and sells it through a commission agent locally known as the *dalal* merchant. If it remains unsold on the day on which it is brought in, it is stored in the *dalal's* godowns at the cultivator's expense and as the latter cannot generally afford to wait about until the sale is effected, it is doubtful if, in many cases, he receives the full sale value. The middle class ryot generally disposes of his produce through the same agency but, unlike the rich ryot, he is not free to choose his commission agent, because he has usually taken advances from a particular *dalal* on the condition that he will hand his produce over to that *dalal* to sell. Not only, therefore, does he sell at an unfavourable rate but he pays a heavy interest, up to 36 per cent or even more, on his advances. His relations with the middleman are those of creditor and debtor, rather than of selling agent and producer. In almost all cases, the major portion of the produce of the poor ryot finds its way into the hands of the village moneylender. Whatever remains is sold to petty traders who tour the villages and the price at which it changes hands is governed not so much by the market rates as by the needs of the ryot.

In the case of commercial crops for export, such as groundnut, there is a long chain of intermediaries between the producer and the exporter. The exporting firms have no direct dealings with the producer. First in the chain comes the village merchant and moneylender, or the more well-to-do ryot, who buys at a cheap rate and charges heavy interest on advances; if he is in business on a substantial scale, he may sell direct to the brokers of the exporting firms; if not, he deals with the wholesale merchant in the town, who in turn does business with the broker of the exporting firm. Where producing areas lie close to towns, the wholesale merchant frequently takes the place of the village merchant.

It is the cultivator's chronic shortage of money that has allowed the intermediary to achieve the prominent position he now occupies. Where the cultivators are tolerably well off, as in the Kistna and Godavari deltas, his position is not by any means so strong. There, the ryot, once he has paid his land revenue (*kist*) keeps a very steady eye on the prices prevailing for rice imported from Burma, and is in no haste to come to terms with the agent or buyer if the terms do not suit him. The ultimate market for his produce (Madras city and the inland districts of Coimbatore and Salem) is close at hand; he sells his husked rice to local mill-owners

who hull it before passing it on, and who are at least as much concerned to keep their mills working as they are to beat down prices. Thus, in these deltas, the marketing of produce is on a reasonably satisfactory basis. The man who tills the land in the Cauvery delta is not in quite such a happy position, because much of the valuable land there is in the hands of a small number of large landholders, who lease out their land on the share system and who, therefore, accumulate the bulk of the surplus available, for export to Ceylon.

Forward contracts enter very largely into the system of marketing cotton. As in the case of groundnut, the producers have no contact with the larger exporting firms. The latter enter into advance contracts with local merchants for the supply of a definite quantity of cotton at a definite price. The element of speculation so introduced probably affects the cultivator but little in the long run, since the low price he gets in years of heavy outturn will be compensated by the higher price which the merchant will be forced to pay in years when the crop is short and the contract difficult to fulfil.

A Cotton Transport Act is in force in three tracts which produce well-known trade types of cotton (Northern and Western, Tiruppur-Cambodia and Tinnevelles). The object is to maintain and improve the standard of the cotton in the protected areas by preventing inferior cotton being brought in. Previous to the introduction of the Act, merchants and middlemen intent on immediate profit had made a practice of importing inferior cotton with the object of mixing it with quality cotton and so obtaining a price approximating to that of the pure grade, or even of passing it off in its entirety as the genuine article. Under the provisions of the rules issued under the Act no lint, *kapas* or seed may be imported into these areas by rail or sea except under a license issued by the Director of Agriculture. The Act has not yet been applied to imports by road on account of the great difficulties of such control. As a result of the experience of the working of the Act, it has been found necessary to alter the regulations with a view to combine the Tinnevelles and Cambodia areas into one and to allow free movement of cotton seed without license, and it is proposed to take necessary legislative sanction to permit of this.

The sugarcane grower generally markets his produce as jaggery. A special system is in vogue in South Arcot where the East India Distilleries Company advances both sets and money to the cultivators, on the condition that the cane is sold to them.

Scattered up and down the presidency, at distances varying from ten to twenty miles, are innumerable weekly markets owned mostly by local bodies and, in some cases, by private individuals. These are the centres to which, week by week, the cultivators and their families flock in their hundreds to buy their day to day requirements which they pay for either in cash which they have brought with them, or from the proceeds of small lots of produce which they have brought for sale. In certain tracts, as for instance in the Agency and the Nilgiris, barter still lingers. In the

deltas, where practically nothing but rice is grown, the weekly market supplies all the other necessaries of life and, at the end of the day, there is generally a considerable accumulation of unhusked rice which finds its way into commerce through the medium of the agents of town brokers who are sent out to buy it. In areas where cropping is diversified and supplies the bulk of the food requirements of the local population, the markets are primarily centres at which small lots of produce of different kinds are re-shuffled, the buyer of one kind being the seller of another, and are therefore of little importance as centres from which large quantities of produce are sent out of the district.

## 12. LOCAL SELF-GOVERNMENT.

Local self-government in Madras is regulated by the provisions of the District Municipalities Act, the Local Boards Act and the Village Panchayat Act of 1920 and the Madras City Municipal Act of 1919. The local authorities are the municipal councils, district, taluk and union boards and the village *panchayats*. Separate district boards have not yet been constituted for the East and West Godavari districts, but, with this exception, the area under the district board is the revenue district, excluding municipalities of which there are eighty. The total number of district boards is 24 of which 15 have been granted the privilege of electing their own presidents. The maximum membership of a district board is 52. Not more than one-fourth of the members may be appointed by Government and the remainder, excluding presidents of taluk boards who are *ex-officio* members, are elected by taluk boards. In some districts, taluk boards have been constituted for each revenue taluk but more frequently the area of their jurisdiction corresponds to the revenue subdivision and comprises more than one taluk. There are now 129 of them. The maximum membership is restricted to 24, not less than three-fourths of whom are elected, the remainder being nominated by the president of the district board. Union boards, of which there are 486, may be constituted for villages with a population of 5,000 and over and such bodies exist in all districts except the Nilgiris and South Kanara. Membership is restricted to a maximum of fifteen, not less than three-quarters of whom are elected by the taxpayers, the remainder being appointed by the president of the district board. The Madras Local Boards Act of 1920 defines the powers of supervision and control which may be exercised by district boards over taluk boards and by district and taluk boards over union boards. The main source of income of the district and taluk boards is the land cess of one anna in the rupee of the annual rental value of all lands in the district which is shared equally between the taluk board concerned and the district board. In addition, the district board is empowered to levy, for district board purposes alone, an additional cess of three pies in the rupee as is the taluk board for its own purposes. The other sources of income of the district board are tolls on carriages, carts, and animals, taxes on professions, companies and pilgrims, rents from fisheries and fees for the use of markets, cart-stands and slaughter-houses. The income of the union boards is mainly derived from a tax on houses which is levied in all unions.

As elsewhere, the ordinary duties for which local boards are responsible are the construction and maintenance of roads, bridges, hospitals, dispensaries, markets, waterworks, wells and drains, the training of nurses and vaccinators, sanitation and the diffusion of education. Elementary education in Madras is governed by the provisions of the Elementary Education Act of 1920 under which district educational councils are constituted. These councils consist of a president and such members as the Government may prescribe. The president of the district board is an *ex-officio* member of the council and the district board is entitled to elect an additional representative. Municipalities and taluk boards are also entitled to elect representatives. An elementary education fund is constituted for each municipality or taluk board area, the main contributions to which are grants from Government and the proceeds of a tax not exceeding twenty-five per cent of the taxation leviable under the heads, land cess, tax on companies, profession tax and house tax in taluk board areas and property tax, tax on companies and profession tax in municipalities. Where this taxation is levied, as it now is by 93 taluk boards out of 129, the Government make an additional grant of an equal amount.

The functions and the sources of income of the village *panchayats* are very similar to those of the larger bodies. The local Government may also entrust to them the management, protection and maintenance of village forests and the protection, maintenance and management of irrigation works. The *panchayat* movement appears to be gaining in strength. No less than 991 of them were constituted in 1926-27, bringing the total number at the close of that year up to 1924.

### 13. PUBLIC HEALTH AND SANITATION.

A visitor to Madras who is acquainted with agricultural communities in western countries cannot fail to be impressed with the generally poor physique of the Madras cultivator. The average expectation of life for a male at birth is 26 years and for a female 27.5 years; and the expectation of life in Madras is markedly higher than in any other province in India, excluding Burma.

The problems which confront those whose work it is to seek to improve the general health of the community are many and complex. They originate primarily in the conditions under which the villagers, who constitute nearly 88 per cent of the total population, live. Dwelling houses are badly constructed, devoid of light and ventilation. The houses of the very poor (and these unfortunately form the great majority) harbour both the human and the cattle population under the same roof; and cowdung and house refuse are accumulated in the close vicinity of the houses. In villages which have more than one source of water supply, no particular well or tank is reserved exclusively for drinking water and pollution by washing, bathing and by animal and human organic matter is universal. No system of drainage is in practice, with the result that pools form in every depression during the rainy season and stagnate in the hot weather. Of sanitary arrangements there are almost none so that

the soil in and around the village becomes polluted and all waterways are a positive danger. For medical assistance a villager may have to travel miles to the nearest dispensary, unless he is prepared to entrust himself to the administration of the "quack". Little wonder, then, that the deaths from preventible diseases reach appalling figures. Of these, the most violent and the most dreaded—cholera, small-pox and plague—are not the most dire in their results. A far heavier toll is taken by diseases like fevers and dysentery, not only in the number of deaths for which they are responsible, but in the general enfeeblement and consequent lowering of productive capacity which they leave in their train. A large proportion of the deaths registered under fevers is ascribed to malaria. People are well aware of the value of quinine as a specific against this disease and, were it available in sufficient quantity and at a price within the means of the people, it would be widely used. But in present conditions, the cost of any scheme of general distribution is prohibitive.

Figures are available which show that in the wet districts, especially where rice cultivation is the main occupation, eighty to a hundred per cent of the people are heavily infected with hookworm. This disease, though not immediately fatal, steadily undermines the physique of the population as do fevers and dysentery. Tuberculosis is believed to have increased rapidly within the last two decades, though accurate statistics are not available. Finally, the proportion of deaths in maternal cases is four times as high as it is in England, and, little wonder, in view of the fact that for every 1,000 births registered in 1927, only 55 women received skilled attention during labour.

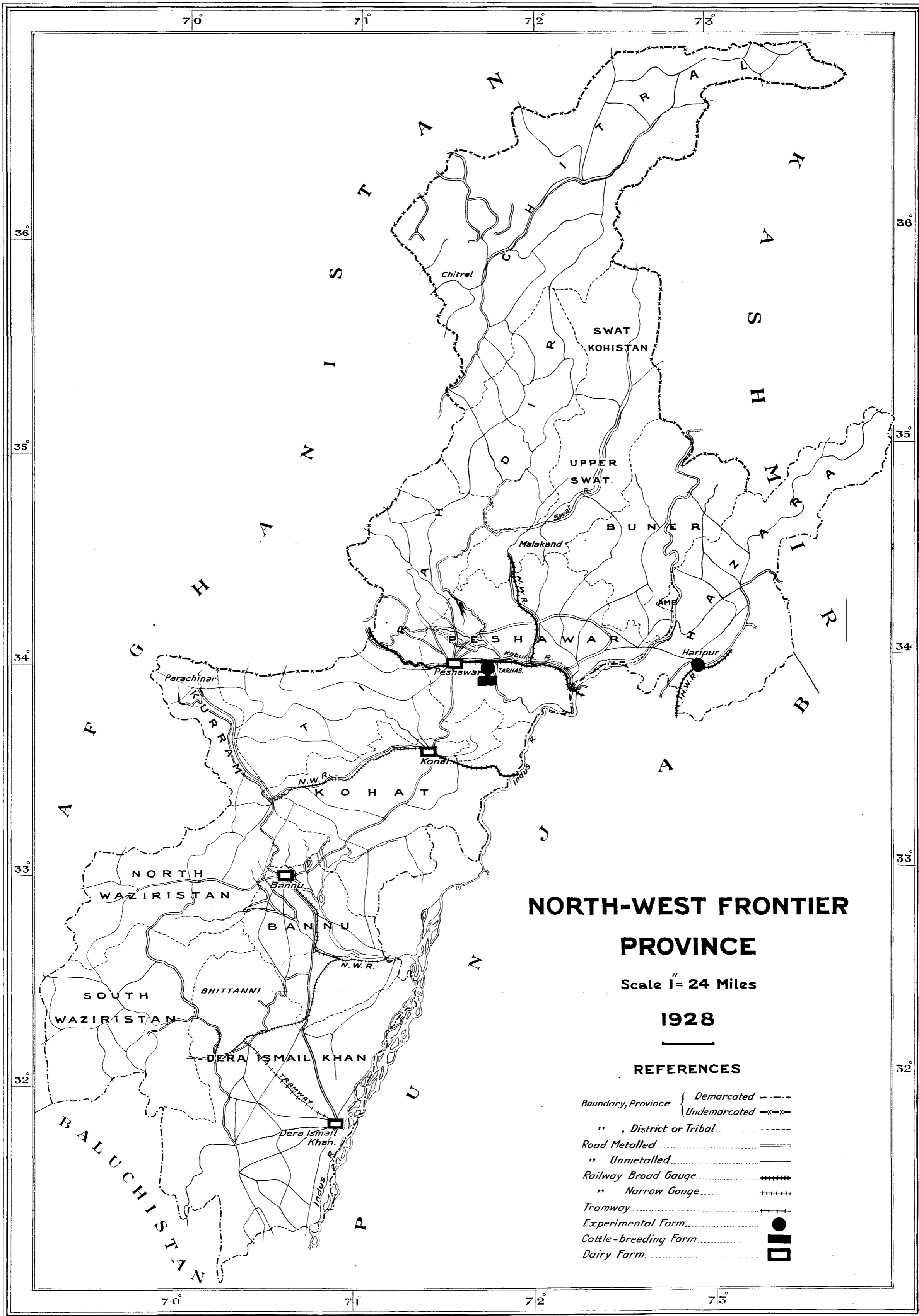
Such is, in brief, an indication of the problems which lie before the Public Health Department. It remains to describe how these problems are being tackled.

Prior to the introduction of the District Health Scheme in 1922 and 1923, no co-ordinated system of public health administration existed. Separate organisations there were, each under separate control. The Collector was responsible for plague measures, the Director of Public Health for cholera, and the vaccination staffs were controlled by local bodies. From 1923, three assistant directors of public health have each been placed in charge of a bureau in the office of the Director. A trained health officer is entrusted with the public health administration of each district, and each taluk has at least one health inspector who is under the supervision and control of the district health officer. The strength of the district staff in 1927 was 25 health officers and 252 inspectors. All these officers are government servants, whose services are at the disposal of local bodies for carrying out the provisions of the Local Boards Act, 1920. The salary of all health officers is paid by Government, but, in the case of municipal health officers, twenty-five per cent of the average cost of the posts, together with the proportionate leave and pensionary contribution, is recovered from the municipal councils. The whole expenditure in connection with the prevention of epidemics and for the improvement of sanitation is a charge on the local bodies. Briefly, the organisation is concerned with the investigation and control



of epidemic disease, with vaccination, inoculation, improvement of vital statistics, with the drawing up of plans and estimates for sanitary projects and with systematic health propaganda. About two million people are being vaccinated every year, a rate of progress which foreshadows the day when small-pox will no longer be a serious menace to the presidency. Prompt measures in regard to outbreaks, and the efficient sanitary control over fairs and festivals, have resulted in minimising the spread of cholera, and outbreaks of relapsing fever in 1922-23 were speedily stamped out. The hookworm problem is being tackled by a special branch subsidised by the International Health Board of America. A comprehensive scheme of health propaganda has been embarked upon. During 1927, 70,300 lectures were delivered in 44,200 centres to about 3,800,000 people, and some lakhs of posters and leaflets dealing with health subjects were issued; in some cases, local bodies were provided with magic lanterns and slides; miniature health exhibitions were held, and in 3,500 schools, lectures, dialogues and dramas were given. Perhaps the most potent of all propaganda measures has been the inauguration of the "National Health and Baby Week"; and it is worthy of mention that the Bellary exhibition in 1927 was awarded the Empire prize for child welfare schemes. The "weeks" are run according to a model programme drawn up by the Director of Public Health. The movement has appealed to the general populace in an extraordinary manner, substantial evidence of which is forthcoming in the increasing volume of funds raised by private subscriptions.

With regard to medical relief, a scheme has recently been introduced, the aim of which is to induce medical practitioners to settle in rural areas. A subsidy of Rs. 600 or Rs. 400 is granted for one year, according to whether the practitioner holds a degree or a diploma. In addition he is given Rs. 360 for drugs and Rs. 100 if he retains a qualified midwife. Two hundred such practitioners have now been installed and the result of the experiment will be watched with keen interest.



# NORTH-WEST FRONTIER PROVINCE

Scale 1" = 24 Miles

1928

## REFERENCES

- Boundary, Province { Demarcated - - - -
- { Undemarcated - x - x
- " , District or Tribal .....
- Road Metalled .....
- " Unmetalled .....
- Railway Broad Gauge .....
- " Narrow Gauge .....
- Tramway .....
- Experimental Farm .....
- Cattle-breeding Farm .....
- Dairy Farm .....

## NORTH-WEST FRONTIER PROVINCE

### 1. GENERAL FEATURES AND NATURAL DIVISIONS.

The North-West Frontier Province, as at present constituted, came into existence in 1901. In that year the districts and tribal tracts now included in the province, which had till then been under the control of the Punjab Government were made a separate charge and placed under a Chief Commissioner and Agent to the Governor General in direct subordination to the Government of India in the Foreign Department. This step was taken in consequence of the decision of His Majesty's Government "that the conduct of external relations with the tribes on the frontier should be more directly than heretofore under the control and supervision of the Government of India."

As its name denotes, the province is situated on the north-west frontier of the Indian Empire. In form, it is an irregular strip of country lying north by east and south by west. On the north it is shut off from the Pamirs by the mountains of the Hindu Kush. To the south it is bounded by Baluchistan and the Dera Ghazi Khan district of the Punjab; on the east by the Kashmir State and by the Punjab, and on the west by Afghanistan. Although the district of Hazara and part of Kohistan are cis-Indus and the trans-Indus tahsil of Isa Khel is included in the Mianwali district of the Punjab, the province may generally be defined as the tract of country north of Baluchistan, lying between the Indus and Afghanistan. Its greatest length is 408 and its greatest breadth 279 miles. The area of the five districts under regular administration, Hazara, Peshawar, Kohat, Bannu and Dera Ismail Khan, is 13,193 square miles which is roughly about twice the size of Yorkshire.

To the north and west of these districts is the tribal territory, some 25,472 square miles in area. It is separated from Afghanistan by a boundary line known as the Durand line, named after the late Sir Mortimer Durand, the British plenipotentiary who negotiated the agreement of 1893 with Afghanistan, in accordance with which the demarcation of the boundary, for the greater part of its length, was carried out in 1894.

The total area of the province is 38,665 square miles. The population of the five districts as enumerated at the census of 1921 was 2,251,340. No census of population has ever been taken in the tribal tracts. Only estimates based on the fighting strength of the clans are available. On the basis of five persons to a family consisting of one combatant and four dependants, one woman and three children, the tribal population is estimated at 2,770,666. On this calculation the population consisted of 554,133 men and 2,216,533 women and children in 1921. If an allowance is made for the old and infirm among men, the active fighting strength of the tribes may be put down at 400,000.

The population of the tracts is entirely, and of the districts predominantly, Muhammadan. The proportion of the Muhammadans is ninety-five per cent in Hazara, ninety-two per cent in Peshawar and Kohat, eighty-nine per cent in Bannu and eighty-four per cent in Dera Ismail Khan. Agriculture is the chief occupation of the population in the settled districts.

In the tribal tracts, the exiguous agriculture and pastoral pursuits are diversified by internal feuds, raiding and occasional warfare.

For the quinquennium ending 15th June 1926, the total cultivated area, including fallows, of the five districts including the revenue-paying portion of the North Waziristan Agency amounted to 3,179,000 acres or practically one-third of the total area of the districts. No land revenue is levied in the bulk of the tribal territory. Consequently no figures of the cultivated area are available.

The province falls into three geographical divisions :—

- (i) the cis-Indus district of Hazara ;
- (ii) the comparatively narrow strip between the Indus and the hills, constituting the districts of Peshawar, Kohat, Bannu and Dera Ismail Khan ; and
- (iii) the belt of territory of varying width extending from the Gomal (or Gumal) Pass in the south to Kashmir in the north. This is generically known as the Independent Territory.

## 2. THE LAND AND THE PEOPLE OF THE FIVE SETTLED DISTRICTS.

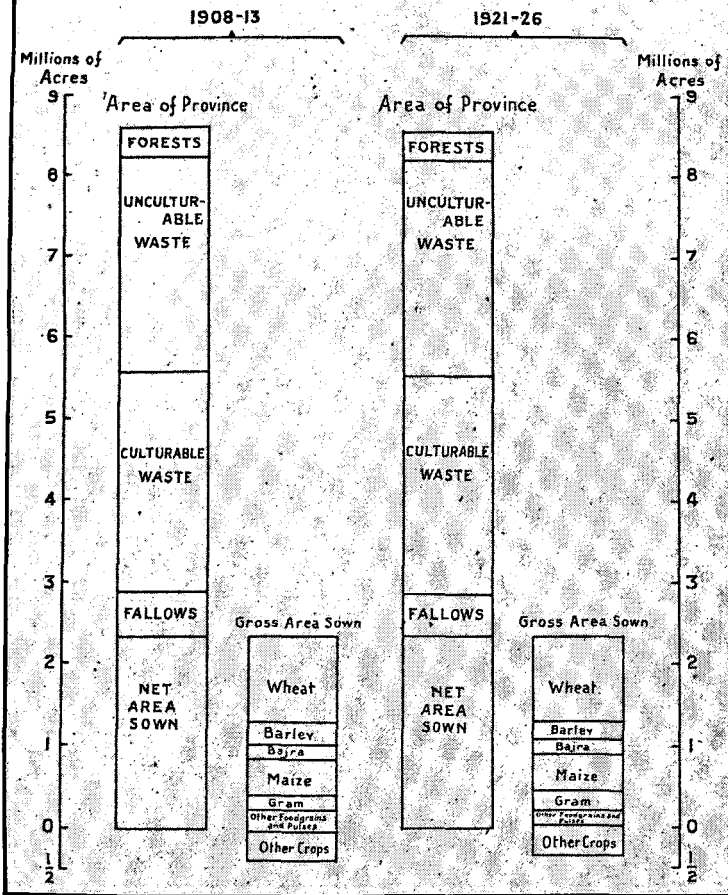
(a) *Hazara*—Hazara is the most northerly district of British India. It lies at the base of the Himalayas, its apex running up as a wedge between Kashmir and the mountainous regions that drain into the Upper Indus. Its extreme width from east to west is 50 miles and length from north to south, 120 miles. It comprises three tahsils, Mansehra, Abbottabad and Haripur, which occupy its northern, central and southern portions respectively. Including Feudal Tanawal, the total area of the district is 2,985 square miles. It is bounded on the east by the Kashmir and Poonch States, on the west it marches with the independent territories of Kohistan, Allai, Nandihar and the Black Mountain and, further south, with the territory of the Utmanzais and other trans-border tribes and finally with a portion of the Swabi tahsil of the Peshawar district. On the northern boundary of the district lie Chilas and part of Kohistan and the southern is the administrative line that separates it from the Attock and the Rawalpindi districts of the Punjab. The mountain ranges, which run down either side of the district, with a trend generally from north-east to south-west form its leading physical feature. The space between the mountainous ranges is occupied by a series of level tracts of varying size and character. Of these the principal are (1) the Pakhli plain in the Mansehra tahsil, which is 3,000 feet above sea level and in extent is 11 by 10 miles ; (2) the Mangal tract in Mansehra, less open and more broken than the Pakhli tract, with a fertile soil of deep loam but no irrigation to speak of ; (3) the Orash or Rash tract in the Abbottabad tahsil, four miles in extent either way, with the appearance of having once

# NORTH-WEST FRONTIER PROVINCE

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS

(5 Year averages)

NOTE: The difference between the Gross Area Sown & the Net Area Sown represents the area sown more than once.



been a great lake. It is famous for its maize. The Mangal and Orash tracts are both about 4,000 feet above sea level; (4) the Haripur plain, the largest of the plains tracts, thirty-two miles long and twelve miles wide. Its altitude gradually descends from 3,000 to 1,600 feet. The Dor flows through its northern part and irrigates land of great fertility on either side. The lower part of the plain is unirrigated and seamed, here and there, by deep ravines.

The rivers flowing through the district are (i) the Siran, which irrigated 6,273 acres in 1907, of which 4,671 acres were in the Mansehra, 143 in the Abbottabad and 1,459 in the Haripur tahsil; (ii) the Dor, which has much less water than the Siran but commands more than double the area; it irrigated 1,133 acres in the Abbottabad tahsil and 13,713 acres in the Haripur tahsil in 1907, tracts which are rich in crops of sugarcane and turmeric; (iii) the Harroh which rises in the Dunga Gali range and has two branches, the eastern known as the Dhund and the western known as the Karral Harroh. It irrigated 3,200 acres, chiefly in the Panjkatha tract. About 21,400 acres were irrigated in 1907 from *kathas* which are small tributaries of the main streams mentioned above.

Hazara is a district of varied characteristics, with alternations of hill and plain, vegetation and barrenness, dry soil and moist. The rainfall varies, from an annual average of 30 inches in Haripur to one of 47 inches in Abbottabad and 36 inches in Mansehra. Two-thirds of the amount falls in the hot weather, April to September and the remainder is received in the cold weather, October to March. The northern portions of the district are uninhabitable in winter on account of snow. The summer climate is temperate, especially in the northern part of the district. In the southern part, round Haripur, it resembles that of the northern Punjab. The heat in the lower hills can be fierce. In the more elevated tracts, in Abbottabad and Mansehra, the charm of the hills is enhanced by the beautiful climate. The Kagan Valley is superb in the beauty of its scenery. The area cultivated in the Mansehra tahsil amounted in 1921 to sixteen per cent and the area irrigated to two per cent; in the Abbottabad tahsil, the cultivated area was thirty per cent and the irrigated area one per cent; and in the Haripur tahsil, thirty-six per cent and five per cent of the total area were cultivated and irrigated respectively.

Maize is the principal crop, 41·2 per cent of the cultivated area being under it. Wheat comes next, with a percentage of 27·8 followed by barley with a percentage of 7·9. *Juar*, *bajra* and other cereals take up 16 per cent.

Excluding Feudal Tanawal, the rural population amounted to 560,000 in 1921.

Besides agriculture, the people derive a considerable income from their livestock, mainly cattle and flocks of sheep and goats. At the settlement of 1907, the annual profits from livestock were estimated at eleven lakhs of rupees, including five lakhs of rupees for *ghi*. Forests are another

important source of income of the people. The management of village forests is under the supervision of the Deputy Commissioner to whom it gives endless trouble.

Government service, both military and civil, brought in an income to the people of over eight lakhs of rupees in 1907. At the present time, the amount must be considerably greater.

The principal tribes of the district are Awans, Gujars, Tanaolis, Swatis, Pathans, Gakhars, Khanals, Dhunds, Mishwanis and Saiyids. Of these, the Tanaolis, Awans, Gujars and Mishwanis are the best agriculturists. The others are of average or indifferent quality. But where the struggle for existence is severe, even the Saiyids will become thrifty and industrious.

Pashto is spoken by Pathans who are in a minority in this district. The language of the bulk of the people is Hindko which is a dialect of Western Punjabi.

The Hazara peasant is enterprising and travels far afield in search of employment. He has not, however, the manliness of the Pathan or the sturdy independence of the Punjabi Muhammadan of Rawalpindi and Jhelum.

(b) *Peshawar*.—The four districts lying between the Indus and the hills form a compact group and are generally classed together. The Peshawar district has an area of 2,607 square miles. Its population, at the census of 1921, was 907,367. On the east, Peshawar is separated from the Hazara and the Attock districts by the Indus. On the south-east, the Nilab Ghasha range divides the district from Kohat. Elsewhere the border of the district marches with the territory of the Pathan hill tribes, who are now all within the sphere of British influence. To the south-west lie the Hassan Khels and Pass Afridis; to the west, the Akko Khel and Bassi Khel Afridis, the Khyber Afridis and Mullagoris. Further north across the Kabul river, the Tarakzai, Halimzai, Burhan Khel and Isha Khel Mohamands hold the border hills and carry the frontier on to the Swat river. The northern boundary of the district marches with the territory of (1) the Utman Khel, (2) the Ranizais of Swat, (3) the Buner Yousufzais, (4) the Khudu Khel, (5) the Gaduns, and (6) the Utmanzais.

The greater part of the district is a valley surrounded by rugged and barren hills. The rainfall is scanty and falls mostly in the cold weather. It could not have been greater in early days, as the Buddhist wells still in existence are as deep as those now constructed.

The climate from June to September is exceedingly hot and trying and resembles the heat of the Red Sea. Malaria is rife in the autumn. The irrigated portion of the valley is notoriously unhealthy. The cold in the winter is intense.

The rivers and minor streams form the source of supply of numerous canals which now interlace the whole of the western half of the district and thus counteract the deficient rainfall, so far as cultivation is concerned. The rivers which affect the agricultural conditions of the district

are (i) the Swat, and (ii) the Kabul. The Indus is not tapped for irrigation. The principal minor streams are (i) the Bara from the Afridi Hills, (ii) the Makam, and (iii) the Kalapani Nalas in Yousufzai.

Mr. (now Sir) Louis Dane, writing, in 1898, as a Settlement Officer remarked of the Lower Swat Canal that it had changed the character of the tract, which before the introduction of the canal was merely an arid high-lying upland. The canal has been an enormous boon to land-owners. The Kabul River Canal, dug in 1885 at the suggestion of Mr. Tucker, the Deputy Commissioner, was considerably improved in 1891 at the instance of Mr. Merk, another Deputy Commissioner. It irrigates a considerable area of the richest lands in the Peshawar and Nowshera tahsils. The Upper Swat Canal has now proved a financial success. Its working in the year 1926-27 resulted in a profit of 6.24 per cent on the capital invested against a percentage of 1.77 during 1925-26. Civil canals, a term which embraces minor canals constructed either by government or private enterprise and controlled by the Deputy Commissioner of Peshawar, play a very useful part in irrigation. Irrigation from wells is resorted to, more especially in the eastern half of the district, that is, the Swabi and Nowshera tahsils. In Yousufzai the soil is sufficiently firm to admit half the wells being worked without a complete masonry lining. The area served by a well is kept down by the curious custom of distribution of the village lands between the sharers in strips. A certain amount of irrigation is obtained from springs below the Afridi hills in Peshawar and in Baizai and in the east of the Swabi tahsil. The area irrigated by government canals amounted to 363,058 acres in 1925-26.

The population of the district has increased. In 1868 it was 441,000, in 1881, 517,000. In 1891, it had grown to 704,000. In 1901 and 1911 the numbers were 788,000 and 865,000. At the census of 1921 the figure stood at 907,000.

Pathans form the bulk of the population. The non-Pathan population consists of tenants and village servants. The tenants are chiefly Hindki Awans and Gujars mainly in Yousufzai; Malis, east of Swabi and Nowshera and Baghbans scattered all over the district.

The first Pathans to invade the district appear to have been the Dilazaks, who made themselves masters of the whole tract at some time between the tenth and fourteenth centuries. The Yousufzai and Gigiani clans of the Khakhai stock in combination with the Muhammadzais and Usman Khels ousted the Dilazaks, who fled across the Indus at the close of the fifteenth century. The tract was partitioned among the conquerors. The Gigianis received the Doaba; the Muhammadzai, Hashtnagar and the Yousufzai, the whole country to the east as far as the Indus. Subsequently the Yousufzai conquered Swat and Buner. In the tribal re-adjustment the Yousufzai proper moved to the hills in the north and assigned their share in the district to their kinsmen of the Mandan subdivision of their tribe. The remnants of the Dilazaks were dispossessed by the Khalil, Mohmand and Daudzai clans of the Ghorey Khel and by the Khattaks, who emerged from the hills to the south-west and established themselves in the eastern portion of Nowshehra. The defeated



and despoiled Dilazaks are now hardly to be found in the district, and are not recognised as true Pathans by the other tribes. The district is still held as it was originally parcelled out amongst the invaders in the seventeenth century, except for an extension of the Khattaks across the Kabul river as a result of their raids against the Mandans, who had to surrender their southern villages and some portions of the Baizai Valley to the Khattaks and some to the Utman Khel as the price of their help. The Pathans of the district are a lively people, proud, brave and hospitable, three prominent virtues which cover a number of other traits. Their pride is a marked feature of their character.

The three principal elements in their code of honour, the Nang-i-Pakhtana, specially among the Pathans not under regular British administration, are (1) *nanawatai*, or "the entering in," according to which the Pathan is expected to give asylum and to protect, at the cost of his life, even his own enemy, should he seek the shelter of his roof in his extremity; (2) *badal* and *kisas*, or the law of an eye for an eye and a tooth for a tooth; (3) *mailmastai*, hospitality to any traveller arriving at his house and demanding it. Hospitality is popular and a saving man is looked down upon as a *shum* or a miser.

Under the peace and security of a settled government, these distinctive customs are disappearing. The Pathan like most other people is gradually being rounded into shape like the pebbles carried in a river. Crime, mostly connected with *zan*, *zar* or *zamin*, i.e., woman, money or land, is decreasing. The Pathan readily enlists in the army. The language of the people has two dialects, the hard northern and the soft southern. Books are few; poems many, in the language. Their great poet has been Khushal Khan Khattak, poet and patriot, chief and warrior. He led them against the Moghuls with success. In a poem full of spirit, he has chastised the Yousufzai for their baseness in deserting the Pathan cause on the field of battle. Khushal Khan had a good opinion of himself, as he has recorded that he was grateful to God for many things; but, above all, for the fact that he was Khushal Khan Khattak.

The old Pathan custom of *khula vesh*\* (periodical distribution of land and even of houses on the basis of mouths) among the male adult population on the most naked principles of socialism has fallen into desuetude in this district, as a result of the introduction of settled government and the spirit of its institutions. Irrigation has completed the process and washed out the last traces of *vesh*.

Except near Peshawar and in parts of Swabi tahsil, the pressure of population on the soil is not heavy. The total cultivated area is 882,968 acres, the number of holdings 396,885, and the average size of the holding is 2.2 acres. The density per square mile of the cultivated area is 607.

Occupancy tenants are rare except in Mardan. Tenants-at-will generally pay produce rents. The proportion is usually one-half and sometimes three-fifths of the produce. On the Lower Swat Canal, the owner

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\* Khula Vesh literally means "mouth distribution."

either takes half the produce and pays the canal rates, or one-fourth and leaves the tenant to pay the canal revenue. On lands irrigated by wells the owner's share varies from one-third to one-half. On unirrigated lands the owner's share may be from one-fourth to one-sixth and for poorer soils may fall from one-sixth to one-tenth or even one-twelfth of the produce. The percentage of cultivated area under tenants is high in Charsaddar, Peshawar and Mardan and low in the tahsils of Nowshera and Swabi.

The *kharif* staples are cane, cotton, maize and rice, and the *rabi* crops are wheat, barley and tobacco. Tobacco is a speciality of the eastern half of Yousufzai and is generally grown on lands irrigated by wells.

*Berseem* or Egyptian clover is spreading in the Peshawar Valley. More cuttings are obtained if the sowing is done in the third week of September than when it is delayed.

(c) *Kohat*.—The Kohat district is the central of the five districts of the province. It occupies most of the wild hilly country lying between the fertile plains of Peshawar to the north and of Bannu to the south. On the west, the district adjoins the country of the Wazirs. To the north-west lies the country of the Zaimusht and Orakzai tribes. Farther east, the hills north of the town of Kohat divide British territory from the country of the Sipaiah and Bizoti Orakzais and the Adam Khel and Jowaki Afridis, while on the Indus, the Nilab Ghasha range separates the Kohat and Peshawar districts.

The district is wedged in between the Indus and the Kurram rivers, with the province of the Punjab on the east and the semi-independent Afridi, Orakzai and Wazir tribes on the north and west.

The area of the district is 2,694 square miles, of which 460 square miles or about one-sixth are under cultivation; 350 square miles are classed under culturable waste and 1,900 square miles, or seventy per cent of the whole, consist of bare hills, arid rocks and deep ravines, all combining to form a dreary picture of barren desolation. For administrative purposes the district is divided into three tahsils, Kohat, Teri and Hangu.

The sterner features are particularly marked in the Teri tahsil and the Kofi and Shakardarra tracts of the Kohat tahsil, known as the Khattak country. This tract is entirely dependent on rainfall, with only 2,300 acres irrigated out of 206,000 acres under cultivation. About forty-two per cent of the cultivation in this tract is under autumn crops, of which *bajra* is the principal. Among the *rabi* crops, wheat and gram occupy more than half the cultivated area.

The soil is a good sandy or stony loam, light, cool, clean and wonderfully retentive of moisture. *Kharif* crops are liable to failure. Spring crops, if assisted by moderate winter rains, are abundant and general failure is rare.

The rest of the district is known as the Bangash country. It includes the China and Toi circles of Kohat tahsil, which are fairly open and fertile plains and yield excellent crops of maize, rice, wheat and barley.

Nearly sixty per cent of these crops are protected by irrigation from springs, streams and other sources. The Miranzai valley forming part of Hangu tahsil is picturesque and fertile.

The rainfall in the Bangash tract is more favourable than in the Khattak country. The soil, however, is stiffer and crops show the effects of a drought quickly. Agriculture in the Bangash tract is more varied and complex than in the dry Khattak tract. Maize, *bajra*, *mung*, rice and cotton are the principal *kharif* crops. The *rabi* crops are wheat and barley. Gram is unsuitable on account of the stiffer texture of the soil. More reliance is placed on *kharif* than on *rabi* crops.

The Teri tahsil and the Kohi and Shakardarra tracts of the Kohat tahsil are the home of the hardy, martial and enterprising Khattak race, who own nearly two-thirds of the district and form one-half of the total population. The sterling qualities of endurance, enterprise and courage have won for the Khattaks a high place among the Pathan tribes. These qualities are largely the product of their healthful but barren environment, which has compelled them to seek a livelihood as soldiers, from Gilgit to Hyderabad and from Quetta to Mandalay.

The Hangu tahsil and the more favoured portions of the Kohat tahsil (China and Toi) are inhabited by the Bangash, who entered the district from the Kurram valley and gradually displaced the Niazi Pathans, the Awans and other Hindki folk. Along the western border of the district, there are a few settlements of Afridis, a few of whom hold land as owners and many as tenants. The Bagash of the Upper Miranzai valley are, as agriculturists and fighting men, like the Khattaks. In Kohat and the Lower Miranzai valley, which are favoured by nature, they are softer, more indolent and less manly, as a result of easier conditions. The Pathan feelings of jealousy, faction and hereditary feuds, however, pervade all alike. Compared with other tracts in which security has lessened the need for common action and has loosened the tribal and village bonds, there is, in the district as a whole, much of the old cohesion still existing.

At the census of 1921, the population of the district was 214,123. Those dependent upon agriculture are exclusively Muhammadans, of whom no less than seventy per cent belong to the Pathan tribes.

The democratic organisation of the Pathans has reflected itself in the agriculture of the tract. The typical features of purely Pathan tracts are (i) a numerous class of small peasant proprietors, (ii) few large holdings, (iii) no tenants, and (iv) little necessity for village menials.

The district does not produce enough to feed itself. Alternative sources of income have, therefore, to be found, the principal among which are : (i) military service ; (ii) raising of livestock, chiefly cattle, sheep and goats ; (iii) the carrying trade in salt and grain ; (iv) sale of the products of the dwarf palm ; and (v) rent and wages from the exploitation of the salt mines.

Military service is the most secure and lucrative source of income. Some of the border villages enjoy remissions of land revenue for service in border defence.

Mr. (now Sir) Michael O'Dwyer in reviewing the Settlement Report of the district, from which much of the information is incorporated in this sketch, observed in 1905 that one of the greatest needs of the district was to conserve the scanty rainfall, which runs off uselessly into the Indus, and that the policy of actively helping the people had yielded good results and should be steadily pursued. Conservation of the rainfall is a necessity if the resources of the people are to be strengthened. "There are four good things in life," says a Pathan proverb, "river water; wheat on unirrigated land; weeping (wet) rice and the strength of a young man." It shows what value the Pathan attaches to water, the prime factor in his husbandry.

(d) *Bannu*.—The Bannu district is a level plain, almost circular in shape and enclosed on all sides but the north-east by a rampart of bare hills. It is bounded on the north by the hills of Waziristan, on the east by the Kohat district and the Mianwali district of the Punjab, on the west by the Wazir and Bhattani hills, and on the south and south-west by the Dera Ismail Khan district. Its extreme length from north to south is 52 miles and its extreme breadth from east to west 34 miles. The district is divided into two tahsils, Bannu, the northern, occupied by the Bannuchis and Wazirs, and Marwat, the southern, the home of the Marwat tribe. The Bannu plain falls into four natural divisions, central Bannu, the Thal, southern Marwat and the western plain. Two rivers, the Kurram and the Tochi, known in Marwat as the Gambila, flow through the district. The volume of water in the Tochi is steadily becoming less and less. There are a number of hill torrents. The principal ones running into the Kurram are Barganathu or Adhami, the Kashu, the Gangu Nariwah, and the Shinawah. Those which cut their way into the Gambila are the Baran or Lohra, the Khaisora, the Shaktu, the Sawan, the Varmola, the Nugram, the Kharoba, the Lohra and the Chunnai. These torrents have produced a network of ravines, which is spreading year by year. No benefit is derived from their waters. On the contrary, they bring actual loss.

Agriculturally, the district falls into two subdivisions, one of which is irrigated and the other unirrigated. The irrigated tract occupies one-sixth of the total area, and one-fourth of the area cultivated, maintains two-thirds of the population and is responsible for more than three-fifths of the total land revenue assessment. The main sources of perennial irrigation are (1) the Kurram river, and (2) the Lohra canals. The Kurram canals are of great antiquity. Their design is faulty; natural drainage is often blocked and considerable areas become waterlogged. The general management of canals is in the hands of the Deputy Commissioner. The distribution of water is regulated on the basis of custom. In the west of the district, dams are often placed across hill torrents and divert their floods to embanked fields. Three floodings ensure a magnificent crop. But floods are uncertain and sometimes in their fury they sweep away dams, embankments and the land as well.

The unirrigated portion consists of the Thal and southern Marwat. Ploughing and sowing form one operation and cultivation is confined to

the *rabi* crops only. Wheat and gram are practically the only crops grown. Outturns are light. Wells are few.

The area of the district is 1,675 square miles. At the settlement of 1903-07, forty-eight per cent of the total area was under the plough and nearly one-fourth of this was irrigated. The rest depended upon a scanty rainfall. In 1881, the population was 182,000; in 1891, 204,000; in 1901, 226,000; in 1911, 250,000; and in 1921, 246,000.

The district is inhabited by Wazirs, Bannuchis and Marwats. The Bannuchis and Wazirs hold thirty per cent and fifty per cent respectively of the cultivated area in the Bannu tahsil. The Marwats hold four-fifths of the cultivated area in the Marwat tahsil. Saiyids are scattered all over the district and hold about five per cent. The lands of the Bannuchis are the richest. Bannu is, like all Pathan districts, a district of small peasant proprietors.

The first to enter the district were the Bannuchis. They occupied the best lands and by their patient and plodding industry have worked out and maintained the elaborate system of irrigation which is the chief basis of the prosperity of the district. They are a home-loving people and stagnate on their petty holdings, the average size of which is some two acres. They are good at agriculture, poor in physique and listless and extravagant in character.

The Marwats, who form a branch of the Lodi tribe, ousted their kinsmen the Niazi Pathans and occupied their lands. They are a simple, frugal and hardy race, inferior to the Khattaks in enterprise, to the Wazirs in intelligence and to the Bannuchis in industry. Unlike the Bannuchis, they have kept their blood and their customs pure. Traces of *khula vesh* still exist among them. They enlist freely in the Army as well as in the Border militias.

The Wazirs came in the second quarter of the nineteenth century. These hungry, hardy and greedy mountaineers were pressed out of their highlands by their hereditary foes, the Mahsuds, and in turn displaced the soft Bannuchis.

The British occupation has stereotyped conditions. The Wazirs of the hills cannot now descend and oust the people from their lands. Impelled by hunger, they beat ceaselessly against the rampart of law and order, a fact which is at the root of many of the troubles on the frontier.

(e) *Dera Ismail Khan*.—Dera Ismail Khan is the most southerly of the five districts. Its area is 3,458 square miles. Its greatest length is 90 and its average breadth is 40 miles. The district is divided into three tahsils: (1) the headquarters tahsil lying north and south, along the Indus, (2) Kulachi, parallel to the headquarters tahsil and including the sub-montane tract in the south-west and (3) Tank, which occupies the north-west corner.

The district falls into two main natural divisions: (1) the Kachhi or Indus valley proper, lying below the present high bank of the river, and (2) the Daman (literally, the skirt of the hills), which occupied the whole tract

between the Indus valley and the hills. The soil of the Daman is made up of the alluvial deposits brought down by hill torrents; the Kachhi is composed of silt and sand. The tract lying at the foot of the Sheik Badin Hills differs from the rest of the Daman in having a sandy soil.

Throughout the Kachhi, the water is close to the surface. In the Daman, with the exception of a few small streams, which disappear soon after they leave the hills, there is no permanent supply of water. Cultivation, the existence of men and cattle, depend upon the storage of flood water.

Irrigation in the riverain tract is carried on largely by means of wells and during the summer by means of inundation canals known as the Tuckerwah, Puran and Kasschuhra. The soil of the riverain tract is divided into four classes: (1) *retli*, soil with a large admixture of sand, (2) *drammar*, soil with a thin surface layer of sand, (3) *mattiwali*, soil enriched by silt and (4) *gas*, light loam.

Constant uncertainty as to the river's action leads to haphazard methods of cultivation. After harvesting their wheat, the people move off to villages situated on higher land, to escape the floods.

The Daman tract is roughly 90 miles long and 30 miles wide. The soil is poor. Good crops of gram are obtained in the *rabi*, if the rain has been favourable. The northern part of the Daman is a *barani* tract; along the western border of the Daman, there are small patches of cultivation, dependent upon perennial hill streams, known as *zams*. The more important of these are: (1) the Gomal and Tank, (2) the Zarkanni, (3) the Draban, and (4) the Chaudhwan *zams*. The bulk of cultivation in the Daman is dependent upon flood water from hill torrents, the principal ones being the Suheli, Takwara, Luni, Sawan, Toa, Waleyri, Gajistan and Ramak.

Conditions of life in the Daman are extremely hard. The hill torrents very often either bring down no water or at times too much, causing floods. There is a chronic scarcity of water. Men and cattle from some villages move down to the Indus in the hot weather. Those who do not, have to content themselves with one drink a day and the cattle with one every other day. The Daman would be a desert, were it not for the aborious building of dams and the embanking of fields. The staples of the Daman are *bajra* and wheat. The rainfall of the district is low, the annual average for the two tahsils of Dera Ismail Khan and Kulachi bring less than nine inches. For the Daman, the rainfall on the hills is of greater importance, as the hill torrents supply the deficiency.

At the settlement of 1906, the total area of the district was classified as follows:—

- (1) Unculturable, twenty-six per cent.
- (2) Government waste, two per cent.
- (3) Old waste which has not borne a crop for four years, forty-three per cent.

(4) New waste which has not borne a crop, five per cent.

(5) Cultivated, twenty-four per cent.

Dera Ismail Khan is the poorest and the most insecure district on the Frontier. Remissions of revenue are frequently necessary. The system of fluctuating assessment by crop rates prevails.

The Pathans are in a minority. Important tribes are the Jats and Baloches. The population of the district was 203,000 in 1881. At the census of 1921, it was 260,000.

### 3. DEPARTMENTAL ACTIVITIES.

The administration of the province is conducted by a Chief Commissioner and Agent to the Governor General in Council, with the help of a Revenue Commissioner, two Judicial Commissioners, five Deputy Commissioners and five Political Agents for the trans-border area. There is also the usual Secretariat at the headquarters. The province does not possess a Legislative Council. Local self-government, in the strict meaning of the term, does not exist. The members of district boards and municipalities are all nominated. The chairmen of district boards are officials. The province raised Rs. 77·22 and 78·5 lakhs in revenue and spent Rs. 270·89 and 285·25 lakhs in 1924-25 and 1925-26, respectively. Three heads of expenditure, Political, Police and Civil Works, which possess an all-India aspect absorbed Rs. 96·1 lakhs, 51·5 lakhs, and 52·9 lakhs, respectively. The land revenue administration is on the same lines as in the Punjab. Tenures are simple.

Owing to the small size of the province, and in order to avoid stagnation, this province and the Punjab have a common superior cadre in some departments, *e.g.*, the Police and Income Tax.

Some efforts to start co-operative societies in the province were made in 1904 but these were a complete failure and it is only since 1924-25 that the movement has been heard of again and a few societies, less in number than the fingers of one's hands, have been started in the districts of Hazara and Peshawar. The budget allotment for sanitary measures for the whole province was Rs. 82,000 in 1925-26. Rural areas are given some help out of this grant if they make a demand. Hospitals exist at the headquarter station of each district. Smaller towns have dispensaries. The agriculturist has to go to these towns to get medical help. Plague, cholera and fevers are responsible for much loss of life and ill-health. Typhus and relapsing fever are being steadily introduced into the province by caravans from the west. The staff of the Veterinary Department consists of two inspectors and twenty-one veterinary assistants, with a superintendent who is also in charge of the Northern Punjab Circle. Diseases of livestock are also to some extent brought in by the herds of nomad graziers and traders from Afghanistan. The demand for education is keen and is spreading even across the border.

The first edifice which attracts the eye of the weary traveller, as he emerges from the oppressive rocky desolation of the Khyber is one dedicated to learning. The Islamia College is a symbol at the gateway of British India, proclaiming her message, far and wide, to men across the border. In 1901, the year in which the province was formed, there were 28 secondary and 154 primary schools for boys and 8 primary schools for girls. The number of scholars in all kinds of institutions was 12,938; of these 5,082 were in secondary and 7,365 in primary schools for boys. The eight girls' schools had 491 pupils. The total expenditure on all kinds of educational institutions was Rs. 1,52,972.

The development that has occurred since then, during the first quarter of the century, may be judged from the following figures. In 1926-27 there were 3 arts colleges which are private institutions but receive State aid; 25 high schools, 70 vernacular middle schools, 547 primary schools for boys, 70 primary schools for girls and 286 private schools. The total number of institutions of all kinds was 1,033, the number of scholars 69,718 and the total expenditure under education amounted to Rs. 20·76 lakhs. Much still remains to be done and the cry is for more. The percentage of male scholars to the male population of school-going age in the year 1926-27 was 33·7 and of girls only 4·8. There is the usual wastage in the primary stage. For example, out of 51,967 scholars in the primary schools, the number in class I was disproportionately large. No less than 30,561 were in that class, 9,001 in class II; 6,690 in class III and 5,715 in class IV.

The province has two agricultural farms—one at Tarnab near Peshawar, comprising 180 acres and the other at Haripur in the Hazara district, extending over some 20 acres. The sanctioned staff of the department consists of the Agricultural Officer and six agricultural assistants. For research, the province is dependent on the visits of experts from Pusa. Two improved varieties of wheat, Pusa No. 4 and Federation, have been introduced. It is the aim of the department to help in the development of the trade in fruit by improving first the varieties at the farm at Tarnab and afterwards introducing them among the fruit growers of the province. Widespread cultivation of *berseem* or Egyptian clover promises to be a success.

There are in the province, chiefly in Hazara, 381 square miles of reserved and protected forests, exclusive of large areas of village forest and grazing ground. The Deputy Conservator of Forests exercises a control which may be close or merely nominal. Reckless grazing is producing much harm in the principal forest area, that is, the district of Hazara. When no grass is available on the ground, the goat-herd does not hesitate to use his staff which has a curved blade at one end to lop off the branches of valuable trees.

Recently, measures have been initiated to check the future denudation of the existing forests in the catchment areas of the Indus and its western tributaries, and to build up fuel reserves in and around the Peshawar valley to meet the ever growing pressure of a dense population or inadequate fuel resources. The preservation of forest cover in the upper basin of the Indus and its tributaries is not only of vital economic concern



to the people, but has intimate reactions on the Peshawar canals, and on the vast Indus irrigation projects of the Punjab and Bombay.

The Irrigation Department is controlled by a Superintending Engineer, lent by the Punjab Government, under whom there are three executive engineers and seven subdivisional officers besides the subordinate staff consisting of overseers and sub-overseers. The department manages the Lower Swat, the Upper Swat and the Kabul River canals. Other canals, constructed by the people themselves or by Government, are managed by the Deputy Commissioners. If the services of an irrigation engineering staff were available for those district canals, managed by Deputy Commissioners, they would be improved out of all recognition. The possibilities of Kohat and Hazara in irrigation have not been investigated. Dera Ismail Khan requires check dams and delay reservoirs for stopping the destructive action of hill torrents. The needs of Peshawar are, realigning, proper outletting of canals, prevention of waste of water and proper attention to drainage. Improvement and extension of irrigation in Bannu, including a thorough investigation of the upper reaches of the Kurram and the Tochi, with a view to reducing the violence of floods and ensuring a steady flow in the cold weather by the construction of dams and reservoirs are considered necessary by the Superintending Engineer.

#### 4. THE TRIBAL TERRITORY AND ITS PROBLEM.

The regions between the settled districts and the Afghan frontier are generally known as the Tribal Territory. In the extreme north lies Chitral. South of Chitral are Dir and Bajaur and the fertile valleys of the Panjkora and Swat rivers. Then towards the south-west come the Mohmand Hills, a rough and rocky tract with little cultivation. Further south lies the Khyber Pass, the historic route to India. South of the Khyber Pass is Tirah, the maze of mountains and valleys held by the Afridi and Orakzai tribes. Next comes the Kurram valley, stretching in a south-eastern direction up to the Miranzai valley in the Kohat district. South of the Kurram lies Waziristan, a rugged and inhospitable medley of ridges and ravines, straggling and confused in hopeless disarray, especially towards the west. Waziristan is divided into two parts—North Waziristan and South Waziristan. There are two fertile tracts in North Waziristan, viz., the valleys of Daur and Kaithu, and two in South Waziristan, the Wana plain and the valley below Kaniguram.

The tribal territory is inhabited by a number of tribes, the principal ones being the Wazir, the Mahsud, the Zaimusht, the Orakzai, the Afridi, the Mohmand, the Ranizai of Swat and the Yousufzai of Buner. They are divided into many sections and sub-sections. Faction creates another line of division among the tribes, some being in the *Tor Gundi* (the Black Party) and some in the *Spin Gundi* (the White Party), for purposes of protection and aggression.

Islam is the religion of the tribes. Passions are hot and feuds are endemic. There is a saying current among two tribes in the Kurram to

the effect that "if you boil their flesh and bones and our flesh and bones together, the water will not mix." Their rocks are hard, the people not less so. The ultimate sanction for such law and order as exists is the rifle in the hands of the individual tribesman. The rifle is now the modern weapon of precision and not the old *jazail*, the match-lock gun. The tribal organisation, in most cases, is on extreme democratic lines.

Their past history reveals some interesting facts. They have never owed allegiance to any master, established either east or west of the Indus. Their independence they have valued more than their lives. At no time have they shown any desire to relinquish it. Their desire to maintain it is equally great at the present day.

Holding the territory which lies athwart some of the great trade routes between Central Asia and India, they have exacted contributions from commerce. At the present day, they receive tribal allowances which have their origin in historical antecedents. Some portion of these allowances is for the rendering of service, *e.g.*, escort of caravans; some for the privileges surrendered, *e.g.*, the right to levy tolls; and some for concessions granted, *e.g.*, construction of roads.

The estimated population amounts to nearly 2·8 millions. The population of the five settled districts is 2·25 millions. In point of economic resources, the districts with a smaller population are in a far stronger position than the tribal tracts. There is little fertile land in the latter. Much of the area is taken up by mountains, which produce little. The meagre agriculture and pastoral pursuits do not provide enough. Of trade there is little; of exploitation of natural resources, there is none; the population is greater than the land can bear.

The tribesmen are thus forced to cast longing eyes at the plenty that prevails in the plains. Their intercourse may be peaceful or otherwise. Large numbers come down in winter in search of work. In summer they retire to their hills. Sometimes they supplement their scanty resources by raids. On occasions, which are now happily becoming few and far between, the frontier may be ablaze. Such conflagrations may be general or partial.

Experience has brought home the fact that the basic problem of the tribal tracts is the primeval one, hunger. The mountains breed many but they feed few. For the solution of the mountaineer's problem the remedies required are primarily economic. Like mountaineers all the world over, the tribes are forced to supplement their scanty resources either by peaceful means or by armed robbery. A parallel in English history may be found in the position of the Highlanders of Scotland until, after the rebellion of 1745, the English Government of the day sought a remedy for its troubles by opening for the warlike Highlanders a military career in the Highland regiments and by constructing Wade's road for effective military operations. It may be mentioned in passing that the most effective weapon at present employed for bending the political will of the tribes is the blockade. It manifests itself in three

forms, *viz.*, (i) seizure of tribesmen in British territory, (ii) stoppage of allowances, and (iii) stoppage of intercourse. This pressure is exercised not in tribal but from British territory.

For a permanent solution, however, the remedies, as stated above, must be of an economic character. These are the opening up of the country by means of communications and the systematic development of its economic resources.

The political control over the tribes is exercised through five political agencies maintained in the tribal tracts. From north to south the agencies are :

- (i) The Malakand Agency which embraces Chitral, Dir and Swat ;
- (ii) The Khyber Agency, for the areas adjoining the Khyber Pass ;
- (iii) The Kurram Agency, where conditions are more settled ;
- (iv) and (v) Waziristan, which is split up into two charges, North Waziristan and South Waziristan, the basis of the Agencies being the Tochi valley and the Wana plain respectively. For co-ordination there is a Resident in Waziristan.

The deputy commissioners of the five settled districts are also in charge of political relations with such tribes or sections of tribes, as occupy territory adjacent to their charges. The political agents and the deputy commissioners are under one common authority, the Chief Commissioner, who, in his capacity as agent to the Governor General in Council, harmonises the control of the tracts with the administration of the districts.

70°

72°

74°

76°

78°

34°

34°

# PUNJAB

Scale 1 Inch = 32 Miles.

1928.

32°

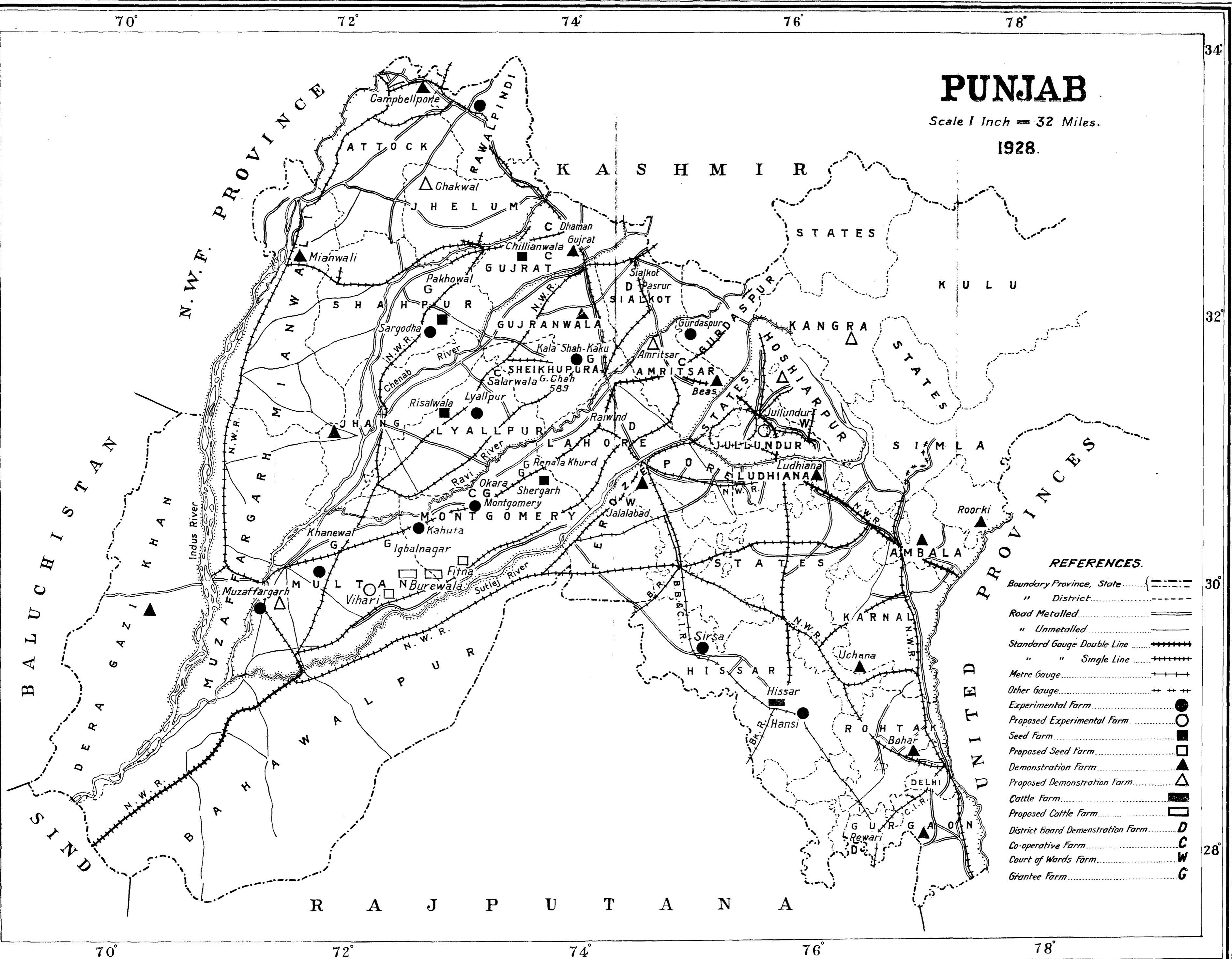
32°

30°

30°

28°

28°



### REFERENCES.

- Boundary Province, State..... (---)
- " District..... (---)
- Road Metalled..... (==)
- " Unmetalled..... (—)
- Standard Gauge Double Line..... (++++)
- " " Single Line..... (++++)
- Metre Gauge..... (++++)
- Other Gauge..... (++++)
- Experimental Farm..... (●)
- Proposed Experimental Farm..... (○)
- Seed Farm..... (■)
- Proposed Seed Farm..... (□)
- Demonstration Farm..... (▲)
- Proposed Demonstration Farm..... (△)
- Cattle Farm..... (■)
- Proposed Cattle Farm..... (□)
- District Board Demonstration Farm..... (D)
- Co-operative Farm..... (C)
- Court of Wards Farm..... (W)
- Grantee Farm..... (G)

## THE PUNJAB.

### 1. GENERAL FEATURES.

The Punjab, with a total area of 65 million acres, is a country just twice the size of England and greater by 9 million acres than the whole of Britain. About 3 million acres are occupied by the territories of certain Indian States\* while 62,260,000 acres are under direct British administration. The northern portions of the province are mountainous and provide little cultivable land, and even in the great plains there is still much land which, for want of water or other causes, is not under cultivation. At the present time the total area cultivated—an area growing rapidly as irrigation extends—is about 30 million acres. It is estimated that a further 15 million acres are cultivable. Thus in time there will be available for the Punjab peasant a possession equal in extent to the whole cultivated surface of the British Isles.

The rainfall in the mountains is often torrential, in the sub-montane tracts it is sufficient, being usually from 30 to 40 inches, but throughout the plains it is scanty and uncertain, increasing gradually, as one traverses the province, from less than 5 inches in the south-west to 30 inches in the north-east; a fall of 10-12 inches may be expected at Lyallpur, 18-20 inches at Lahore and at Hissar, in the south-east, 11-13 inches. Readers of gazetteers not sixty years old will find the greater part of the Punjab plains described as being sandy deserts. But in the interval irrigation engineers have been at work and the deserts have largely been converted into fertile territory occupied by extensive cotton fields in the autumn, and by still more extensive wheat fields in the spring. Water is still, however, the paramount consideration to the Punjab cultivator. Too little of it, or occasionally too much, is at the bottom of most of his perplexities; his grievances centre round the short-comings, real or supposed, of the men who control the canals, just as the grievances of the British farmer usually originate from the failings of the clerk of the weather; but on the whole the unbiased observer must agree that, at least in the canal colonies, the Punjabi cultivator is the better served of the two; he can plan his tillage operations, sow his seed, and reap his harvest with a degree of certainty that many a British farmer would envy. Nor is the temperature, if hard on man and beast, unkind to the crops. There is rarely, as there was in the winter of 1926-27, a killing frost. Cotton gives rise to anxiety in cold winters, but only in the case of certain varieties, sugarcane can be grown even in the northern portion of the Province, and is seldom a failure, and

\* Until 1920-21 the area of Indian States included in the province was 24,500,000 acres. Most of these States have been brought into direct political relationship with the Government of India.

tobacco is more certain of a safe season than the early potato crop of Britain. In the colder months the temperature of the plains may range from 35 to 45 degrees, and the growth of cereals is slow; but this gives them time to root and tiller before the forcing weather of the springs sets in, and they are seldom far enough advanced to be laid badly (as British crops are in July) by the occasional rain-storms of early spring. In the summer months, when the mean maximum temperature may rise to 110 degrees or even more in the shade, growth is extraordinarily rapid, and if weeds do grow apace on badly tilled land, the careful husbandman has his opportunities. He may then grow not only the main staples, but minor crops in a variety, and catch crops to an extent, impossible in a temperate climate.

The soils of the plains consist for the most part of a very deep alluvium, of light to medium texture; when dry they often appear to consist wholly of sand, but mixed with the sand of the surface soil there is always a proportion, often a very large proportion, of fine silt, naturally rich in plant-food, and under irrigation capable, even without manure, of producing for a long period crops that could not be equalled on unmanured land in Britain.

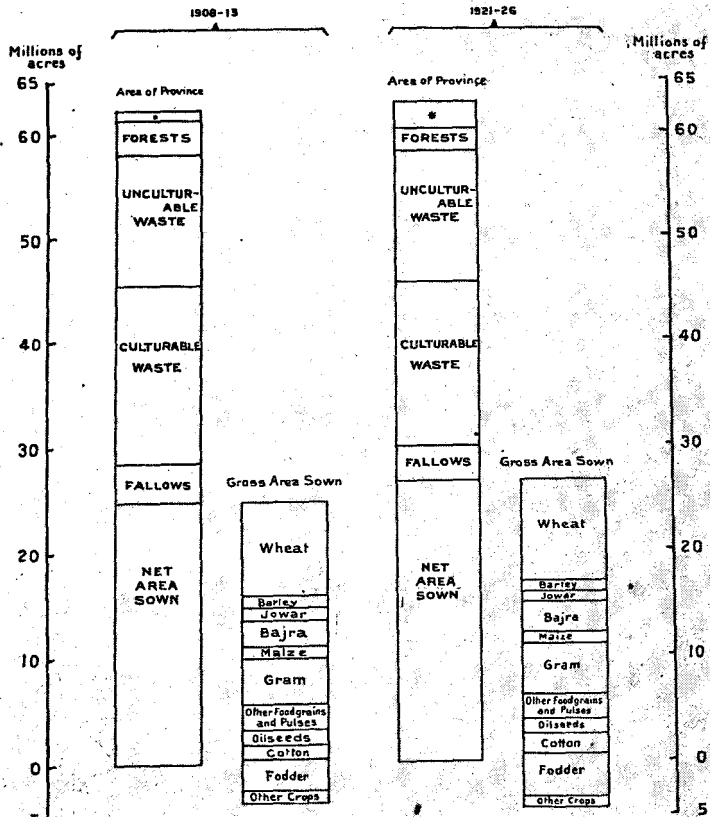
For successful cultivation in the plains water is the one thing needful, and this, as will be shown later, has been and is being supplied to new tracts at a rate which it is difficult for those who have no experience of large irrigation works to realise. The Punjab Administration Report for 1924-25 contains a graph showing that the area watered by Punjab canals rose from about 2 million acres in 1887-88 to over 11 million acres in 1922-23, and it is pointed out that the area irrigated by canals is now greater than all the ploughed land of England and Wales. It may be added that in five years' time it is likely to equal the whole arable area of Britain. It is, indeed, difficult to convey by mere figures the effect which these canals have produced on Punjab agriculture; the very term "canal" belittles them to those who are familiar only with British canals. The canals of the Punjab may perhaps be described as great "inverted" rivers. One of the largest, the Upper Chenab, may, without exaggeration, be described as an artificial Thames; for its upper reaches carry as much water as passes under London Bridge when the Thames is flooded, and its water passing into its "tributary" Lower Bari Doab Canal, fertilises the fields of cultivators as far distant from the head works as is the source of the Thames from its mouth.

The relative importance of the chief crops of the Punjab is shown by the diagram at the end of this introduction. It will be noted that wheat, gram *bajra* and fodder are the crops which occupy most land. The crops sown in 1925-26 and the current fallows account for nearly 34 million acres of cultivated land, and as the actual area under cultivation is about 30 million acres, it will be seen that some 3½ million acres of crops resulted from double-cropping favourably situated fields. The

# PUNJAB

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 Year Averages)

Note: The difference between the Gross Area Sown & the Net Area Sown represents the area sown more than once.



\* The areas marked with an asterisk represent the difference between total area of the province according to the Professional Survey and the total area according to the Village Reports, the latter being the Source from which this diagram was constructed.

normal rate of crop failure is 21 per cent. It goes as high as 65 per cent. in dry areas in poor years.

For the harvest of 1925-26 the Department of Agriculture has prepared some estimates which illustrate the scale of Punjab agriculture. The aggregate value of the chief Punjab field crops in that year was estimated at about Rs.100 crores (approximately £75 millions). Over one-third of this total was attributable to the wheat crop, of which 9.5 million acres had been sown. The resulting crop was estimated at 2.9 million tons of wheat. The magnitude of the Punjab wheat crop is emphasised if we recall the fact that it equals about half the annual import of wheat into Britain, and that (if we exclude the grasses and clovers grown by him) it covers nearly as much land as the British farmer has at his disposal for the growing of all his other crops. Next in importance to wheat in point of value is the cotton crop, which, in 1925-26, was worth nearly Rs.15 crores.\* The next crop in order of value was gram (Rs. 8.6 crores). Of lower relative value, but of great intrinsic importance, were raw sugar 6.0, rice 4.6, maize and *bajra* 3.8 each, oil-seeds 3.2, and barley 2.1 crores.

A periodical census of livestock is taken. In the last four of these cattle have shown no tendency to increase; the figures were: 1908, 14.2 millions; 1914, 15.5 millions; 1920, 14.3 millions and 1923, 14.9 millions. In the last census year there were 4.1 million bullocks (including bulls), 2.7 million cows, 3.0 million buffaloes, and 5.1 million young stock, including young buffaloes. These figures are open to question, and the Agricultural Department estimates the approximate numbers to have been 4.5, 3.0, 3.4 and 4.0 million respectively. There is no doubt that the actual number of cattle, both for draught and dairy purposes, is sufficient, but the quality, especially the quality of milking cows, leaves much to be desired, and in urban centres the supplies of milk and *ghi* available are limited, and the prices high.

The numbers of sheep and goats in 1923 were 4.1 and 4.3 million respectively, and there were 390,000 horses, 650,000 donkeys and mules, and 260,000 camels. Sheep are important in the arid tracts of the province, while goats are widely distributed. The breeding of army remounts and transport mules is a considerable industry in a few districts. Camels are found mainly in the dry, sandy areas.

## 2. NATURAL DIVISIONS.

From the point of view of agriculture, five fairly well-marked divisions may be distinguished in the Punjab. A brief reference to the characteristics of each will be desirable.

*Central Division.*—This division, which stretches from Gujrat in the north to Muzaffargarh, Multan and Ferozepore in the

\* In 1924-5, a very favourable year for cotton, it was worth nearly Rs. 20 crores.



south, is much the most important agricultural part of Punjab. It is bounded in part by the Jhelum on the west, and is traversed by the rivers Chenab, Ravi, Beas and Sutlej. It consists of level plains with narrow strips of low-lying land bordering the rivers. Until about thirty years ago, the western (Canal Colony) region of these extensive level plains was almost valueless owing to the rainfall being insufficient to mature crops; but almost the whole area has now been commanded by canals most of which are perennial. The cultivators in this tract consist in part of those already settled along the river valleys before canals were constructed, and in part of colonists introduced from congested districts of the Punjab. The latter have been settled on "squares" or "rectangles" of land of from 25 to 27½ acres, and new, carefully-planned, villages have been built. The compact, well-arranged fields enable cultivators to work their holdings economically and the general level of cultivation in the canal colonies is high. The leading crops are wheat, gram, Punjab-American cotton, rape, and mustard.

*Western Division.*—To the north-west and west of the central irrigated area, and composed of the districts of Jhelum, Rawalpindi and Attock, with parts of the districts of Shahpur, Mianwali and Dera Ghazi Khan, is a dry area not open to irrigation from canals and irrigated only to a small extent from wells. Agriculture is, therefore, dependent on rainfall, which in the north of this area is usually sufficient to mature a crop, but in the west and south is uncertain and deficient. Here and there in river valleys good cultivation is found, as in the Chhach circle of Attock, where valuable crops of sugarcane and tobacco are grown under well irrigation; but for the most part the riverain tracts produce indifferent wheat and gram crops in winter, and small quantities of fodder in summer. The people are almost entirely Muslim, of fine physique. Cattle and horse-breeding help to supplement the meagre yield of the crops. This division forms a notable recruiting ground for the army; thus income from the land is assisted by the pay and pensions of soldiers.

*Mountainous Region.*—Along the northern boundary lies the western portion of the great Himalayan chain. The north of Gurdaspur district and the whole of Simla are embraced in its spurs, while, in between, the district of Kangra lies right athwart the range, two of its cantons being in trans-Himalayan country. The rainfall is abundant, but the soil is rocky and the surface often precipitous, so that much labour is involved in terracing and preparing land for cultivation. Rice is cultivated with the aid of irrigation from watercourses led out of mountain streams; on unirrigated land wheat, barley, maize, pulses, buckwheat and amaranth are grown as food crops, and sheep-breeding supplements the earnings of the people. As in the case of the Western Division, many young men join the army. The pressure of population on the land is

great, and the problem of improving the output of these over-peopled mountain soils is as important as it is difficult.

*Submontane and Eastern Division.*—Between the Central Division and the mountainous region referred to above, there lies a submontane tract with a rainfall of from 35-40 inches, and a wide stretch of flat country with a rainfall of from 15 to 20 inches. The administrative districts included in this division are Sialkot, Gurdaspur, Hoshiarpur, Jullundur and Ambala, with parts of Ludhiana, Karnal, Rohtak and Hissar. With the exception of Jullundur and Hoshiarpur, all these districts receive irrigation from the great canal system, but the Western Jumna can only protect a part of the three south-eastern districts of Karnal, Rohtak and Hissar, leaving the great portion of the land dependent upon a very capricious rainfall. In the whole tract, well-irrigation is an important feature. In areas where the water table is within 20 to 40 feet of the surface and where the texture of the soil is light and suitable for intensive cropping, the cultivation is of very high quality.

In the submontane tracts wheat, and even sugarcane, can be grown without irrigation. The country is naturally rich, but the climate during the monsoon period is unhealthy. Much fertile soil has been lost in recent times in parts of the Hoshiarpur and Ambala districts because of erosion following the destruction of hillside forests. A special Act (Act No. II of 1900, as amended by Act No. IV of 1905, Act No. VII of 1926 and Act No. VIII of 1926) has been passed to prevent further damage, and efforts are being made to enlist the sympathy and aid of the people in restoring trees on the devastated slopes.

*South-Eastern Division.*—This dry region includes those parts of the districts of Hissar, Karnal and Rohtak not watered by the Western Jumna Canal, and Gurgaon. Although the rainfall is usually somewhat greater than in the Western Division, this region suffers much from drought. In some parts well irrigation is possible, but in others the water table is so deep that raising water is too expensive. Some assistance to the natural rainfall has been given by constructing dams, but much remains to be done before the requirements of crops are met. Crop-growing being so uncertain, special attention has been given to cattle-breeding, and this tract is the home of the celebrated Haryana breed.

### 3. PROVINCIAL INCOME AND EXPENDITURE.

In order that the activities of the Punjab in developing its resources may be traced in proper perspective, it will be necessary to glance at the financial position. In certain other provinces there was much evidence to the effect that lack of money was the root of all evil. This was not the case in the Punjab, although in picturesque terms it was pointed out to the Commission that there were times within the past five years when the

GOVERNMENT OF THE PUNJAB.

Revenue and Expenditure Charged to Revenue.

(Figures are in lakhs of Rupees.)

Revenue Head.	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.	Expenditure Head.	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.
<i>Principal Heads of Revenue—</i>						<i>Direct demands on the Revenue—</i>					
Land Revenue ... ..	221	298½	299	294	306	Land Revenue ... ..	49	45½	41½	42	44
Excise ... ..	116	103	104	119	123	Forests ... ..	44	49½	29½	27	26½
Stamps ... ..	82	89	96	116½	114½	Other heads ... ..	8	7½	7	8	21½
Forests ... ..	50	34	44	37	41	Capital outlay on Forests charged to Revenue.	—	—	—	—	2
Other Principal Heads...	6	12½	11	11	13	Irrigation—Revenue Account ...	92½	89½	102½	109	115½
Irrigation : Net Receipts...	333	364	392	430	457	Irrigation—Capital Account charged to Revenue.	0½	—	—	—	81
Debt: Interest ... ..	4	6½	5	6	12	Debt Services—Interest on Ordinary Debt.	—4	2½	6½	—1	—6
Civil Administration ... ..	31½	37	41½	41	41	Debt Services—Reduction or avoidance of Debt.	—	—	—	2	2
Civil Works ... ..	4	4	5	5	6	<i>Civil Administration—</i>					
Miscellaneous ... ..	17	25	24	25	23	General Administration ... ..	97	101	100½	99	104
Miscellaneous adjustments between Central and Provincial Governments.	—	—	—	1	0½	Administration of Justice ... ..	44½	45½	53	54	52½
Extraordinary Receipts (Sale of Waste Lands, Government Estates, Town Sites, etc.)	33	30	69½	68	129	Jails and Convict Settlements ... ..	36	38½	29½	30½	32½
						Police ... ..	111½	122½	110	112	107½
						Education ... ..	88½	99½	103½	109	142
						Medical ... ..	32	30½	31	30½	35½
						Public Health ... ..	11	11	11	15	16
						Agriculture ... ..	32	30½	28	28½	38
						Industries ... ..	6	8½	8½	7	7½
						Other Departments ... ..	1	2	2½	3	1
						Civil Works ... ..	124½	105	84½	70	109
						Miscellaneous ... ..	107	96½	55	49	62½
						Provincial Contribution to Central Government.	175	175	175	175	114
						Miscellaneous adjustments between Central and Provincial Governments.	13	0½	—	1	—
<b>Total Revenue ... ..</b>	<b>897½</b>	<b>1003½</b>	<b>1091</b>	<b>1153½</b>	<b>1266</b>	<b>Total Expenditure charged to Revenue</b>	<b>1069</b>	<b>1061</b>	<b>979</b>	<b>972½</b>	<b>1108½</b>

*Capital Receipts and Expenditure.*

Receipt Heads.	1921- 22.	1922- 23.	1923- 24.	1924- 25.	1925- 26.	Expenditure Heads.	1921- 22.	1922- 23.	1923- 24.	1924- 25.	1925- 26.
Revenue Surplus ... ..	—	—	112	183	157½	Revenue Deficit ... ..	171½	57½	—	—	—
Loans and Advances ... ..	13½	42½	21	18	15	Construction of Irrigation Works ...	19	91	146½	83	82½
Permanent Debt incurred... ..	—	—	192	—	73½	Civil Works ... ..	—	2	1½	20	19
Loans from Central Government (for Revenue).	100½	60	—	—	—	Loan from Central Government (repaid).	—	—	100½	—	1
Loans from Central Government (for Irrigation).	—	72	—	—	—	Loans and Advances ... ..	63½	23	11	30	18
Famine Insurance Fund ... ..	—	4	4	3	3	Payment to Central Government of Balance of Provincial Loan Account.	53	—	—	—	—
Reserve and Sinking Fund ... ..	—	—	—	2	2	Other Capital Expenditure ... ..	—	1	1½	4	3½
Total Capital Receipts ... ..	114	178½	329	206	251	Total Capital Expenditure ... ..	307	174½	261	137	124
Opening Balance ... ..	193	—	4	72	141	Closing Balance... ..	—	4	72	141	268

wastepaper baskets of departments were being ransacked in the hope of converting the contents, if not into rupees, at least into annas and pies! Although great capital commitments have been, and are being, incurred on irrigation and other public works, a substantial proportion of the investments rapidly become remunerative; and difficulties, when they have arisen, have more often been of the kind experienced in a rapidly expanding business, than of the kind which embarrass the chancellors of debt-encumbered nations. In 1921-22 the Government had on its loan account an overdraft of about a crore from the Government of India. This has been paid off; and the capital since required, with the exception of  $1\frac{1}{2}$  crores raised by loan at  $6\frac{1}{2}$  per cent, has been provided from ordinary revenue or extraordinary receipts. But it is not now intended—for this is not the time or place—to discuss the financial situation and financial outlook of the province. All that is here required is to state what the recent income and expenditure have been and to show the main headings under which receipts accumulated and disbursements have been made.

#### 4. REVENUE ADMINISTRATION AND LAND RECORDS.

Benefiting by the experience of the older provinces the Government of the Punjab from the beginning devoted careful attention to local facts and customs in devising a system of administration of land revenue and tenure.

For the purpose of revenue management the whole province is divided into five divisions, each under a commissioner, not identical with, but roughly corresponding to, the natural divisions above described. The divisions are further divided into twenty-nine districts, each in charge of a deputy commissioner. The districts are sub-divided into three or four tahsils each in charge of a tahsildar and an assistant or naib-tahsildar.

The unit of revenue administration is an estate, usually identical with a village, of which there may be on an average from 200 to 400 in each tahsil. In each village there are one or more headmen or *lambardars* who represent the villagers in their dealings in revenue matters with government officials; the headman is a paid representative, getting five per cent of the revenue collected from the village. Originally the villages were treated as communities jointly responsible for the total amount of revenue due, and legally this obligation remains; but in practice in the canal colonies the revenue is now collected from the individual who is the owner or grantee of land registered as his holding in the village records. Much attention is given to village records, the whole of the land is carefully mapped on a scale of 220 feet to the inch, and a village register of rights of ownership, and tenancy, is maintained by a minor revenue official, the *patwari*, who has charge of the books of one or more villages. The villages are grouped into circles or *zails*, and in each circle

a leading *lambardar* is recognised as *zaildar*, or representative of the people, and as such he receives payment for his services. To supervise the work of *patwaris* a *qanungo* or inspector is appointed. A *qanungo* usually supervises proceedings in some twenty circles. Close inspection is necessary, for much detailed work is required of the village *patwari*. His village note-book summarises the revenue records in statistical form and so constitutes the basis of all agricultural statistics. The different revenue records show: the area of each holding; the *khariif* and *rabi* crops grown; the position as regards revenue payable, or paid; the transfers of land, whether of ownership or of occupancy rights; a list of owners and of mortgages or revenue assignments effected by them; statements of the rent paid by tenants-at-will; and a record of the livestock, and of certain kinds of dead stock, in the possession of the cultivators. Special importance is attached to the Record of Rights. Under the Punjab Land Revenue Act, 1887, which is the basis of all revenue administration in the province, a record must be maintained for every estate, showing all the fields into which the estate is divided, the names of the persons who are owners or tenants, and the nature of their interest in the land. This record must be brought up to date and re-written every four years, and, at intervals of twenty or thirty years, when the assessment to land revenue is re-settled, a special revision of the village records is made.

The re-settlement of a district is a lengthy process conducted by a special settlement officer, under the supervision of the commissioner of the division and the Financial Commissioner of the province. The district is in the first place divided into assessment circles in which the agricultural conditions are similar, and then a careful estimate is made of the net rents, or assets for each circle. These estimates take into account cash rents in the relatively few cases in which cash rents are paid. When rent is paid in kind the produce of land, customary payments to village menials and other consequential charges are ascertained, and the revenue is based on the estimated net income derived from ownership of land. In pre-British times the rulers of the Punjab collected produce rents, varying with the times and with the ruler's conception of his rights and his needs, but always high. Originally the maximum cash demand made by British collectors was limited to 50 per cent of the net assets; but as in practice this figure was never reached, and is now being reduced to 33 $\frac{1}{3}$  per cent, the usual revenue demand is about 25 per cent of the estimated net assets. In addition to the land revenue, villagers have to pay a local rate imposed by district boards on all land assessed to land revenue, which varies from district to district, and is limited by statute to an amount not exceeding twelve and not less than ten pies for every rupee of its annual value.\* There are also certain village cesses.

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\* The Punjab District Boards Act, 1883, as modified up to 8th May, 1925.

The total amount of land revenue collected in the year ending 30th September, 1924, was 443 lakhs of rupees, of which 243 lakhs was permanent and 200 lakhs fluctuating revenue. The collection of fluctuating revenue is a feature in the Punjab administration. It originated because of the great uncertainty of the harvests in the dry tracts. With the object of reducing suspensions and remissions of revenue, the plan of charging revenue on the land from which crops were actually harvested was introduced. It was subsequently found that this method of collection was also specially suited to the conditions in canal colonies, where the charges made for canal water had always been based on the actual crop grown and the area under that crop. Remission of this fluctuating revenue is never necessary, though suspension is sometimes called for in the event of unforeseen calamities. In a province where the rainfall is so small two main factors govern the actual amount of land revenue payable. If no means of irrigation exist, soil and rainfall, by determining the net returns which the cultivator secures, determine also the general level at which revenue is levied. If from any source water can be secured which will ensure the ripening of a *kharij*, or a *rabi* crop, or of both, then, since net returns are increased, a higher rate of revenue is collected. Should the water come from a government canal, the cultivator pays, in addition to land revenue, a water rate varying in amount with the kind of crop grown, but in every case the rate charged for canal water is very much less than the cost to the cultivator of raising water from wells. Thus when canal water is brought into a district the wells which may exist there usually fall into disuse.

Just as the Land Revenue Act, with the rules and orders framed under it, regulate the relations between the landowner and the Government, the Punjab Tenancy Act regulates the relations between landlord and tenant. There are two chief kinds of tenants. The hereditary or occupancy tenant holding under old custom, usually paying a privileged rent, and not liable to disturbance so long as he carries out the conditions of his tenancy, and the tenant-at-will. The Act defines the circumstances under which occupancy rights accrue and the nature of these rights, and it protects the tenant-at-will so far as possible from hardship.

A third Act which has an important bearing on the position of the zamindar is the Punjab Land Alienation Act, 1900. Before the passing of the Act much land was being expropriated by moneylenders to whom the owners were indebted. Under the provisions of this Act the main agricultural tribes in each District are listed in groups. Within these groups the Act imposes no restrictions on alienation; members of the listed tribes may sell freely to persons within their own group, but not to others; for the Act allows of the sale of land to non-agriculturists only under special circumstances which must be

approved by the deputy commissioner. The Act has aroused keen controversy; but the criticism so far has come from non-agriculturists, and it is admitted that it has checked the evil which it was designed to cope with. It was at first feared that by affecting the value of land, the Act might injure the agriculturists' credit, but the records of land sales shows that this fear was groundless. There has been a very rapid rise in land values in the Punjab, and such is the land hunger that many sales are now effected at wholly uneconomic prices. For the four years preceding the Act of 1900, the arithmetic mean of the average price at which cultivated land sold in each year was Rs.81 per acre. In the following five-year periods up to 1924-25 the corresponding figures were Rs.77, Rs.105, Rs.158, Rs.231 and Rs.373. The average recorded price of cultivated land rose from Rs.383 per acre in 1923-24 to the record figure of Rs. 438 during 1924-25, and in the Lyallpur district it was as much as Rs.738. The sale price of land for the province as a whole represents 300 years purchase of the land revenue as against 273 in the previous year and 6 at the commencement of the British occupation. For a year or two after the Alienation of Land Act became law prices may have been affected; but the figures for subsequent years make it clear that the movement of land values in the Punjab now calls for a brake rather than a stimulus.

##### 5. THE CULTIVATOR.

It is not possible in this brief introduction to rural conditions in the Punjab to give any adequate account of the many types to be found among the tribes differing in race, and the communities differing in religion, who till the soil of the Punjab. Nor fortunately is such required or necessary; for a Punjab civilian, Mr. M. L. Darling, has recently supplied in his book, *The Punjab Peasant in Prosperity and Debt*,\* a description which has already taken its place among the now considerable number of classic monographs that relate to the peoples of India. A sketch of the cultivator, of his social and economic position, and of his special difficulties, has been supplied to the Commission in the memorandum prepared for them by the Punjab Government, and from this source, in itself largely dependent on Mr. Darling's book, a few facts may be given.

The Punjab Census of 1921 showed in British districts a total population of about 21 millions, of whom some 10 per cent lived in towns. The remainder lived in about 34,000 villages, with an average population of just under 500. Of the villagers, 100 would own land extending to about 1,140 acres, of which some 770 acres would be cultivated. The village is constructed from local materials, the flat-roofed houses are usually built of sun-baked mud, while here and there stand the more substantial brick houses of some *bania*, army pensioner, returned emigrant, or

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\* Oxford University Press, 1925.



retired official. The lay-out, except in the canal colony areas, is haphazard, the water-supply coming usually from a well, tank, or canal. Sanitation, in the sense of an ordered scheme for the disposal of offensive matter, in the words of the Public Health Department, "does not exist." Beyond and surrounding the village site are the scattered fields of the zamindar.\* It is difficult to arrive at close estimates of the number of actual cultivators, and of the amount of land occupied by them in different districts, but the estimates usually accepted placed the number of actual landowners, including minors and women, at about four millions, and the number of adult cultivators at between 4½ and 5 millions. Recent economic enquiries based on sample areas suggest that these figures are too high. The samples were extensive, covering over 2,000 villages scattered throughout the province, and the figures obtained throw so much light on the position of the Punjab peasant cultivator that a few of them may be given here.

In the first place, the enquiries bring out the fact that in the Punjab there is no sharp differentiation between the owner, tenant and labouring classes. An owner of a few acres belonging to an agricultural tribe may hire land for cultivation, or he may supplement his income by working for wages; conversely a member of one of the menial tribes, who habitually works for wages, may own a small plot of land. The enquiries were primarily directed to ascertain the conditions of "owners" on the one hand, and of "cultivators", whether owners or tenants, on the other. The following statement† shows how the land in the sampled areas was distributed between groups of owners and of cultivators.

Group.	Percentage Owned.	Percentage Cultivated.
In holdings of under one acre ...	1.0	1.5
" " " 1 and under 5 acres	11.0	12.1
" " " 5 " " 10 "	15.1	20.6
" " " 10 " " 15 "	11.5	17.4
" " " 15 " " 20 "	8.4	12.3
" " " 20 " " 25 "	6.8	9.1
" " " 25 " " 50 "	20.4	18.5
" " " 50 and over ...	25.7	7.9

Taking the province as a whole, the "average" cultivated area belonging to an owner would, on the basis of these large samples, work out at about 8 acres, and the average holding under tillage in the occupation of each cultivator, whether owner or tenant, at 7 acres.

\* The term zamindar, literally landowner, is in some provinces, as e.g., Bengal, applied only to large landowners; in the Punjab it is used for any landowner, however small.

† 1. "The Size and Distribution of Agricultural Holdings," by H. Calvert C.I.E., I.C.S., Board of Economic Enquiry, Punjab, Lahore, 1925.

2. Cultivators' Holdings in the Punjab, by H. Calvert, C.I.E., I.C.S. Ibid.

Similarly these enquiries point to the conclusion that the total number of owners, including minors and women, is about 3½ million, and that the number of cultivators is just over 4 million.

If the question of the typical Punjab holding is raised, the answer in the first place must point out that in the 29 districts of this large province many types exist. For example, the typical holding in Kangra is entirely different from that in Montgomery and the Montgomery type would not be that of Mianwali; but bearing in mind these distinctions, depending chiefly on rainfall or on canals, it may be said that the Punjab is a province mainly cultivated in small holdings of between 1 and 20 acres. More than 60 per cent of the cultivated area is accounted for in this way, and about half is found in holdings of 1—15 acres.

Omitting from consideration the 625,000 owners and 900,000 cultivators of less than one acre, the following figures show the percentages of the total number of persons owning or cultivating holdings in each group.

Group.					Owners.	Cultivators.
Holdings of	1 and under	5	acres		49·7	42·4
"	" 5 "	"	10 "	"	21·9	26·9
"	" 10 "	"	15 "	"	10·3	13·4
"	" 15 "	"	20 "	"	5·2	6·8
"	" 20 "	"	25 "	"	3·3	3·9
"	" 25 and over	...	...	...	9·8	5·5

It will be seen that, neglecting the owners and cultivators who have less than one acre of land at their disposal, 81·9 per cent of the remaining owners and 82·7 per cent of the cultivators fall within the 1—15 acre limits.

Outside the canal colonies the holdings of 15 acres and over are usually found where uncertainty of sufficient rainfall makes cultivation precarious, the largest holdings being characteristic of the most arid tracts.

In the canal colonies settlers were originally placed for the most part on squares of about 25 acres; sub-division occurs when sons inherit, but as the colonies are still young the average holding of good land is at the present time substantially larger than in other districts. If we accept these canal colonies, it would broadly be correct to say that the cultivator is always short of land. The increase of the population, which since 1881 has risen by close on 20 per cent, and the fact that industries other than agriculture offer little alternative employment, has resulted in a pressure on the land which, though less than in other provinces still leaves many cultivators with holdings too small for full time occupation.

The pressure of the people on the soil is shown by the following figures: In Sialkot, Amritsar and Jullundur districts there are from 400 to 500 persons to the square mile, and there are localities outside urban influences in these districts where it may even

reach 800. In the dry western districts of Dera Ghazi Khan, Muzaffargarh and Mianwali the population per square mile falls below 100. In general, outside those canal colonies in which population has not yet overtaken production, the density is determined by rainfall and the fertility of the soil. "In India," to quote Mr. Darling, "every advantage of nature is sooner or later neutralised by an increase of population. It may almost be said that the fertility of the land is a measure of the fertility of woman."

The sub-division of land which has taken place because of the customs of inheritance, which give to each son an equal share in the father's land, is made worse by fragmentation. Not only must the value of the property be divided between heirs, but the actual fields themselves are also divided. Thus in such districts as Jullundur where a fertile soil, irrigation from wells, and a moderate rainfall have resulted in a dense population, the fields have been divided up to an extent which has offered a severe handicap to successful tillage. It is in this area, as will be noted under Co-operation, that co-operative societies for consolidating scattered holdings have been most active.

The peasant is illiterate, some 4 per cent only of the rural population can read and write; nor, as a rule, does he consider that literacy and land cultivation have much in common. He is still apt to be sceptical of the views advanced by his practical instructors, except where, as in the canal colonies, close contact has been established between himself and the Agricultural Department. But since the 1921 census was taken there are already signs that, as a result of the work of the Co-operative Education and Agricultural departments, his traditional views on education and its value are undergoing change. Men who have been in France with the armies, or who, in search of work, have penetrated to lands as distant as China, Australia or Brazil have returned home with new ideas, and are leavening the too solid mass produced by local tradition and experience. As a cultivator, his virtues are both high and low. The Chinese gardener would find a competitor in the Arains of Jullundur, or the tobacco cultivators of the Chhach; the Jats of the Central Punjab could match themselves against the Kunbis of Gujarat, the Belgian small-holder, or any other peasant who by his industry and skill has made a name for his cultivation; the Rajputs, except that they could not allow their women to work in the fields, would be entirely happy in the agricultural atmosphere of a southern Irish county; and there are tribes, which may remain nameless, who are very successful in supplementing the meagre produce of their land by cattle-lifting.

As a man the Punjab cultivator, especially the cultivator of the Northern Division, has given many proofs of his quality in the Indian army. When on gala days he turns out to compete in an inter-village tent-pegging competition, his horsemanship does credit to the cavalry regiment to which he once

belonged, and on occasions when he displays in public a carefully treasured uniform, the medals on his breast betoken varied experiences gained far beyond his native Punjab.

As a man, too, the Punjab cultivator gives many evidences of human frailty. Without distinction of tribe or religion, he is inclined to indulge in litigation; this being almost his only mental relaxation. He cannot read, he does not listen to weekly sermons, the village does not support a theatre, and if strolling players there be, they do not often come his way. On the other hand, pleaders are everywhere, courts are numerous, and argument, though it be expensive, some moneylender will readily help him to buy. His debts, as we shall presently see, are in many cases so heavy that he has no expectation of being in a position to repay them. When, therefore, fortune sends him a good harvest the toil of yesterday and the needs of to-morrow are forgotten; he enjoys himself and spends freely, for what is left over his creditors will annex. If he be a Sikh he may not smoke, if he be a Mahomedan he may not drink, but drink and tobacco are not the only forms of wasteful expenditure open to him; and in buying ornaments and other non-essentials even an orthodox Hindu, who touches neither drink nor tobacco, can, if so minded, dissipate the little store of rupees that should go to reducing his mortgage or improving his land. The thrift of the French or the Scottish peasant is a rare virtue in the Punjab.

He is, as has been said, in many cases an excellent cultivator. He is more careful of his cattle than are most Indian ryots; the working of his land is intelligent, and scientific study in many cases confirms the soundness of the principles which he follows. He displays, however, a certain tendency to let the morrow take care of itself, and this, joined to a lack of business capacity the result of lack of education, and to the simplicity of mind that he brings to bear on the happenings of nature, often proves the undoing of the frugal, hard working Punjab cultivator. His particular industry, in whatever country it is successfully carried on, requires either the possession of capital, substantial in amount in relation to the annual net output, or cheap credit. The capital of the cultivator is in his land, his bullocks, his implements and his seed corn. The major part, that in land and bullocks, is subject to rapid changes in amount. The father, if a landowner, may be a substantial man, his sons, even if only two or three in number, inherit land that may prove too limited for the needs of their families. Cattle disease is rife, and at any time most of his working capital may disappear with the death of his bullocks. Except in the canal-watered areas, shortage of rainfall may cause the crops to fail, and even where canal water is available bad weather may involve poor harvests. Thus, even to the substantial zamindar, credit may become a necessity at some period. Then, apart from his business, there are many calls for ready money. Social obligations involve expenditure on marriages

and funerals, and religious observances must be fulfilled. In no country can social obligations easily be set aside: in India they are a tyranny. The Punjab peasant must pay or become a dishonoured man. These being the conditions under which he lives and works, it is not surprising to find that most cultivators are reduced to borrowing.

Agriculture is the greatest and moneylending the most profitable industry in the Punjab. One cannot readily measure the income derived from moneylending against that derived from agriculture; but it may be noted that income tax collections in the Punjab, in 1925-26, amounted to Rs.9.67 lakhs from bankers and moneylenders, as against Rs.8.88 lakhs from all manufacturers and industries. And if on the basis of land revenue collections it is argued that agriculture in the aggregate must show a much greater gross income than moneylending, the investigations of Mr. Darling and others may be cited to prove that it is mainly into the pocket of the moneylender, and not into that of the cultivator, that the actual profits of agriculture now find their way.

In examining the work of the co-operative societies it will be found that there are exceptions; but as a broad general statement it is correct to say that once the cultivator falls into debt the difficulties of clearing himself are very great. Compound interest at high rates, the uncertainty of harvests, the cultivator's lack of literacy and of account-keeping of any kind, the immediate calls for cash which even a frugal man must inevitably experience, and the system on which the lending business is worked all combine to make the moneylender master of the situation. As the lender's policy is to remain master, and to increase the amount of the capital lent, rather than to call up loans, the volume of indebtedness grows; it has grown rapidly in recent years because the rise in the value of land has added to the security which the debtor can offer.

In the absence of thrift, agriculturists must have credit, and until he is replaced by other means of credit the moneylender must remain an essential partner in the agricultural industry. From the point of view of the industry (as distinguished from the point of view of the cultivator himself) the serious matter is that the moneylender is a bad partner. He gives credit of the wrong kind, it is of the seductive type so often fatal to the thoughtless borrower, and he takes no care to see that his loans are applied to productive purposes. It is all one to the moneylender whether a peasant borrows for the purchase of bullocks, or for the marriage of his daughter, for the sinking of a well or for carrying on a law suit. The result is that land in the Punjab bears a dead load of unproductive debt, which greatly hampers the efforts of those who are endeavouring to promote the prosperity of the cultivator.

In illustration of the evil a few facts from Mr. Darling's book may be cited.

The total average mortgage debt on Punjab cultivated land is Rs.31 per acre or twenty times the land revenue. In general the higher the security available the greater the debt. Thus, in such districts as Amritsar and Gurdaspur, where the soil is fertile and irrigation is practised, it rises to Rs.66 and Rs.49. In the poor, unirrigated districts of Dera Ghazi Khan and Hissar it falls from Rs.13 to Rs.6 per cultivated acre. There are exceptions to this rule, e.g., in the fertile colony land of Lyallpur it is only Rs.20, but Mr. Darling points out that the colony is young, and that most of the causes of indebtedness have not yet arisen there. A very interesting contrast is drawn between Lyallpur and Ferozepore, two districts enriched in recent times by canal water. In the former picked colonists, favourably situated, have amassed wealth, and incurred little debt; a good deal of the money borrowed has, moreover, been borrowed for productive purposes. Here there is real prosperity. In Ferozepore water, coming through the exertions of canal engineers, was accepted by the people as a windfall from heaven. There was a great expansion of the cultivated area, and with high prices and improved communications a marked increase of wealth followed, accompanied as usual with a corresponding development of credit. In spite of epidemics, there has been a considerable increase of population, but not as yet sufficient to counterbalance the increase of area under crops; many of the people became relatively wealthy, but others have succumbed to the temptations of a too facile credit, and the district has now the largest mortgage debt in the province although it is one of the most prosperous. In an enquiry which embraced 1,941 landowners, only 9 per cent were found to be free of debt, and the average debtor owned Rs.655. It is estimated that the total debt, secured and unsecured, in Ferozepore district must amount to Rs.7 crores, or to 38 times the land revenue. Careful inquiry suggests that little of this heavy debt has been incurred for productive or even useful purposes. Much is due to extravagance, a certain amount to expenditure regarded as necessary, and a small proportion to the satisfaction of agricultural needs.

The total debt of landlords in the Punjab is estimated by Mr. Darling at Rs.90 crores. The interest payable on this debt is a huge sum. It is not possible to estimate the average rate of interest with any accuracy, but it is believed that it cannot be less than 25 per cent. If the interest is unpaid it goes to swell the loan; thus it may be stated that the interest now accruing annually on zamindars' loans must be about Rs.22 crores, or five times the land revenue of the province and about seven times the income-tax collections.

With the establishment of British rule and peace in the Punjab, land, which before that time had had little or no market value, began to rise in price, and its importance as a security soon attracted the moneylender's attention. In the

last quarter of the nineteenth century it had begun to pass in alarming quantities into the hands of this class, who did not cultivate it themselves but leased it to tenants, with the result that there appeared a danger of the land passing from the ownership of the hereditary cultivator, an economic revolution which could hardly be regarded without misgiving. To check this tendency the Punjab Alienation of Land Act, 1900, which is referred to on a later page, was passed and a check imposed upon mortgaging to non-agriculturists. Echoes of the grave situation may still be heard in the country-side in the folk-song :—

*Je nâ honda Thorburn*

*Tan hondi Pindi Chaur-Chapat.\**

Whereas in 1901 about 3,250,000 acres of land were mortgaged, by 1924 the area had fallen to 2,900,000 acres, but as land has risen much in value, the mortgage money, on transactions in 1901 was about 53 times the amount of the land revenue due on the property, and in 1924 was no less than 127 times the land revenue on the area mortgaged in that year. Mortgaging to neighbouring cultivators has, since 1901, become a very common practice; an enquiry made in Ferozepore district disclosing the fact that zamindars were there exchanging property so freely that land had in effect become a new form of currency.

In describing co-operation further reference will be made to the cultivator's financial position; enough has been said here to indicate that the Punjab peasant, and those who work for his betterment, have difficulties to contend with which cannot be ascribed to the soil, or climate, or even, as many reformers would have it, to the Government, but are inherent in himself and in his relations with his neighbours.

## 6. THE AGRICULTURAL AND VETERINARY DEPARTMENTS.

A description of the work of the Agricultural Department will be found in the evidence given by the Director of Agriculture, and the Principal and members of staff of Lyallpur College. As an introduction to this evidence it will be convenient to summarise here the main facts relating to the history and activities of the department. The work as now planned falls into three sections—investigation, education and propaganda. It centres round the Agricultural College at Lyallpur and a reference to this institution and its development may first be made.

Work at Lyallpur began in May, 1901, when the Director of Land Records and Agriculture established there an experimental farm of 54 acres, representative of the colony-land watered by the Lower Chenab canal. In 1905 a technical deputy director of agriculture was appointed, and the farm was enlarged to

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\* If Thorburn had not been there, Pindi (district) would have gone to pieces.

300 acres. At this time the Government of India resolved on a forward agricultural policy and provided for the purpose 20 lakhs of rupees per annum. Of this sum 2½ lakhs were assigned to the Punjab. A college at Lyallpur was then planned at an estimated cost of 4 lakhs and the buildings were completed and occupied in 1909. Meantime, in the autumn of 1906, a professor of agriculture and a chemist began work at Lyallpur and in the following year an economic botanist was appointed. These officers were engaged in investigations to be subsequently referred to until, in 1909, the college was ready to receive students.

A large number of candidates, some 400 in all, applied for admission to the new college, but in the first year the entry was limited to 16 students. A three-year diploma course was planned, partly to train workers for the Agricultural Department, and partly to meet the assumed demands for instruction of sons of the larger cultivators in the canal colonies; but, as elsewhere in India, it was found that government service was the goal of all candidates for admission, and when it was discovered that the demand for government officials was quite limited, requests for admission to the three-year course fell off rapidly, until in 1913 there was not a single applicant. This led to a revision of the courses. For those who desired an extensive training, with the object of qualifying for the better posts in the Agricultural service, a four-year diploma course was offered; for others, whose school qualifications, or whose means made the study of the sciences bearing on agriculture impossible, there was provided a two-year course in practical agriculture leading up to a college certificate. A few of these certificate students were to be eligible for employment in the department's lower posts; the others were expected to go back to the land. Finally, in 1917, the college was affiliated to the Punjab University and the four-year diploma course was remodelled into a course leading up to a B.Sc. degree in Agriculture.

In addition to the four- and two-year courses, there are three shorter courses of study. The first of them to be provided was a six months' vernacular course intended for zamindars' sons. It was begun in 1912, and is well attended. In 1918 a one-year course was instituted for training certificated teachers to give agricultural instruction in the rural vernacular middle schools which have already been described. In 1916 a one-month course was instituted for recruits to the Indian and Provincial Civil Service in the Punjab, with the object of explaining to young administrative officers the scope of the department's activities and the possibilities of improvement offered by local agricultural practice. Experience has shown that officers who have gone through this course have subsequently done valuable propaganda work.

In recent years applications for admission to the college have varied from 108 to 300, and the number annually enrolled from



53 to 64. In 1926 there were on the college rolls 261 students, viz. :—

Degree course students ... ..	162
Two-year certificate course students ... ..	23
One-year teachers' course students ... ..	32
Six-months' vernacular course students ... ..	43

The average cost of education to students attending college courses is Rs.45 per mensem. Scholarships are awarded by Government and by district boards. The aggregate annual value of these scholarships is about Rs.16,700.

The increase in the attendance at the college has necessarily involved addition to laboratories, class rooms and hostels. The residential accommodation in 1926 provided rooms for 186 students, and a new hostel, now building, will house a further 126.

Lyallpur provides the Punjab with both a college and a research institute. The staff is common. With the increase in the college itself there has been a large increase in the amount of experimental work. The teaching, research, field experiment and clerical officers now number 160 and there are, in addition, some 280 laboratory attendants and workmen either employed in the buildings and on the experimental fields, or working in the province from the college as headquarters.

The original 54 acres of land taken up in 1901 for experimental work have now been extended to 761 acres which are used as follows :—

	<i>Acres.</i>
College experimental farm ... ..	460
Students' training farm ... ..	71
Dairy farm ... ..	20
Botanical research ... ..	110
Entomological research ... ..	4
College site and grounds, staff bungalows ... ..	96

With the exception of a small piece of sandy land above the level of the canal, the whole area is irrigated, and it consists of a level tract of deep alluvial soil, light in texture, and admirably adapted for experiment work. The absence of rain, the facilities for irrigation and the easily-worked soil enable markedly uniform crops to be grown. The absence of variation in individual experimental plots is in striking contrast to the results that must usually be expected on the undulating fields and in the uncertain climate of Britain. The general impression given by the college estate is that here the experimentalist works under very favourable conditions. Insect and fungus pests have to be reckoned with; but the facilities for study afforded by the adjacent laboratories, and the equipment at the disposal of the college, enable most of them to be kept in control. The farm buildings are extensive, there is available a wide range of European, American and Indian cultivating and other implements, and there are workshops in which repairs can be carried

out. It is on this college estate that the improvements recently introduced into Punjab agriculture have mainly originated, and some account of the work may be given before referring to the district agricultural work being carried on in the province.

If the college estate can claim to be the focus of agricultural activity in the Punjab, the botanical research area may claim to be the focus of the estate. Cotton and wheat have received, and still receive, most attention; but the improvement of a number of other crops is undertaken. Quite recently, under an arrangement made with the Indian Central Cotton Committee, cotton has been given a section to itself; a cotton research botanist has been appointed, a new laboratory has been built, standing in its own 18-acre experimental field, and a farm of 200 acres has been acquired a few miles from the college for the further testing of the new cottons being introduced. From 1907 until 1923, however, cotton improvement formed a main preoccupation of the economic botanist.

In 1907, when botanical work began, two classes of cotton were found growing in the Punjab; by far the most common was the native Indian or *desi* crop, consisting of short staple growths of the species *Gossypium neglectum*, or less commonly *G. sanguineum*; the other was a cotton of American origin (*G. hirsutum*) which had reached the Punjab from various sources, mainly from Dharwar. This American cotton was grown under irrigation in several districts, but was in no great favour with cultivators, and making little headway. On examination by the economic botanist, it was found to consist of a mixture of types, some of them obviously of a superior quality. In 1910 seed of a promising type which had then been selected from the mixture was passed on to be tried on the experimental farm, where it proved to be of high value. It was distributed to cultivators as Punjab-American 4-F and it found so much favour that in 1926 over a million acres of this variety was grown in the province. Meanwhile, as the result of further study, several other cottons of still better quality were isolated from the same group, and two of these, 285-F and 289-F, are being grown on a considerable scale. The staple of ordinary *desi* cotton measures from .5 to .7 of an inch and spins from 6s to 10s counts. Punjab-American 4-F has a staple of about .9 of an inch and spins from 20s to 25s counts, and 289-F has a staple of 1.2 inches and spins from 50s to 60s counts.

About one-half of the cotton area of the Punjab is still occupied by *desi* cottons, and it is unlikely that they will be superseded, for the American types are not suited for unirrigated land, and even where irrigation is available local conditions may indicate the indigenous types as the more suitable, since they admit of later sowing. Attention has, therefore, been given to the selection of superior strains. While no such marked improvement over the ordinary crop has yet been secured as in the case of exotic cotton, the mixed country

cottons have been separated into four more or less pure strains, each possessing some quality commending it to the cultivators of some locality, and it is anticipated that as a result of further study superior strains will yet be discovered.

It should be noted that the improvements in cotton so far effected have resulted from the discovery, isolation and growing on of superior strains occurring naturally in field crops. Hybridisation is now being resorted to in the hope of artificially producing new strains of better quality than those found in the existing crops.

Work on wheat has followed the same lines as in the case of cotton. From 1908 onwards a study was made of the types discovered among mixed field crops and many were isolated. The first to show high merit was the wheat known as Punjab No. 11 which, in 1926, occupied some 625,000 acres. This wheat was one of those originally isolated by Pusa investigators; but it showed no special merit in the Pusa district. Proof of its value for the Punjab was obtained at Lyallpur. By continued selection a second wheat of much value—Punjab 8A—was isolated. It is not only a better yielder, but produces a better flour than No. 11, and it is superseding this variety. In 1926 some 830,000 acres were being grown from seed supplied by the department.

Just as the best wheats distributed widely by Pusa, and largely grown in the United Provinces and elsewhere, have not commended themselves in the canal colonies of the Punjab, so the best Punjab wheats are seldom popular further south, and not even in the Peshawar valley in the extreme north. This illustrates a general experience among agriculturists. By whatever process a new variety may originate, whether as the result of selection or of cross-breeding, its value to a locality can only be determined by rigid tests conducted in that locality. It is recognition of this fact that governs much of the experimental work at Lyallpur. The larger part of the botanical area (as distinguished from the area assigned to the special officer in charge of cotton) is now occupied by an extensive series of selections of wheats; some of them picked out from existing crops, others the result of hybridising. The special qualities of these wheats are carefully noted, the most promising are passed on to the experimental farm, and there, after further tests, if they prove satisfactory, are multiplied for distribution to seed-growing farms in different parts of the province.

The work of the chemical section at Lyallpur, like that of the botanical, partly consists of intensive studies of subjects to be further worked out on the experimental and dairy farms, and partly of work arising out of investigations in progress in other parts of the province. As an illustration of the former type of work may be instanced the investigations now in progress on animal nutrition. The digestibility of the more important feeding stuffs is being determined by trials conducted on cows

and bullocks; while the effects of foods on milk production, and the feeding value of new types of fodders—with special reference to materials that might be employed in times of scarcity—have recently received special attention. A new digestion stall accommodating six animals, with facilities for the separation of dung and urine, has been provided for these experiments on cattle.

Investigations of the second type, that is, work carried out at Lyallpur in association with experimental farms, or observation plots in other parts of the province, now cover a wide range of subjects. The nutrition studies are being extended to samples of fodder from all parts of the Punjab; while it is worthy of note that special attention is being given to the mineral content of the natural grasses in districts where there is reason to suspect deficiencies. Co-operative manurial experiments are conducted, green-manuring, and the uses of ordinary artificial manures have been investigated. A sugarcane survey has been undertaken, and many local and introduced varieties have been analysed. Waterlogged soils and salt lands have been examined, and special experimental treatment has been devised with a view to the reclamation of such barren lands. A large number of samples of Punjab soils have been collected and analysed.

An entomological section has been at work since the college started; in 1919 it was reorganised and much enlarged, and now, in addition to teaching and research work at Lyallpur, it employs a staff for dealing with insect pests in the province. Under its supervision many thousands of fruit trees are sprayed each season. At the present time, in association with the Indian Cotton Committee, much time is being given to studies of the pink cotton bollworm, whose ravages are specially severe in the south-eastern Punjab. The adjacent tracts of the United Provinces also suffer from this pest, and parallel studies of methods of control are being made at Cawnpore. Treatment of cotton seed with hot water before sowing has been found very useful. Other insects now receiving special attention are cotton-, sugarcane-, maize- and rice-borers, and fruit pests such as the mango hopper and the psylla of citrus trees.

With the object of studying the feeding-habits and life-histories of injurious insects, an insectary has been provided, and four acres of land are set aside for observational and experimental work.

The section is also charged with fostering sericulture and lac cultivation in the province.

An agricultural engineering section was started in the college in 1915, and in 1920 new workshops were provided with offices for draughtsmen and clerical staff. From this centre the work of improving irrigation from wells within the province is conducted. Special attention has been given to increasing the water supply in ordinary wells by boring, and to providing deep

tube wells, where these are suitable. A new power-boring machine has been designed, and an improved type of strainer for preventing the choking of bore holes with fine sand has been introduced. Three power-boring machines and 72 hand-boring plants are now at work, and the number will shortly be increased to 10 and 140 respectively.

Hitherto the demands on the time of the engineer in connection with well-irrigation have not allowed of much attention being given to the designing of new machines and implements; but a special engineer is now to be employed on this work, as the experience already gained shows not only that there is scope for better designs, but that with skilled assistance it will not be a difficult matter to effect improvement.

The large experimental farm is employed in testing and developing the work of the laboratories and research fields, for in dealing with Indian cultivators it is of special importance that nothing which has not been thoroughly tested should be brought to their notice.

The farm consists of two sections. About half is leased out to tenants and the remaining half, the most suitable for experimental work, is laid out under crop-variety tests, rotation experiments, manurial trials, and irrigation experiments. From what has already been said on the work of the scientific sections, the scope and purpose of the experiments will be inferred, and one experiment only, that on "Intensity of Cropping," need be referred to because of its general interest.

In Indian agriculture fallowing takes an important place as a means of cleaning and improving land; but it is known both that Indian soils are specially deficient in humus, and that there is in them a large production and loss of combined nitrogen. It was therefore argued that provided the land can be kept clean, the greater the intensity of cropping the better the result should be, for root residues would add humus and the growing of crops would prevent the loss of combined nitrogen. To test the correctness of this theory, advanced by the then Professor of Agriculture, a series of rotation experiments was planned in 1920. About 25 acres of level and uniform land was divided into four blocks which may be designated as R1, R2, R3 and R4. Each block carried a three-year rotation of crops. The first of these was a common local rotation wheat—fallow—cotton. The fallow was relied on for land improvement, and it will be seen that the intensity of cropping was 66 per cent. R2 consisted of wheat—gram—cotton; thus the intensity of cropping was 100 per cent and a leguminous crop was relied on to effect improvement. R3 consisted of a leguminous crop, *guar*, ploughed in, followed by wheat-rape cotton; intensity of cropping 133 per cent with a leguminous green manure to effect improvement. R4 consisted of wheat—mixture of *fowar* and *guar* (for fodder)—gram—cotton—*senji* (an annual medick); here the intensity of cropping is 166 per cent, three

leguminous crops are grown, and additional fertility has been imparted by the direct application of 10 tons per acre farmyard manure to the cotton crop.

The financial returns for two three-year rotations are now available and are as follows :—

	First rotation.		Second rotation.	
	Rs.	As.	Rs.	As.
R1. Average net income per acre per annum ... ..	36	13	95	3
R2. Ditto ... ..	45	2	115	11
R3. Ditto ... ..	56	4	124	15
R4. Ditto ... ..	66	5	152	3

It will thus be seen that the more intense the cropping, the greater was the net income, and also that the final figure suggests a marked increase in value to be due to the direct application of farmyard manure.

The above experiment has been referred to as an illustration of the work at Lyallpur, but the results are of much general interest as bearing on the possibility of increasing production on irrigated land. Given water, active bullocks and seed of the right kind, there would seem to be no reason why cropping should not be intensified, and fertility enhanced, by following methods suggested by sound theory and approved by six years' practical experience.

The section of the experimental farm which is let out to tenants is not let unconditionally, but is used to promote the objects of the department. New varieties of crops, which show sufficient promise under experimental conditions, are passed on to the tenants so that their value, under the ordinary methods adopted by the Punjab cultivator, may be ascertained before they are distributed to the agricultural public.

While the stock and crops on the experimental farm are available for teaching purposes, they are not subjected to the prentice hands of students. For giving practical instruction, so very necessary in the case of Indian students, there is a farm of 71 acres worked by the students themselves, who are required to undertake all the usual farming operations, including the care and feeding of the working cattle.

Side by side with the development of the investigations and educational work at Lyallpur there has gone on an expansion of district work. Some reference to this has been made incidentally in describing the activities of the college. It will now be necessary to allude further to the work proceeding within the province.

In July, 1906, a separation was effected between the Departments of Land Records and Agriculture, which had hitherto been under a single director, and a director of agriculture—an Indian civilian—was appointed. When in the autumn of the same year a principal was appointed to Lyallpur, the

deputy director, who had previously taken charge there, was set free for work throughout the province. In the following year the Secretary of State authorised the employment of three deputy directors, but it was not until 1914 that the third appointment was made. The province is now divided into five circles, each in charge of a deputy director, and proposals have recently been made, and approved in principle, for the employment of three additional deputies. The present organisation, however, is on the basis of five circles, the headquarters of the deputy directors being Gurdaspur, Hansi, Montgomery, Multan and Lyallpur. Subject to the general supervision of the Director and assistant director, whose headquarters are in Lahore, the five deputies are responsible for all the work proceeding in their respective circles, except that in the case of Lyallpur the college—the focus of all this district work—has its own Principal. The five deputies are members of the Indian Agricultural Service with salaries (exclusive of overseas pay) rising from Rs.350 per mensem to Rs.1,250 as a maximum. Immediately under them are nineteen extra assistant directors stationed at appropriate centres throughout the province, who are members of the Provincial Agricultural Service drawing salaries of Rs.200 per mensem rising to Rs.750 as a maximum. Under the assistant directors there is a corps of agricultural assistants, separated into two groups. Group A consists of men who have passed the B.Sc., or diploma examination, or who have been promoted for special merit. They begin on salaries of Rs.100 and may rise to Rs.300 monthly. Group B consists of men who have taken the college certificate after a two-year course. They enter the service at Rs.70 and may rise to Rs.180. Including the assistants stationed at and working from the college as a centre there are now some 140 in the A and 50 in the B Class.

The provincial staff is employed in managing seed and experimental farms, in conducting local experiments and in lecturing and propaganda. A large extension in district work including the provision of many more farms is, as already stated, in contemplation; for the present the facilities for local experimental and other work are the following:—

In the First, or Gurdaspur Circle, there is an experimental farm at Gurdaspur of 161 acres; six government or district board farms of from 43 to 54 acres, located at suitable centres throughout the circle; a seed-growing and experimental farm of 500 acres at Sargodha, and a second farm of 250 acres of the same type at Chilianwala. In the Second (Hansi) Circle, there are at Hansi itself an experimental farm of 589 acres, and three local demonstration farms of 40, 52 and 100 acres respectively. In the Third (Lyallpur) Circle, in addition to the properties attached to the college, there is a seed-growing farm of 878 acres. In the Fourth (Montgomery) Circle are two seed-growing farms of 250 and 275 acres respectively, a district

board demonstration farm of 46 acres, and an experimental farm of 558 acres which has a special problem the reclamation of *bara* land, that is, land with a high percentage of salt and a peculiarly intractable texture. In the Fifth (Multan) Circle there is a seed-growing farm at Multan, and a demonstration farm at Mianwali.

To this list of permanent centres for developing the agriculture of the province, there must be added the livestock improvement farms, which will be referred to subsequently, and the grantee farms, the latter, of which there are about half-a-dozen engaged in crop improvement, consist of large tracts of land varying from about 2,500 to 7,500 acres granted on condition that the grantees take a share in experimental work, demonstration, and seed-growing. These large and well-managed farms have been of special value to the Agricultural Department in testing out new processes, in growing on pure strains of seed, and in providing data for estimating the cost of production of crops. As showing the relation between science and practice in the province, it is interesting to find that two of these farms extending to some 10,000 acres, one leased by a British company, the other by a substantial Indian landowner, are now under the management of a former member of the college staff, and that the size of the crops and the success of the farming are attracting widespread attention.

It is unnecessary to refer here to the character of the work for improving crop-production that is being carried on by the Agricultural Department. It is described in the evidence and its general nature may be inferred from the facts already given; but it should be noted that in addition to the problems of crop-growing, the officers of the department have given close attention to questions of marketing. It was found, for example, that the spread of improved cotton was being hindered by malpractices, or by carelessness. Traders could be induced to offer no more for the small quantities of high-grade cotton produced in the earlier years than for unimproved country cotton; and, when the bulk of the long staple variety increased, the practice of mixing good or bad staples was reflected in the prices procurable by the grower. Special steps were therefore taken to organise auctions of Punjab-American cotton and to safeguard its reputation. This action by its effect on prices markedly assisted the spread of the new introduction.

*Livestock Farming and Veterinary Work.*—Schemes for the improvement of livestock are carried out by the agricultural civil veterinary and co-operative departments who attack the problems presented from different angles and work with a common policy.

The breeding of improved livestock is undertaken by a special branch of the Civil Veterinary Department, a department whose staff at present form a separate service under a Chief Superintendent, linked to the staff of the Agricultural Department



through the Director of Agriculture, who is in turn responsible to the Minister of Agriculture for the work of both services.

The improvement of cattle presents, as elsewhere in India, much more serious difficulties than the improvement of crops. Although the native breeds of the Punjab are among the best cattle to be found in India, there exists here, as in other parts of the country, the difficulty of providing fodder throughout the year; indeed, owing to the dry climate, scarcity is more pronounced than in many provinces. Before the wide expansion of cultivation rendered possible by the extension of canal irrigation, the need for plough cattle was much less than it now is. Formerly there were extensive areas of waste land, over which wandering herdsmen roamed in search of fodder for their livestock; natural selection played a part in the survival of the fittest, i.e., the most active and enduring of the cattle, and the herdsmen themselves were not devoid of the eye and instincts of the breeder. As population increased and man came into competition with his cattle for the scanty produce of the soil, the lot of livestock became harder; but when the British first reached the south-east Punjab, they found there as fine a class of bullock for military transport as India could then produce; and in the dry district of Hissar, they established a great farm of 42,000 acres for breeding these Haryana cattle for the army. That farm still exists. Some twenty-five years ago it was handed over to the Punjab Government, and it is now used for breeding Hissar bulls for distribution to district boards working livestock improvement schemes. Unfortunately, throughout its long history the Hissar herd has not always been wisely managed; the passion for experiment has at times prevailed over the knowledge of the cattle-breeder. Cattle of good quality from other parts of India were introduced, and crosses appear to have been made—as they are still being made in some parts of India—just to see what would happen! As a result the Hissar herd lost some of its original characteristics. The policy, which has been followed since the present management took over charge of Hissar farm, has been to restore the herd to the original Haryana type; and except in the case of a few of the older cows, the Hissar cattle now exhibit that degree of quality and character which should be regarded as essential in a herd maintained for the production of bulls for the improvement of draught-cattle. The best of the young bulls left when fit for service are sold at an upset price to representatives of district boards and co-operative societies responsible for cattle improvement. The supply is not equal to the demand, and efforts are directed towards supplying those villages where the best use is made of good bulls. The chief difficulty met with in the initial stages of improvement is that many of the village cows are so poor in quality and so badly fed that there is no chance of a satisfactory calf, however good the bull. In the better organised districts, measures are taken to prevent pedigree bulls from being mated

with valueless cows. A second difficulty lies in the existence of worthless wandering bulls. There is no certainty that a cow, itself the result of a satisfactory mating, may not be served by one of these; alongside the campaign for the better treatment of cows, there is also carried on a castration campaign, for reducing the number of inferior bulls. Where, as in Gurgaon district, both these difficulties have been resolutely tackled, a rapid improvement in livestock may be looked for, and there is a keen demand for more Hissar bulls by district boards and livestock improvement co-operative societies.

The total size of the Hissar herd is about 4,000, the number of cows 1,450, and the number of young bulls suitable for service sent out in the year 1925-26 was 406. There has recently been a rapidly increasing demand; but the supply falls far short of the needs. The actual number of Hissar bulls at stud is at present under 2,000. It was estimated in 1920 that the province as a whole requires 50,000 bulls; and even if it be assumed that cattle of the Hissar breed are suitable for distribution in not more than one-third of the province, it will be obvious that a largely increased supply of pedigree animals of this breed is required. The Hissar herd is to be enlarged; meantime the Civil Veterinary Department are developing ancillary farms. Grants of land on special terms are made to agriculturists who undertake to breed Hissar cattle. At present three of these farms, of an aggregate area of about 5,250 acres, and maintaining 925 Hissar cows, have been established in the Lower Bari Doab canal colony.

In the north of the province there is found a second breed of draught cattle—the Dhanni—very different in appearance and qualities from the Haryana or Hissar type, and as popular with cultivators in the north and western districts as Haryana cattle are in the south-east Punjab. A start has been made in the improvement of these cattle by using selected Dhanni bulls. Cattle-breeding associations have been formed in the Rawalpindi, Attock and Jhelum districts. A herd book for Dhanni cattle has been established. Approved bulls are allocated to selected villages. These bulls are the property of private owners to whom a premium is paid in aid of maintenance; the premium may be as much as Rs.20 per mensem.

A third notable breed of cattle found in the Punjab is the Sahiwal or Montgomery. This is one of the few Indian breeds that possesses good milking qualities, and in recent years the native stock has been much depleted by sale to town dairymen, or to Military dairy farms. To preserve the quality and maintain the supply of this breed the Civil Veterinary Department have established five farms in the Montgomery district. These farms maintain some 1,200 pure bred cows and have an aggregate area of about 12,000 acres. In addition government land is being leased out to members of certain cattle-breeding tribes

on the condition that they maintain a specified number of Montgomery cows for breeding pure stock. With the object of encouraging the improvement of milking cattle the department is, at Hissar and elsewhere, also resorting to milk-recording.

The total number of selected bulls provided under the Government's cattle-breeding schemes in 1925-26 was 616, and on the 31st March, 1926, there were 2,253 stud bulls owned by local bodies undertaking cattle improvement. Gurgaon district alone had 463.

To a limited extent the improvement of sheep is receiving attention. The Hissar farm maintains a flock of from 450 to 500 ewes. Merino rams have been used in crossing and selected rams from the cross-bred flock are being supplied to a few co-operative societies formed for promoting sheep farming; but considerable results cannot yet be claimed.

Hissar farm breeds a small number of Arab horses and donkey stallions for mule breeding; but with this work the Civil Veterinary Department have now little direct connection. Horse and mule-breeding operations were, in 1903, transferred to the Army Remount Department which has organisations for the purpose in twelve of the Punjab districts. As in other cases, grants of government land have been made to private individuals on condition that they co-operate with the Remount Department. In the Lower Jhelum and Montgomery district alone some 300,000 acres are being granted on certain conditions to cultivators who engage in horse-breeding, and in the Lyallpur district some 40,000 acres are similarly granted in aid of mule-breeding.

The main work of the Civil Veterinary Department is not the breeding of livestock but the prevention and treatment of disease, and here, as in the case of the Agricultural Department; a reference may first be made to the college. Among Indian educational institutions this college has quite a long history; it began in 1882, when a veterinary school was founded to provide a two-years' vernacular course. This course was in 1899 increased to three years. In 1919 the scheme of training was entirely remodelled. The school, affiliated to the university, became a college; the course was extended to four years, and English replaced Urdu as the medium of instruction. The standard for entrance was henceforth the matriculation examination of the university, and the diploma of L.V.P. (Licentiate in Veterinary Practice) was offered to successful students. Since that time the college has been provided with extensive and well-equipped buildings; including not only classrooms, teaching laboratories and hospitals, but research laboratories, much exceeding in spaciousness and material opportunities for study anything that the veterinary colleges of Great Britain can show. In 1926 the staff consisted of a principal and eight professors, and there were 112 students on the college roll, of whom seven had already taken the diploma and were engaged in advanced studies. From 4,000 to 5,000 cases of

disease are annually treated in the hospitals. For the study of surra a special laboratory was established in the north of the province. Valuable work was done which, unfortunately, has been interrupted by the resignation of the officer in charge.

As in the case of agriculture, the students look forward mainly to government employment for a career.

For veterinary work the province is divided into three Circles each under a superintendent, one of whom is also Chief Superintendent of the department. The Superintendent of the Northern Circle is also responsible for work in the North-West Frontier Province. Each superintendent has under him a deputy, and the provincial staff includes 27 inspectors, 7 veterinary assistant surgeons, and 226 veterinary assistants. In association with district boards, who establish and maintain veterinary dispensaries, this staff is engaged in treating sick and maimed animals all over the province, and in combating as best they can the spread of contagious disease. In the absence of legislation on the lines of the Contagious Diseases (Animals) Acts of Britain, it needs no description of their task to prove that the difficulties under which veterinary officers work are formidable.

Diseases are treated partly by members of the staff of the Civil Veterinary Department on tour, and partly at local dispensaries to which sick animals are brought. In 1925-26 the touring staff visited 22,600 villages, treated 120,000 sick animals and castrated 90,000 scrub bulls or bull calves. The veterinary hospitals (of which there are now 191), and the dispensaries had 24,000 in-patients, 574,000 out-patients and castrated 76,000 animals, of which 64,000 were cattle. Some 230,000 cattle were inoculated with serum (alone) against rinderpest, and 92,000 against hæmorrhagic septicæmia, and against the latter disease 148,000 were vaccinated.

The cost to the central Government of the Civil Veterinary Department was Rs.12.93 lakhs in 1925-26, hospitals and dispensaries accounting for 3.17 and livestock breeding and improvement for 6.16 lakhs. In addition, local bodies expended 2.75 lakhs on hospitals and dispensaries, and 2.87 lakhs on livestock improvement.

*Horticulture.*—It is recognised that there is a wide field for the fruit and vegetable grower in the Punjab, and the difficulties of the horticulturist are being met to some extent by the Entomological and other specialist sections of Lyallpur College. On the cultural and crop-improvement side a small amount of work has been done by the Economic Botanist, such, for example, as the introduction of the Arabian date-palm into Muzaffargarh; but it is agreed that much more requires to be done, and it has recently been decided to add fruit and vegetable specialists to the agricultural staff.

Pending further developments within the department, Government has sought to encourage horticulture by granting leases of State land on favourable terms, on condition that

experiments in fruit-growing are carried out. The most important of these grants was made in 1920. A farm of 720 acres in the Montgomery district was leased to a fruit-grower on condition that he would cultivate grapes and endeavour to establish a raisin industry. Climatic difficulties have been encountered, the ripening grapes are apt to burst during the rains, and varieties which ripen before or after the rainy season are being sought. Other farms of 125 acres and 75 acres respectively have been granted for general fruit culture. In these cases the prospects are more hopeful, but the trees planted are still young and definite success is not yet assured.

This outline of the development of the Punjab Agricultural Department may be concluded by citing the expenditure incurred at various periods as the department grew in size. In the post-War years the increase in salaries and other costs must be kept in mind. Otherwise the rate in growth of expenditure may be taken as a fair measure of the Punjab Government's effort. It will be seen from the evidence of the Director of Agriculture that the claim is made that the expenditure has been highly remunerative, and as Government contemplate large extensions of the department in the next five years, and the Legislative Council have already granted funds for the first part of the new programme, it may be inferred that the province is satisfied with the returns that so far have accrued.

The total expenditure on the Agricultural Department at five-year intervals from 1906-07 onwards is shown below. The cost incurred by other departments in providing buildings or land for the Agricultural Department has been included, but the cost of the Veterinary Department (which has been given above for 1925-26) has been excluded.

						Rs. lakhs.
1906-07	...	...	...	...	...	2.58
1911-12	...	...	...	...	...	3.00
1916-17	...	...	...	...	...	7.05
1921-22	...	...	...	...	...	19.23
1926-27 (Budget Estimate)	...	...	...	...	...	38.46

## 7. IRRIGATION.

The total area of irrigated land in the Punjab in 1925-26 was 13,819,000 acres. Of this area by far the greater part was supplied with water from the great system of canals. In regions which canal water does not reach, wells are the main source of supply. The total area irrigated from wells in 1925-26 was about 3,715,000 acres as compared with 4,612,000 in 1868-69. Of well irrigation it is unnecessary to write. As in other parts of India, water is lifted by the Persian wheel or the leather bag; bullocks, or occasionally, buffaloes supplying the power. In a few districts oil-engines are employed,

especially for pumping from deep (tube) wells. The main difficulty that confronts the cultivator depending on wells is the lowering of the water-table in certain tracts. Intense well irrigation exhausts the relatively small supplies of subsoil water existing in dry tracts; and the falling, by even a few feet, of the water table so greatly increases the cost of lifting that it may easily turn a prosperous into a wholly unprofitable form of cultivation. Uncertainty as to the water-supply available is now hindering the extension of deep wells, and experimental batteries of tube wells are projected in one or two important districts with the object of testing the effects of intensive pumping on the supplies afforded by shallow wells in the same localities. As will be mentioned later, scientific officers of the irrigation and agricultural departments are studying both the prospects of increasing the number of tube wells and the effects they produce on the subsoil water level.

The distinctive feature of Punjab irrigation is its canal system. While the magnificent waterways which now fertilise the province have been constructed mainly within the past half century, it must not be supposed that canal irrigation in the Punjab is a new thing. The oldest of the existing canals—the Western Jumna—owes its origin to Firoz Shah, in 1351, and its re-exca-  
vation and extension to Akbar in 1568. The words of a *sanad* of this great ruler are worth quoting:\* “ My wisdom,” he writes, “ wishes that the hopes, like the fields of those thirsty people, may, by the showers of liberality and kindness, be made green and flourishing, and that the canal may in my time be renewed, and that by conducting other waters into it, it may endure for ages. For God has said from water all things were made. I consequently ordain that this jungle, in which subsistence is obtained with thirst, be converted into a place of comfort free from all evil.” In the seventeenth and eighteenth centuries irrigation was neglected, but early in the nineteenth the canal of Firoz Shah and Akbar was resurveyed and restored by the British engineers, Macartney, Blane and Colvin, and since that time the mantle of the Mogul ruler has fallen on a succession of British and Indian engineers, so that the Punjab, if not yet “ free from all evil,” is rapidly being converted into a province in which subsistence, formerly obtained “ with thirst,” is now obtainable in “ comfort.” When the projects in course of construction, or investigation, have been carried out, the dream of Akbar will indeed have become a reality.

It is possible to describe in words the Punjab canal system, and to show by figures the magnitude of the engineering works; but it is scarcely possible to convey to those who have not visited the province a conception of the change which irrigation has brought about on its scrub-covered wastes and sandhills. In

\* Yule, “*Jour. Asiatic Soc.*,” 1846; quoted by Buckley, *The Irrigation Works of India*, Allen & Co., London, 1880.

regions not yet reached by canals the traveller may still journey by train for hours across wastes consisting, it would seem, of hopelessly barren land; and on the following day, in one of the canal colonies, he may traverse wide tracts, patches of which, here and there left unirrigated, consist of the same thirsty sand, but in general now converted into cornfields so prosperous to the eye of the agriculturist that to describe the change he is compelled to make use of Akbar's imagery. It would seem that not moisture alone but "showers of liberality and kindness" have "made green and flourishing" this barren jungle. But in prosaic terms, the irrigation engineer will inform him that the change has, in fact, been brought about by the supply of 2.84 cusecs (cubic feet per second) of water per 1,000 acres through an A.P.M. (adjustable proportional module) from some minor water channel! What is it that the officers of the Irrigation Department have done and are doing?

Two types of canal may be distinguished. First, there are the inundation canals, many of them ancient, depending for their supplies on flooded rivers. These canals are numerous, but as a class they are unsatisfactory from the point of view of the cultivator, since the water supply is uncontrolled and uncertain and crops are liable to injury by the falling of river levels at critical periods, and, except in the Indus Valley, they will cease to exist when the irrigation programme has been completed. Of far greater importance is the second type of canal, for which by means of head works, a large volume is stored and from which a controlled supply can be provided either throughout the year or for a definite term which will ensure the autumn or the spring harvest.

In recent years the irrigation works of the Punjab have grown quickly and they are still in process of rapid extension. When in 1932-33 the Sutlej Valley canals, now in course of construction, have been completed, the Irrigation Department will be able to claim that they have some 15,000,000 acres annually under irrigation. Included in this large area there will be about 2,500,000 acres situated in Indian States; the necessary construction may, however, be claimed as their work by Punjab engineers; it has been, or will be, carried out by them on behalf of Indian rulers.

In 1924-25 there were in all nearly 20,000 miles of government irrigation channels in the Punjab, as compared with 11,000 miles at the beginning of the century.

Including 679,000 acres in Indian States, the area irrigated from government irrigation works in the year ending March, 1926, was 11,109,000 acres, as compared with 5,244,000 acres in 1900, and 2,341,000 acres only in 1887-88.\*

About 5,096,000 acres of *kharif* crops were irrigated in 1925, including cotton, 2,414,000, rice 540,000 and sugarcane 160,000

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\* The figures for 1925-26 are gross and the earlier figures are net.

acres. In the following *rabi* season 6,013,000 acres were irrigated, including 3,593,000 acres of wheat.

The figures given above relate to the actual areas irrigated in a single year. The total areas commanded by the canals are much greater and these larger areas are irrigated in rotation. At the present time 20 million acres of land are commanded, and when projected canals and extensions have been carried out, this area will be increased to 36 millions. For comparison it may be noted that the irrigation works of Egypt and the Sudan command eight million acres.

Not only have Punjab canals converted sandy wastes into fertile tracts of country, but they have proved directly profitable to Government. On the works in operation at the end of 1925-26, a total capital outlay of about 23.54 crores of rupees had been incurred. By far the larger proportion, *viz.* : 23.15 crores, had been spent on productive works. The direct income in water-rate and miscellaneous receipts from productive works in 1925-26 amounted to 4.30 crores, and the expenditure on maintenance and interest charges to 2.34 crores, thus showing a profit of 8.5 per cent. But in addition there were large indirect receipts in the form of enhanced revenue from the irrigated lands. These indirect receipts were about 2.02 crores, bringing the profits after paying interest charges up to 17.2 per cent.

It should be noticed, however, that the capital outlay per acre irrigated has risen greatly. In the case of four of the older perennial canals, the capital outlay per acre irrigated in 1924-25 was Rs.19, while on four new perennial canals it reached Rs.43. In the case of the Sutlej canals now being constructed, the capital cost per acre irrigated is likely to exceed Rs.80; and other projects under consideration would involve a capital expenditure of Rs.100 per acre irrigated.

The charges made for water are on an acreage basis and the rates vary with the kind of the crop. Remissions are given on account of failure. Typical charges in 1924-25 were for sugarcane Rs.12 per acre, for cotton Rs.6-4, for wheat Rs.5-4, and for fodder crops it has recently been reduced from Rs.3 to Rs.1-8 per acre. Proposals for supplying water on a volumetric instead of on an acreage basis have been considered, but for reasons that will be indicated below the Irrigation Department has hitherto found it to be impracticable in general to change its present method of charging by the acre irrigated.

The chief canals from which water is now being supplied may be briefly referred to.

*The Western Jumna Canal* is the oldest in the Punjab. It was originally constructed, as already noted, by Firoz Shah in the fourteenth century. The ancient canal was restored by the British between 1817 and 1847, and was further improved and extended between 1873 and 1880. The present canal takes off from the Jumna at Tajewala, commands about 2,700,000 acres



of land in the districts of Ambala, Karnal, Hissar, Rohtak and Delhi, and in the States of Patiala and Jind; but the water available allows only of the irrigation of about one-third of this area in a year. The full capacity is 6,400 cusecs, and this quantity may be available between the 10th of May and the 15th of September. In December the supply may fall to no more than 1,800 cusecs.

*Upper Bari Doab Canal.*—For political reasons this canal was projected immediately after the annexation of the Punjab. It waters the Doab between the rivers Ravi and Beas in the heart of the Sikh country. It takes off from the Ravi at Madhopur in Gurdaspur district. When full, as it usually is from the 15th March to the 15th December, it carries 6,700 cusecs, but in the later winter months the supply may drop to 1,500 cusecs. It commands some 1,600,000 acres, of which about 80 per cent. may come under irrigation in a year. Rice is an important crop in the area watered by this canal.

*Sirhind Canal.*—This canal, which takes off from the Sutlej at Rupar in Ambala district, was begun in 1869 and completed by 1883. It commands about 2,450,000 acres in the districts of Ludhiana and Ferozepore and can irrigate about 1,000,000 acres annually. The capacity is 5,600 cusecs, and from May to 15th August there is a full supply of water. This canal also irrigates land in the Indian States of Patiala and Jind.

*The Lower Chenab Canal.*—This canal was opened in July 1887, but its capacity was greatly increased when the Upper Jhelum was completed in 1915. It now has a capacity of 10,900 cusecs, and irrigates more land than any other. It commands 3,390,000 acres in the districts of Gujranwala, Lyallpur and Jhang, and can irrigate about 2,000,000 acres annually. The months of April and October are critical periods in the Chenab canals, and consideration is being given to a scheme for increasing the existing capacity of the Upper Jhelum Canal, so that more of the surplus water of the Jhelum than is at present possible may be diverted into the Chenab.

The *Lower Jhelum* canal, the first of the snow fed canals, with a capacity of 4,300 cusecs, was opened in 1901, it commands some 1,300,000 acres in the districts of Shahpur and Jhang, and can irrigate about 825,000 acres annually. A full supply of water is available from February until the end of November.

The rapid increase in canal irrigation in the present century is accounted for mainly by the construction of the linked triple canal scheme which waters the central plains of the Punjab. The following figures show the importance of these canals, which were opened between 1912 and 1915.

The *Upper Jhelum* has a capacity of 8,500 cusecs. It commands 600,000 and irrigates about 300,000 acres in the district of Gujrat; the full capacity of the canal can be used from about the middle of February to the end of November. The main

purpose of the Upper Jhelum Canal is to convey surplus water from the Jhelum river to augment by 6,000 cusecs the supplies required by the Lower Chenab Canal.

*The Upper Chenab Canal.*—This great waterway, with a capacity of 14,400 cusecs, has a double function. It commands some 1,600,000 and irrigates 650,000 acres in the districts of Sialkot, Gujranwala and Lyallpur, and it passes on 7,500 cusecs into the Lower Bari Doab Canal, which, in turn, commands 1,750,000 acres and irrigates about 1,000,000 acres in the districts of Montgomery and Multan.

Three groups of projects are now engaging the attention of Punjab irrigation engineers. There are, as has already been stated, many inundation canals, some ancient, others modern, in the Punjab. One important series depends on the waters of the Sutlej, and the uncertainty of the supply, together with the need for irrigation in new tracts of country, has led to the great Sutlej Valley Irrigation Scheme now in process of construction. Some of the new Sutlej canals have already been opened, and it is anticipated that the whole new system, commanding some 6,000,000 and irrigating 3,640,000 acres annually, will be in operation in 1932-33. A large part of the area to be irrigated (about 2,450,000 acres) will lie within the Indian States of Bikaner and Bahawalpur, which are bearing a proportionate share of the cost. The original estimate of the cost was about 14.6 crores of rupees, but it is now certain that this estimate will be largely exceeded, and a final cost of from 23 to 24 crores is anticipated, of which the Punjab Government's share may amount to about 10 crores.

Several minor schemes for improving the supply from inundation canals are also in progress.

The second type of project receiving consideration, one which demands attention not only in the Punjab but throughout India, is that of water storage. Periods of water scarcity occur on most of the canals, and it is natural that much thought should have been given to storing a part of the water that at certain seasons of the year in vast quantities escapes through flooded rivers to the sea.

When the Sutlej Valley canals have been completed all the winter water supply of the Punjab tributaries of the Indus will be used in irrigation, but only about one-third of the monsoon supply. It is estimated that one-third of the monsoon flood waters must in any case be allowed to escape so as to scour the river channels; but if it were practicable to construct reservoirs, the remaining third might be made available for irrigation. The difficulties presented by storage are formidable. Five schemes have already been investigated, but for one reason or another have not yet been taken in hand. It is confidently believed, however, that the difficulties which the construction of dams

now present will ultimately be solved and that ultimately large additional supplies of water will be available for irrigation.

The most important of these storage projects relates to a dam across the Sutlej at Bhakra, where the river passes through a gorge some 40 miles above Rupar. This dam would be 410 feet high and would impound no less than twelve per cent of all the water which it is calculated might be stored in Punjab reservoirs. After allowing for losses in the canals, it would deliver some 5,500 cusecs of water for 210 days in the year as an addition to the natural flow of about 5,000 cusecs taken from the Sutlej at this point. The water would be used to supplement the flow of the existing Sirhind and Western Jumna canals, and to fill a new Lower Sirhind canal, irrigating *inter alia* the insecure tracts of Hissar district. The entire area irrigated would be about 2,300,000 acres. The immediate obstacle to progress with the construction of the Bhakra Dam is doubt as to the foundations. Geologists have twice examined the underlying strata, differences in opinion have arisen, and a further examination of the site is now being arranged for. An estimate of the cost of the dam and canals was made in 1920, which amounted to 14.4 crores; but revised figures place the cost of the scheme, if carried out before 1937, at about 23 crores of rupees.

The third group of problems now engaging attention relates to the conservation and more effective use of the water at present available. Experience shows that much may be done in this way. If the areas irrigated by canals existing in 1900 be compared with the areas now being supplied, it will be found that although no extra water enters, there has been an increase of about 36 per cent in the area actually benefiting by canal water. Both agricultural and engineering questions are raised in connection with the distribution of water. There are differences of opinion as to the amount of water that crops require, and as to the methods of charging for the water provided. In general, it may be stated that agriculturists are disposed to claim that better results would be got if water were sold by volume and the cultivator left to do what he liked with the supply he received; but engineers argue that not only does the acreage basis afford the only practicable method of charging for water supplied to ordinary cultivators, but that it is the better method for the small cultivator himself. It is agreed that the owner of a large estate, who purchased by volume, would derive advantage from having the distribution of his supply entirely within his own control, and, in fact, a few large owners are now supplied by volume, but it is stated by the Irrigation Department that the advantages claimed for the small man are illusory. The main advantage claimed by advocates of the volumetric system is that it would free the cultivator from the too common exactions of petty officials, who record the area of land he irrigates; but canal engineers

point out that in any case there must be petty officials, that gauge-readers would be no less troublesome than the *patwaris* who now record irrigated areas, and that since it would be necessary to sell by volume as small a quantity as 2 cusecs of water, irrigating less than 1,000 acres, the number of petty officials with whom the cultivator had to deal would not be reduced. On other grounds, the Irrigation Department claim that a record of the area irrigated must in any case be retained, for exact information as to the areas supplied in different districts is necessary in designing canals; moreover, unless such records were kept there would be no sufficient check on tampering with the banks of water channels and illicit irrigation.

Much attention has been given in the past ten years to the equitable distribution of water, both at the heads of distributaries and at the outlets to the land of cultivators, with the result that economy in distribution has been effected, and, as noted above, the area irrigated from canals is gradually being increased. New water modules have been designed, and it has recently (1926) been decided that every reach of every distributary channel is to be fitted with meters of an approved type. Incidentally, these meters, by ensuring equitable distribution, will reduce the opportunities given to corrupt petty officials to extort money from cultivators requiring water.

In distributing water the canal officer is guided by the departmental rule that 88 acres of *kharif* crops and double this area of *rabi* crops should be irrigable for each cusec of water supplied from an outlet. (To allow for waste in channels, the main canal headwork supplies water at the rate of one cusec per 65, and the distributary headwork at the rate of one cusec per 80 acres.) A further rule lays it down that not more than three-fourths of the cultivated land commanded should be irrigated in a year. Assuming 1,000 acres of cultivated land to be in question, irrigation of 750 acres would be permissible, the area to be supplied in the *kharif* season would be 250 acres, and for this area it would be necessary to provide at the outlet for the delivery of  $\frac{250}{88} = 2.84$  cusecs of water. This quantity would

subsequently supply the requirements of 500 acres of *rabi* crop and it is all that would be provided for cultivators. It is admitted that this allowance is a small one in comparison with what the cultivator would like, but it is contended that when the water is skilfully used cultivators are able to irrigate substantially more land than the rules assume; and, as water is scarce, that economy must be practised, if the full benefit of the canals is to be secured by cultivators within the commanded areas.

Reference has already been made to the possibility of conserving the monsoon waters of large rivers by constructing reservoirs. In districts having a moderate rainfall small reservoirs have long been a feature in rural economy. They are formed by small earthen embankments or *bunds*, constructed

in *nullahs* (deep, and during the greater part of the year dry, channels of streams). In the Punjab itself, except in the district of Gurgaon, these *bunds* are of little importance, but elsewhere, for example in Jaipur State adjoining Gurgaon, a large amount of *rabi* irrigation is carried on from embanked *nullahs*. Gurgaon *bunds* were formerly in charge of the District Board, but, as they were being neglected, their management was transferred in 1923 to the Drainage Board (now the Rural Sanitary Board) and 35 *bunds* distributed over four tahsils of the district have recently been repaired.

*Bunds* contribute to rural welfare in several ways. Originally many of them were constructed to impound monsoon water, in order to soak the subsoil and so permit of the growing of crops in the *nullah* beds above the *bunds* when the surface dried. The *nullah* bed is not only soaked, but its surface is enriched by the deposition of silt. Other *bunds* have been constructed primarily with the object of checking erosion; and others have formed large tanks or shallow lakes for the irrigation of *rabi* crops. While, relatively to canals and wells, these *bunds* are of small importance in the Punjab (when the Gurgaon *bunds* were taken over by the Drainage Board it was ascertained that the average area benefited in the preceding fourteen years was 5,779 acres) it is satisfactory to find that their development is now being studied by engineers of the Irrigation Department.

In certain of the canal areas the seepage of water from channels and the too free use of water by cultivators has resulted in a rise of the level of subsoil water to a degree that endangers not only crops but the public health. As compared with the area irrigated the actual extent of waterlogged land is quite small, some 80,000 acres in all in the canal areas, and of this total two-thirds only have been seriously damaged; but in view of the enormous volume of water now spread annually over the soils of the Punjab, and of the cumulative effect to be anticipated in areas where the subsoil is not naturally well-drained, the whole subject of waterlogging is receiving close and continuous attention. Drainage schemes for the relief of waterlogged areas were formerly in charge of the Irrigation Department, but in 1923 a special Drainage Board (now the Rural Sanitary Board) was set up to carry out drainage schemes, and a committee has been charged with the duty of studying the conditions which make for waterlogging. The Irrigation Department are endeavouring to reduce the seepage from canals, and experiments have been made in lining the canals in districts where the soil is specially porous. After thirty years of experimental work, in which various materials, from oiled paper to cement concrete, have been tried as canal linings, the only really satisfactory lining is found to be cement and sand mortar of not less than  $1\frac{1}{2}$  inches in thickness, and the cost of this form of lining makes its general use prohibitive. Well-designed drainage works offer the best prospect of preventing waterlogging, and success has already been met with on the Western

Jumna, Upper Jhelum and other canals. Open drains are mainly relied on, but mole drains and tile drains are being experimented with in saturated fields. In at least one area, Amritsar, pumping from deep tube wells has been successful in lowering the water-table and improving the sanitary conditions of the city and its surroundings, although at a cost that would not have been warranted if agricultural improvement had been the sole objective. When drainage is not available, an effort to control waterlogging in threatened areas is made by suspending irrigation during the *rabi* season.

Apart from the well-known ill-effects produced on most crops by a saturated surface soil, there is in the Punjab a special danger to be apprehended from waterlogging. The deep alluvial soils are frequently charged with large quantities of sodium and magnesium salts; salt or *kalar* soils are common even where the water-table is deep, and when the surface soil, or the subsoil at a depth of a few feet, is saturated *kalar* is almost certain to give trouble. As in other parts of India, remedies have been sought, but the only practicable remedy so far discovered consists in washing out the salts from the surface by free irrigation, and this method to be successful implies equally free drainage.

*Irrigation Research Committee.*—An Irrigation Research Committee, consisting of a soil expert, specialising in soil chemistry and physics, and an engineer, was set up in 1925 to explore the problems now facing the Irrigation Department. A suitable laboratory has been planned and is being built, and a central field experimental station has been established. Three groups of problems will be investigated, *viz.* :—

1. Movements of the water-table in connection with waterlogging, or desiccation. Waterlogging difficulties have been referred to above; the converse problem, lowering of the water-table to an undesirable degree, owing to the increasing intensity of well irrigation, presents itself notably in the fertile tract round Jullundur. Data for study are available in spring level records kept for many years by the Irrigation Department; and, where no canals exist, from the less exact information collected by revenue officials. To supplement existing data, surveys will be undertaken. There is considerable evidence that the free flow of subsoil water is prevented by the occurrence of impervious strata buried beneath the alluvium. Rock masses might account for the waterlogging of tracts lying upstream and, if their existence were proved at no great depth, remedies for the waterlogging of large tracts might be possible. It is proposed to use the Etvös Torsion Balance in searching for such obstructions to drainage.

2. Hydro-dynamical problems present themselves in the designing of irrigation channels in connection with the movements of silt. The only method of studying these movements in detail is by means of models reproducing, under

controlled conditions, the flow of silt-charged water in channels. The new laboratory will provide a hydraulic installation which will enable silt and water movements to be studied in detail.

3. Field investigations relating to the reclamation of waterlogged land are projected. A site has been selected in a locality where much badly waterlogged land exists. Experiments have been planned on mole drainage and tile drainage, in conjunction with a system of open drains. Observations will be made on the behaviour of crops in soils with a high water-table, and, using these observations, crop experiments will be designed which will be conducted at suitable centres elsewhere in the province.

## 8. FORESTRY IN RELATION TO AGRICULTURE.

The Punjab is poorly supplied with timber; less than 10 per cent of the total area of the province is classed as forest land, and in British territory, under direct charge of the Forest Department, there are only some 4.3 million acres, of which 2.7 million are in the hills and 1.6 million in the plains. The land under forests is mostly open for grazing and grass-cutting, and forms a reserve for fodder supply invaluable in time of scarcity. From 280,000 acres only are stock entirely excluded, but on a further 220,000 acres the grazing period is limited. Thus 3.8 million acres of the land now classed as forest may be regarded as an addition to the area available to the agriculturist. The value of the grazing rights is assessed at over Rs.20 lakhs per annum by the Forest Department. In other directions forests confer direct benefits on the Punjab cultivator. It is estimated that he annually receives 25 million cubic feet of firewood, and a million cubic feet of timber free of charge.

In spite of these benefits, the cultivator, especially in the hill districts, regards the work of the forest officer with disfavour, and the forest officer has too good cause to complain of the destruction done in the areas under his charge, by over-grazing and the careless felling or lopping of trees by villagers. Forest destruction has resulted in widespread erosion of hill-sides in the Siwalik hills, and excessive browsing by goats has greatly reduced the value of the land in other hill tracts. It is of special importance in view of the extension of irrigation on the plains that the rainwater of the hills should sink into the soil and not disappear in torrential floods into the rivers, as it does where hill forests are destroyed; and no less for the sake of the welfare of the cultivator of the plains, than for the value of the trees in their charge, forest officers are doing what they can, in spite of local opposition, to conserve and re-establish trees in threatened forest areas. It is from the Forest Department more than any other that complaints

are heard of the over-stocking of grass-land with animals of no economic value, for this is a subject that is constantly being forced upon their notice in the extensive grazing areas which they control.

For the needs of the people, forests in the hill districts are relatively ample. It is in the plains that the great scarcity of timber and fuel reserves is apparent. As irrigation has spread, some 2 million acres of waste land, formerly classed as forest, have been taken up for cultivation, and a further 650,000 acres will shortly be irrigable and used for field crops.

As compensation some 85,000 acres have been, or shortly will be, covered with irrigated plantations, in which the production of firewood and timber will be rapid; but on so small an area even tropical growth must leave the Punjab plains very poorly provided for. It is certain that if the people are induced (indeed before they can be induced) to substitute wood for cowdung as fuel, much larger areas must be set aside for plantations.

In addition to the forests under the Forest Department, there are in the Punjab considerable areas of forests and waste land which come under the Revenue Department and are in charge of the deputy commissioners. The fees received for grazings in 1924-25 amounted to Rs.62,000 and in 1925-26 Rs.66,000. Some forest land is also under Military control. The total area of the forests and waste land under Revenue and Military management in 1925 was 515,000 acres; most of it is of little account as a source of timber or fuel, but about 320,000 acres is classed as "reserved" forest.

### 9. GENERAL EDUCATION.

"It is suggested that the solution of the problem of rural education is the foundation of all rural progress. The agriculturist is of more importance than agriculture." These words, quoted from the memorandum prepared for the Commission by the Punjab Government, may be taken to show the attitude which the Education Department of the Province adopt to agriculture. They are well aware of the importance of the agriculturist in the community which they serve, of the value of education to him, and of the need for an educational system which will meet his special needs. In recent years close and continuous attention has been given to the problems presented by the illiterate peasant population. Before describing what has been done to promote education in rural areas, a few facts about the educational system as a whole may be given.

The total expenditure on education at recognised institutions in the Punjab in 1925-26 was 256 lakhs of rupees, as compared with 190 lakhs in 1920-21 and 60 lakhs in 1911-12. Of the 1925-26 expenditure, fifty-two per cent was contributed by Government, thirteen per cent came from the funds of district



and municipal boards, twenty per cent from fees and fifteen per cent from other sources. The cost per enrolled scholar was Rs.26-4-3. The average cost per pupil at different types of institutions is stated in the table of figures given below.

In 1921 there was in the Punjab a population of some 11,300,000 males and 9,380,000 females. Of the former 954,000 or 8.44 per cent and of the latter 108,000 or 1.15 per cent were under instruction in 1926.

Of the male pupils about 900,000 or 7.96 per cent were attending institutions recognised by the Education Department. In the following table are given particulars of the institutions, scholars in attendance, and cost per head of each pupil :—

Kind and number of institutions.	Number of pupils.	Percentage at each institution.	Cost per pupil.
			Rs. a. p.
1 University ... ..	—	—	—
21 Arts Colleges ... ..	7,383	·82	194 6 0
7 Professional Colleges ... ..	1,729	·19	616 7 2
285 High Schools ... ..	111,126	12·35	44 5 5
1942 Middle Schools... ..	311,218	34·57	13 6 10
5714 Primary Schools ... ..	377,315	41·91	8 10 10
3268 Special Schools... ..	91,386	10·15	10 7 4

The University of the Punjab, Lahore, is at present mainly an examining body. The arts colleges, which prepare students for university examinations, include a new group of seven intermediate colleges, designed to bridge the period between high school and university studies. Largely in the interests of the rural population these colleges have been started at suitable centres so that young boys may not have to leave their own districts for study in the large towns. Two high schools and two college intermediate classes are included in the curricula of the new colleges. Not only do the ablest among country boys thus get an opportunity of preparing for university examinations, but their fellow students, who do not attempt to graduate, get a better education near their own homes than was formerly available. Again, with the object of improving education in country districts new high schools have recently been provided, mainly for outlying districts. A survey of the position of Anglo-vernacular education made some three years ago showed that the richer urban and thickly-populated areas were amply provided for, but that in backward rural areas facilities were "painfully few and far between." By economies effected in expenditure on schools in urban areas, money was provided for extra grants for secondary education in rural districts. In thinly-populated tracts the district boards were found to be unable to support a high school, and at the same time do justice to other forms of

education; in such cases the Education Department provided new high schools supported by provincial funds.

It is not, however, in the high schools and colleges that the interests of the rural population mainly centre. Of far greater importance to Punjab agriculturists are the primary and vernacular middle schools, and it is recognised that, in the past, for reasons which, if not adequate, are easily explained, too much effort has been concentrated on providing higher education for the few, and too little in promoting literacy in their own mother tongues for the people of the province. A determined effort to repair the error dominates the present educational policy of the Punjab.

It will be seen that there were in 1925-26 about 688,000 pupils, or seventy-six per cent of the total number, attending primary and middle schools. The increase in enrolment has been rapid, for in 1920-21 the pupils numbered only some 415,000. The above table requires explanation, for it would appear that the number of middle school pupils is not far short of the number at the primary schools. These unexpected figures are accounted for by the fact that many middle schools have primary classes, and the pupils (about three-fourths of the whole) attending such classes are shown as being in attendance at middle schools.

If one were to judge by the rate of increase in the enrolment of pupils in the last five years, it would appear that in five more years some eighty per cent of the boys of school-going age in the province might be attending school. Unfortunately, from this rapid increase in school attendance it cannot be assumed that after ten years or so the percentage of literate males in the Punjab would rise from 14, the present figure, to somewhere about 75, for by far the larger number of pupils who enrol in class I never become literate. Less than one-quarter of the boys who now enter class I continue at school until they have passed through class IV. Not all who pass through class IV remain literate, and very few of those who do not enter it can be expected to be able to read and write in later years.

Literacy in the masses, and not merely increased school attendance, is the aim which the Education Department has in view. In the furtherance of this object, attention is being concentrated on the training of teachers, the school curriculum, the formation of branch schools, the opening of vernacular middle schools in rural areas, the introduction of compulsory school attendance and the provision of schools for adults.

The teacher is the crux. It is recognised that for country schools teachers must be found "possessing sympathy and understanding of the village people." The most urgent need of the village is "a headmaster who will transform the village school into a village institution, will be respected by the village people and will be 'passing rich on £40 a year'" or on its

equivalent of Rs. 50 per mensem, which is what the Punjabi headmaster may expect to earn. Teachers' training institutions were outside the ambit of most village teachers; the device has, therefore, been adopted of attaching training units (a unit is a class of 40 students) to high schools and other suitable local institutions throughout the province. Of these units there are now 46 for junior and 12 for senior vernacular teachers. Ten years ago the numbers of teachers undergoing training were 796 and 82 respectively; they are now 1,840 and 480. Since the training centres are widely distributed, it is possible to secure many teachers from the agricultural classes. In recent years from 40 to 50 per cent of those under training were drawn from agricultural tribes, and not a few others had been brought up in rural surroundings.

In 1923 a special committee considered and reported on the curricula of vernacular schools. Their main conclusions were (1) that in primary schools "the subject matter taught and the methods of instruction pursued should be such as to bring the work . . . into the closest relation to the life and experience of the pupils . . . the acquisition of suitable knowledge and the attainment of literacy should be the main objects of the course; (2) in regard to middle schools, the central subject of study should be that of rural science, which should co-ordinate and vitalise many subjects already included in the curriculum." When this report was received, it appeared to be desirable that new courses should at once be framed, and suitable text-books prepared, but consideration showed that until teachers could be trained to interpret rural science to their pupils in the spirit and manner recommended by the committee, no substantial advance was possible. For the moment, therefore, there has been concentration on the teacher; in the meantime, by the establishment of new primary schools, by concentrating, where this is practicable, the teaching of classes I and II in branch schools, and by an important experiment in middle schools to which reference will presently be made, preparation is being made for the introduction of new and more educative courses in the rural schools of the Punjab.

This new policy will involve a very considerable increase in expenditure, and it is evident that if literacy cannot be secured, the expenditure must be wasteful. In the view of the educational authorities, the most effective way of avoiding waste would be compulsory school attendance up to at least the completion of class IV. But it is doubtful whether the province as a whole is yet ready for compulsory attendance. Without the backing of the community, especially of the parents, no Act decreeing compulsion could be enforced. The Education Department, therefore, place reliance on what they term "voluntary compulsion." The community must be educated to the point at which they will apply for compulsory education under an existing Act, and then it will be (as it already is in

a number of both urban and rural areas) a practicable measure to enforce compulsory attendance. The success of this policy may be gauged by the fact that in 1927, 1,600 rural areas had introduced compulsory education up to class IV. Moreover, the movement is widespread, for in 20 out of the 29 districts of the Punjab, at least one, and often many local bodies, had at that time voluntarily adopted compulsion. A specially interesting feature of the movement is that sometimes these local bodies take the form of co-operative societies of parents, who agree to send their children regularly to school; penalties against defaulters are in these cases imposed not by the courts but by the co-operative society.

Similar evidence of the public spirit which the co-operative movement has evoked in the Punjab is afforded by the adult schools, which are mainly, it is reported, the outcome of that enthusiasm for self-help which this movement has engendered. In March, 1926, there were 3,208 of such schools attended by nearly 85,400 adults.

Literacy, though acquired, is too often lost by the schoolboy, and the adult is exposed to a similar danger; as a counter to this evil village libraries are being provided. Following a lead recently given by Britain, the Education Department has set up a Rural Community Board, and district community councils, to supervise village library, adult school, local popular lectures and other general "uplift" movements. Where there has been concentration on the work of village uplift, astonishing progress has been made, as will be seen by the evidence given on the Gurgaon district.

From the agricultural point of view the chief interest in the educational position of the Punjab centres in the experiment now being made in teaching agriculture in middle vernacular schools. The growth of the middle vernacular school is one of the best tests of progress which can be applied to rural education, and it may be noted that since 1921 the number of lower middle schools, teaching only in the vernacular, has risen from 400 to over 1,340. It is recognised that the best chance of educating the most intelligent among those sons of the zamindar who will certainly return to the land is to be found in such schools; for once the boy learns English, there is a danger (and the abler he is the greater the danger) that he will seek his fortune in towns. It was decided, therefore, in 1919 to initiate an experiment in the teaching of agriculture in the middle vernacular schools. This experiment has now been working for seven years; the Punjab Education Department believe that it is on the right lines, and the methods employed are now being carefully studied by other Indian provinces; it will, therefore, be desirable to give some details. The reasons for the experiment, and the methods employed are given in a memorandum

issued by the Education Department in September, 1923; they are as follows :—

(i) It was decided to include, and to provide for, teaching in agriculture in the ordinary vernacular schools rather than to start separate agricultural schools of a special type. There are many cogent reasons in support of this decision. In the first place, separate agricultural schools are very expensive. In the second place, specialised training for boys below the age of seventeen is premature. And, above all, a sound and suitable measure of general education should be the basis of all specialised and vocational training. The aim of the Punjab Government is therefore to enrich the middle school course in rural areas by the inclusion of agricultural training and thus to bring it more in keeping with the environment of the pupils; and the object is to use agriculture as a means of mental discipline and training and as an important accessory to the general subjects taught in those schools.

(ii) The training is of a practical as well as of a theoretical nature. For the fulfilment of this object, farms of about three acres each are attached to those schools, in which this form of training is imparted. In 1923, owing to the financial stringency which then prevailed, an alternative was adopted in the form of miniature farms or school gardens. With the exception of a *beldar*, who looks after the bullocks, all the work of the farms is done by the boys.

(iii) The teaching is in the hands of trained and carefully selected teachers who have first taken the ordinary senior vernacular training course and have then completed a special course in agriculture at the Agricultural College, Lyallpur. By this means the necessary co-operation between the departments of Agriculture and Education is promoted.

In 1926 the experiment was in progress in 66 schools, 27 of which had farms, and 38 gardens; and in the same year 32 teachers, holding the Senior Vernacular Teaching Certificate, were undergoing training at Lyallpur, so that the number of middle schools with agricultural classes will soon reach 100. There is now no question that the experiment has been successful; but there is some division of opinion as to whether, apart from expense, a 3-acre farm or a  $\frac{1}{2}$ -acre garden should be attached to the schools. Some of the senior members of the Agricultural Department fear lest the practical management of the school farm may not commend itself to the critical cultivator. On the other hand, it is pointed out that, assuming it to be properly managed, there is no question that the farm is educationally better than the garden; and that in fact some of these school farms are so well conducted that already cultivators are going to the agricultural teachers for advice, or to purchase seed of improved crops. Again, it is clear that the question of

farm versus garden is bound up with the capacity of the teacher. but it may be noted that the Education Department which, in this matter, is directly responsible, is well satisfied with the results hitherto secured, and is hopeful that not only will the school courses prove of direct educational value to the boys of middle vernacular schools, but that many of the school farms may become centres to which the parents will come for practical hints on the management of land. Those who have long realised how well the work of the cultivator is adapted to furnish a subject that may be turned to the educational benefit of the growing boy, will note with special interest the experience now being gained in the Punjab.

And it is not only in the middle vernacular schools that experience is accumulating. Stimulated by the example of American Presbyterian Missionaries, who in their experimental school at Moga have used agriculture and other industries as a means of quickening and training the intelligence of their pupils, the Education Department has started two centres, largely in imitation of Moga, for training teachers. One of these at Ghakkar was an ordinary training centre; its scope has been extended to include practical training in the "matters which should promote the well-being and progress of the Indian village." The other is a school of rural economy at Gurgaon, for senior teachers who already hold certificates. In the ordinary examination for teachers' certificates it has been found that the Ghakkar students showed the best results. The conclusion drawn is that "the fuller and wider training is not only good in itself, but that it also improves the efficiency of the ordinary training for the teaching profession in its limited sense. Steps are now being taken to extend this new form of training to all training institutions."

## 10. CO-OPERATION.

The total expenditure on Co-operation in 1925-26 was only Rs.6½ lakhs, but the guess may be hazarded that it is the work which the Co-operative Department has done for the Punjab that has suggested the title. If it has not, it may at least be claimed that "beneficent" well describes this department's activities.

There are now nearly 17,000 co-operative societies in the Punjab, and the number is increasing rapidly. It is estimated that 4 per cent of the male population are members of the co-operative societies. Most important are the 14,300 credit societies, and it will be necessary to deal with their organisation and character in some detail; but before coming to them it will be desirable to catalogue the other activities of the co-operative movement, so that an indication of its scope may be obtained.

Chief among these other activities, because of the size and difficulty of the problem to be solved, and because of the novelty

of the method of solution, is the work of societies for the consolidation of holdings. Fragmentation of the land into tiny and utterly uneconomic plots is an evil to be found in every Indian province, and it is common in several European countries. Hitherto, with one European exception all those authorities who have attempted to consolidate holdings, have done so by Statute and regulation. In the Punjab the plan of dealing with fragmentation through voluntary and co-operative methods was conceived. Co-operative societies for the purpose were established, and already, although the movement is quite new, about 98,000 acres in 314 villages have been consolidated and re-allotted with the consent of the owners and without resort to compulsion. Consolidation has not only much reduced the cost of tillage; it has enabled new wells to be sunk, and it has removed the cause of much quarrelling and litigation over boundaries. For, in spite of village maps, the boundaries of these innumerable small plots were difficult to define, and his neighbour's landmarks are not always sacrosanct in the eyes of the Punjab peasant. Other indirect results of consolidation show how important is its influence. For example, an owner who found himself with 200 acres in a single block enclosed the whole with a thorn edge—and the reporter adds, "if this practice were to spread, the consequences to agriculture might be momentous." Another result was a complaint that as a result of consolidation a cattle pound had ceased to be remunerative. Cattle-trespass, it should be explained, is a curse to the Indian cultivator; but fines add to the incomes of district boards.

The success of land consolidation in the Punjab is due to the fact that cultivators know compulsion will not be used against them. A committee is set up to re-allot the land, and it is not until each cultivator has seen and agreed to accept the new area assigned to him that the society is registered. Natural conditions in the Punjab also favour the work. In those districts in which progress has been most rapid the land of the village does not vary much in quality.

Cattle-breeding and sheep-breeding societies have already been alluded to. Of these societies there are now 181 with about 2,600 members. Livestock insurance societies were started, but they were not a success and have been closed; the premiums required to cover the risks were high, and greater than members were willing to continue paying.

Milk-recording societies were formed for the first time in 1926, and a special staff of recorders has been trained for carrying on the work required and promoting extensions. Progress is hindered by the superstition that milk-measuring is ill-omened; but when the societies increase beyond the present number of 23 it may be hoped that the fear of ill-luck will disappear.

Ninety-nine better farming societies are now at work; the members pledge themselves to follow methods recommended by the Agricultural Department. A member who farms badly may

be fined. Some of these societies hold agencies for seed and implements. A group of 26 societies with 432 members has been formed in the west of the province for the purpose of clearing the channels by which water is brought from inundation canals to their villages.

Five societies have been formed for cultivating land co-operatively, and the latest report is that they are "improving." But even in the co-operative atmosphere of the Punjab, co-operation for the tillage of land is beset with difficulty, and we read, "Quarrels have for the moment disappeared." The Assistant Registrar supervising them significantly remarks, "the members have realised their privileges rather than their responsibilities."

In every direction attempts have been made to organise agriculturists for better production, but success cannot yet be recorded in the case of fodder storage societies, poultry-breeding societies and one or two other efforts. Valuable experience is being gained of the purposes for which producers will, and will not, combine; but the co-operative movement in the Punjab has only just reached its majority (it started in 1905) and there is still hope the "will-nots" of to-day may become the "wills" of to-morrow.

Co-operation for sale has been begun. Thirteen commission shops were at work in 1925-26. Eight of these shops are in the Chenab Canal area, and in 1925-26 they sold produce to the value of Rs.21 lakhs. Of this form of co-operation the Punjab Administration Report, 1924-25, says: "Advocates of co-operation as the reliable panacea for all rural ills, write of co-operative sale of cultivators' produce as a simple, natural thing which has only to be mentioned to be adopted. In fact, few things are more difficult. In most countries, the middleman holds a strong position with well-established interests; and the Punjab is no exception." It is clear from this statement that the need for caution in developing effective sale societies in the Punjab exists, and is appreciated.

Co-operative purchase of seed, implements and other farming requisites, where this has been organised, is carried on through the credit societies and not by separate purchase societies. Such special purchase societies were formed during the War, to check profiteering; but after the War it was found to be undesirable to continue them.

Outside the ranks of agriculturists themselves, co-operation has been of use to village artisans. There are about 3,700 members belonging to 188 artisans' societies for assisting production, chiefly among hand-loom weavers and dyers. Rural artisans are eligible for membership of the ordinary village credit societies, and often take a leading part in their management.

Agriculturists, with other members of the village community, also form societies for such purposes as promoting thrift, for which there are 745 societies; or for compulsory education which gives work to 158 societies with 6,900 members.



Co-operative credit forms by far the most important feature of the co-operative movement, and its success in the Punjab requires that a description of the policy and methods that have led to results on so great a scale should be given.

In the section of this Introduction which dealt with the cultivator, reference was made to the huge volume of the Punjab zamindar's debt. Mr. Darling has estimated that in 1922 it amounted to some Rs.75 crores or £50,000,000, that the obligations of each debtor averaged Rs.463, that 83 per cent of all landowners were in debt, that tenants, like owners, were deeply involved and that the total agricultural debt of the province was about Rs.90 crores.

In 1905 when the co-operative movement began, agriculturists held *taccavi* advances of Rs.20 lakhs from Government under the Land Improvement Loans Act and the Agriculturists' Loans Act. On the average of the five-year period ending in 1924, such loans amounted to Rs.36.25 lakhs. These *taccavi* advances are made for productive purposes and they are specially useful in time of stress. In relation to the total volume of debt their sum is trivial. Outside the co-operative credit society, therefore, the cultivator has to look to private sources for the money he borrows. These sources are the village shopkeeper or *bania* who subsequently buys his produce and sells to him what he requires on lender's terms; the cattle dealer, from whom if he borrows he must accept the bullocks offered to him, on the vendor's terms; the commission agent who advances money on the growing crop, and is not always careful to pay market price on the crop when delivered; the goldsmith who makes advances on his jewellery; and his more prosperous neighbour agriculturist who takes a usufructory mortgage and so amply recoups his loan. It is impossible to say what the average rate of interest amounts to. It has been estimated, as already stated, at not less than twenty-five per cent. Looking to the general character of his creditors, it may not be unsafe to assume that once he has become deeply involved, the zamindar's creditor takes from him all he can give up. Thus the rate of interest will vary with the harvests; in a period of good years, the moneylender, not the producer, will reap the profits of bumper crops; in a series of bad years the return to the lender may not average more than twelve or fifteen per cent which he himself states to be his rate. There may not be an exact Urdu equivalent for the British maxim, but the Punjabi moneylender, in plucking it bare, is doubtless careful not to kill the goose that lays the golden egg.

It was primarily to deal with this evil, the stripping of a frugal, hard-working but simple and improvident peasantry of all its possessions, by rapacious moneylenders, that the Punjab adopted in 1904 the Co-operative Credit Societies Act. The new movement began in 1905 when a staff to foster it was created. This staff now consists of a Registrar who is a member of the

Indian Civil Service, assisted by two deputy registrars, and seventeen assistant registrars, all gazetted officers of the Provincial Service, one hundred and nine inspectors, fifteen sub-inspectors for artisans' societies, and eighty-five sub-inspectors for consolidation of holdings work.

Most of the sub-inspectors employed in the co-operative movement have matriculated, and all the inspectors (except some men promoted for meritorious work) are graduates. Preference is given to graduates in economics, and, so far as possible, all those employed in the co-operative movement are selected from among the rural community. In any case, all graduates selected are given one year's special training in the field and a three-months' course of study in rural economics before taking up the work of an inspector.

Above the inspectors come assistant registrars, each of whom will have 6 to 8 inspectors working under him, so that he may be dealing with from one to two thousand societies. The assistant registrars are appointed from among those inspectors who have had eight to ten years' experience. Finally, under the Registrar and in charge of all details of work, are two deputies, who divide the province between them. In time it is proposed to have a deputy registrar for each of the five divisions of the province, and also to extend the junior staff, so that each of the 29 districts may have an assistant-registrar and each of the 115 *tahsils* of the province an inspector.

These government officers are almost wholly employed in supervision and inspection, the policy of the department being that the business affairs of societies should be managed by themselves. The ruling body in the movement is the Punjab Co-operative Union, which conducts audits and carries on propaganda. It employs some 450 sub-inspectors. The union is managed by a committee set up by central co-operative banks and banking unions, and these in turn are controlled by the primary societies. The whole credit structure rests on a democratic basis. The broad, and broadening, base of the co-operative pyramid which has been built up in the Punjab is at present formed by some 14,300 societies; the apex is the Co-operative Union, while near-by, forming no integral part of the pyramid but essential to its setting, is the watchful Sphinx—the Registrar of Co-operative Societies.

The union's sub-inspector spends most of his time in auditing, but he must also help weak societies to improve their methods and he must never forget propaganda. There may be as many as six working in a *tahsil*, and each may have 50 societies to supervise. The government inspector may have as many as 300 societies in his area; he checks the work of sub-inspectors and organises new societies where these present special features.

At present there are, as already stated, some 14,300 primary credit societies in the Punjab. Their sphere is not, in all cases,

restricted to credit, but purchasing and other activities are limited. The membership of these societies is 407,500, and they are to be found in about 13,000 out of the 33,000 villages of the province. The capital employed in the credit societies is 11 crores, of which some 5 crores are in the hands of primary societies themselves. This sum includes Rs.68 lakhs in shares, over Rs.122 lakhs of reserves and undistributed profits, about Rs.48 lakhs in deposits, and Rs.2 crores borrowed from central banks.

Above the primary societies there are 116 central banks and banking unions whose funds are derived chiefly from the general public in the form of deposits. The resources of the central banks include Rs.46 lakhs share capital and reserve, Rs.37 lakhs deposited by primary societies and Rs.360 lakhs deposited by the public. The sums held from Government are small, less than Rs.5 lakhs.

In 1924 there was established a Provincial Co-operative Bank to function as a central bank for central banks. It is anticipated that it will take a leading place in co-operative finance. With the aid of a guarantee of interest for a term of years by Government, it is now issuing debentures in order that the mortgage banks referred to below may be assisted to increase their operations; debentures for Rs.5 lakhs have already been issued and subscribed by the public, and a total issue of Rs.20 lakhs is contemplated.

The primary credit society has an average membership of 26 persons, who may all belong to one tribe or caste; but as most villages contain one society only, a distinction of persons is discountenanced, and high-, low- or no-caste members are admitted. Essentially the primary society's success is bound up with the degree of mutual understanding and appreciation shown by its peasant members; just as its only outward and visible sign of existence "consists of a bundle of books tied up in a cloth," for the society has no office, nor telephone, nor telegraphic address. No stranger ignorant of the work that has been done for co-operation in the Punjab would suppose that this unadvertised village body was a unit in a big business; any more than, if ignorant of the canal system, he would connect some little rill of water in the neighbouring field with the Jhelum or Chenab 100 miles away. Those responsible for guiding co-operation in the Punjab have studied co-operative movements in many countries and have noted that too often they were swamped by over-much official management or over-much benevolent attention on the part of rural reformers. These errors they have avoided.

The books of the primary society are usually written up by an honorary secretary of little education, but he does his best, and the sub-inspector corrects the errors. If special difficulties occur an inspector may be called in. It is seldom that the affairs of these societies go far astray; and though the business is transacted by committees, few of whose members can read

or write, the rural population is gaining so much confidence in their work that everywhere there is a keen demand for the formation of new societies.

Primary credit societies differ widely in capacity and in the amount of attention which they require from the inspecting staff. They are classified into four groups. Group A, which, in 1925-26, included 4.25 per cent of the total, consists of those thoroughly competent societies which require no assistance from either the department's or the co-operative union's staff. Their accounts are audited, otherwise they are left to themselves. In class B come 26.25 per cent of the societies. These must be qualified to keep their own accounts, collect dues owing, prepare crop-demands, loan applications and arbitration references, and they must be able to enforce awards against defaulters. They may look to the inspecting staff only for advice and assistance of a general kind. When societies require help from the inspecting staff in the preparation of accounts, or for any of the business mentioned above, they are placed in class C. This is the most numerous type, accounting for 62 per cent of the total. In class D are placed the weakest societies requiring close attention by the inspecting staff; 7.5 per cent were so classed in 1925-26. So far 9,506 of the societies have been classified as above, the others await classification.

In order to ascertain the purposes for which the societies grant loans each sub-inspector analyses the loans made by five societies under his charge. In 1925-26 the affairs of 1,200 societies were thus investigated. The total of the loans granted was found to be Rs.35 lakhs. These loans were then classified under no fewer than 23 headings. The most important items for which money was borrowed were: cattle, 20.5 per cent; debt repayment, 26.0; trade, 8.5; ceremonies, 7.0; building, 4.0, and land purchase, 9.5 per cent. The last item was unusually high in 1925-26 because of the auction of land on new canals; in the preceding five years it had averaged 3.75 per cent.

The assets of all credit societies in 1925-26 amounted to Rs.162.87 lakhs, made up of shares Rs.58.52, reserves Rs.87.49 and profits Rs.16.86 lakhs.

The loans made by primary societies are usually for short periods not exceeding three years; but they may be, and frequently are, renewed. Repayment in 1925-26 amounted to Rs.150.38 lakhs, or 33.5 per cent of the sum on loan at the beginning of the year; about three-fourths of this total consisted of repayment of principal.

Primary societies usually borrow from central banks, or banking unions, the funds which they require at 8 to 9 per cent interest, and lend out to members at  $12\frac{1}{2}$  per cent. Many societies have accumulated a reserve which allows them to lend at lower rates of interest; in a few cases as little as 6 per cent is charged, and 9 per cent is a not uncommon rate. The Muslim religion discourages the taking of interest, and to

meet the views of the majority some thirty Mussulman societies, having accumulated funds, now lend to members without charging interest.

A central bank usually has its offices in the headquarters town of a district and the deputy commissioner often acts as its president; but his participation in the affairs of the bank is seldom more than nominal. The bank is formed by individual shareholders or societies. It has affiliated to it a number of primary societies, not all of which need borrow from the banks; all of them however, have a share in the management. The individual shareholders and the representatives of affiliated societies, each exercising a single vote, elect directors at a General Meeting. It is usual to provide that for every 100 affiliated societies there should be at least one director representing societies on the board. The societies have now in all cases got a majority of votes at the General Meeting and in most cases on the Board of Directors; but since the individual shareholders, and the directors representing them, are frequently educated townsmen, they are able to exercise guidance and control to an extent out of proportion to their number. The directors appoint a secretary usually one of their own number and a lawyer. Under the secretary the larger banks employ a paid manager, but the usual salary, Rs.75, rising to Rs.150, suggests that no great degree of authority is delegated to him. The accounts of the larger banks are audited by professional accountants or trained auditors, the accounts of the smaller by the department's inspectors.

A banking union differs from a central bank in having no individual shareholders. Its membership consists of affiliated societies. These unions borrow from the public, from central banks, or from joint stock banks. They are of great educative value, affording to their members practical training in finance and banking and scope for useful work in supervising constituent societies.

The central banks and unions pay interest on deposits, the rates generally varying from 5 to  $7\frac{1}{2}$  per cent with the term for which the deposit is made. They lend to one another at from 7 to  $7\frac{1}{2}$  per cent, and to primary societies at 8-9 per cent. Central banks may pay dividends up to 10 per cent; 8 to 9 per cent is a frequent rate. They must, like primary societies, carry 25 per cent of the profits to reserve. Banking unions pay no dividends. The reserves of central banks and unions in 1925-26 amounted to about Rs.15 lakhs. These reserves are not deposited in a single regional bank as is sometimes done elsewhere, but are held by the institutions themselves, and invested. The investments are lodged with the Imperial Bank of India. A certain amount of fluid reserve is prescribed and must be maintained. While the Co-operative Department, through the inspectors, is careful to see that the bye-laws are observed, nothing is done which is likely to weaken the sense of responsibility of the bank's directors.

Reference has been made above to the large amount of Punjab land which has been mortgaged. Much has been mortgaged beyond hope of redemption; but there is still much that a thrifty owner may hope to redeem. A controlled mortgage system based on reasonable rates may be, moreover, of the greatest value to the agriculturist, whether he be a large land-owner or a peasant proprietor. The ordinary primary credit society is not intended to deal with mortgage business, which usually involves a loan for much more than the three-year period which primary societies take as their limit. For this reason, land mortgage banks have recently been started in the Punjab. There was no prospect of achieving progress by copying the very successful *Landschaften* of Germany, which issue bonds on mortgaged property, that are freely bought and sold by the public. The monied classes would not have been attracted by such securities, and the Punjab had to gain experience for itself. The first mortgage banks in the province were created to serve a district, and their funds came mainly from government loans granted through the Registrar. Experience has suggested that the district is too large an area to enable adequate supervision to be given, and after four district banks had been at work for a year or two, five new banks serving smaller areas, usually a tahsil, were founded. The first four banks were of the unlimited liability type, the others have adopted limited liability. To obtain an advance from one of them, a borrower, if there is a credit society in his locality, must belong to it, and must gain its support and guarantee for his loan up to a maximum of Rs.1,000. In other cases the mortgage banks satisfy themselves by accepting the security of the applicant's land, supplemented, if need be, by that of guarantors. As the newer banks work within a small area, the directors, who value the land, and may grant a loan up to fifteen times the value of the estimated annual net profits, keep in close touch with the borrower's affairs and the management of his holding. The usual rate of interest is nine per cent. The loans are granted for short periods. In contrast to European banks, where the period of loan may be 30-40 years, and repayment of principal is secured by a sinking fund, the Punjab banks grant loans for short terms, usually not more than fifteen years (in no case can they exceed twenty years) and repayment of principal is required in uniform periodical instalments. The 20-year period is governed by the terms of the Punjab Alienation of Land Act. For under the provisions of this Act a co-operative mortgage bank is not an "agriculturist"; it cannot, therefore, sell the land of a mortgagor, it can only take the annual income, and for a period not exceeding twenty years.

The first banks, being experimental in character, were chiefly dependent on government loans; experience now having been gained and successful working secured, the banks must look to the co-operative movement for funds, and in the second stage of

their work money is being found, as already stated, by debentures, which are being issued by the Provincial Co-operative Bank, aided by a government guarantee of interest. The conditions in the Punjab, and the position and experience gained by the eleven mortgage banks now working, suggest that this form of co-operative activity will develop rapidly. The volume of business as compared with that of the credit societies is, however, quite small at present. The working capital amounts to about Rs.13.5 lakhs, of which Rs.1 lakh consists of share money, and profits (no dividends are paid) and up to June, 1927, 16,000 acres of land, on which mortgages were held by moneylenders, had been redeemed by shareholders in the co-operative mortgage banks. Mortgage banks may, and do, assist other objects than the redemption of land in the hands of moneylenders. Members mortgage their land in order to effect agricultural improvements and they may also mortgage in order to pay off debt of a general kind.

## 11. COMMUNICATIONS AND MARKETING.

The rapid increase in the agricultural output of the Punjab in the past half century has out-run the progress made by its communications. A new programme of road development, which will be referred to later, was adopted in 1924, and recently there has been much discussion of tramways, motor transport and light railways as feeders to the main railway lines.

The province is served by the North Western Railway Company, which has some 6,300 miles of railroad under its charge between the Khyber Pass in the north and Karachi in the south. By far the greater part of the mileage is in the Punjab; and an examination of the map shows that fertile parts of the province are well served with railway lines. They traverse the plains, roughly, in a N.E.-S.W. direction at intervals of 20-40 miles in the canal colony area. Crossing these lines is the main line running N.W.-S.E. between Peshawar and Delhi through Lahore, with, to the east of it, a network of lines connecting up all important towns. In the west there is a line branching from the Peshawar-Delhi line near Rawalpindi in the north, traversing the Indus Valley to Muzaffargarh in the south and joining up with the other lines leading to Karachi near Bahawalpur.

The railway system is being extended on a programme which contemplates an addition of some 300 miles annually in the next five years. The present extensions are being constructed mainly in the interests of agriculture. The management of railways has not been transferred and rests with the Government of India; but in accordance with a policy adopted in 1924, a province may have the lines it desires if it is prepared to guarantee the Central Government against loss. Should the line be one, which, in the view of the Imperial Railway Board, is likely to be profitable, no guarantee is exacted. At the present time two lines, one of

5 feet 6 inches gauge and one of 2 feet 6 inches, are being constructed under a guarantee, and one 5-foot 6-inch line is being made without a guarantee.

There has been much discussion on the advisability of feeder tramways not under railway management. Advocates claim for these that they would be cheaper than roads, and that local management would ensure attention to local needs. On the other hand, it is pointed out that they would not admit of through booking, and that the charges which tramways would require to make in order to run at a profit would be likely to lead most cultivators to continue to do their own carting, so that little relief would be given to the roads. The present policy favours the construction of light feeder railways rather than tramways, but it is admitted that further experience may show tramways to be desirable for some districts.

Attention is also being given to motor transport. For passenger traffic the motor omnibus is spreading quickly, but for the conveyance of agricultural produce the motor van must await the development of metalled roads. For wheeled vehicles access to villages, except the few situated on the metalled roads, is barred by the condition of village lanes. The track or half-track vehicle is more likely to penetrate to villages than is the motor van, and experiments with it are desirable. It remains to be discovered whether in the present condition of village approaches, even the track vehicle could negotiate them with sufficient success to displace the indigenous means of transport.

There is much uncertainty as to the volume of the hired transport traffic in different parts of the province. It is known that in many districts hired carts and camels play a large part; but the cultivator does a great deal of carting to market, thus is it difficult to forecast the success of such alternative means of transport as motor traction or tramways.

There were in the Punjab in 1924 some 25,000 miles of road, excluding village lanes, but the condition of many of them was far from satisfactory, and in that year a new policy was framed. In the earlier years of the century the work of engineers on canals had far outstripped the work on roads; largely increased quantities of crops were being grown, and relatively little was being done to facilitate their movement to market. The Public Works Department, before 1924, had been responsible for some 1,800 miles of roads only, one-third of which—mainly in hill districts—were unmetalled. The remaining roads were in charge of district boards who had taken over responsibility for roads of different degrees of importance at various times. The chief roads in charge of the local authorities were those known as "Provincial Roads in charge of District Boards" and for these when taken over in 1911, earmarked grants for maintenance had been made. But these earmarked grants had gradually become merged in the general funds of the boards, and the pressure of other demands on local funds led to so much neglect of the roads



as to cause general complaints of their condition. The case for a new road policy was clear; a Communications Board was set up, and a new road programme drafted. This new programme has just been taken in hand, and its salient features may be indicated.

Punjab roads, as distinguished from village lanes, have now been grouped into three classes. Class 1 embraces arterial roads, and their construction and maintenance is entrusted to the Public Works Department. Excluding the Grand Trunk Road from Calcutta to the Khyber, which passes through the province, these arterial roads will mostly radiate from Lahore, will pass through all district headquarter towns and also traverse towns with a population exceeding 20,000. While maintaining the general arterial plan, branches will, where necessary, connect up important towns off the main routes. At present there are some 2,000 miles of metalled and 2,600 miles of unmetalled road in this class, and the policy is to metal all class 1 roads where heavy traffic makes this necessary. Because of the distance from which material must be brought, metalling is very expensive on the plains; the cost of annual upkeep is also high and may amount to Rs. 1,000—Rs.2,000 per mile. Class II, now known as "Main Roads," consist of roads of secondary importance maintained jointly from provincial and local revenues. They include roads passing through more than one district, or connecting up towns with 5,000 to 20,000 inhabitants. There are about 7,000 miles of such roads in the province, largely unmetalled. There remain some 13,000 miles of class III roads, almost wholly unmetalled, to be maintained by district boards out of their own funds.

At the present time, apart from the roads in the Nili Bar canal colony area, which are being financed out of the proceeds of land sales, the cost of roads to the Government is about Rs.35 lakhs for class I roads, and Rs.6 lakhs for grants-in-aid of class II roads. It is estimated, if the present programme is carried out, that in fifteen years time the expenditure on roads from provincial revenue will be Rs.80 lakhs and from district board funds Rs.30 lakhs.

This great programme of extension is yet in the future, and as will be seen it aims mainly at supplying the pressing needs of the fertile plains. At the present time the Punjab offers contrasts in means of transport as great as can be found in any part of India.

The hill regions, the canal irrigated plains of the centre and the waterless plains of the west are of widely different importance from the point of view of agricultural transport; but each of them has its own transport problems, and each its own method of meeting them.

A few roads are maintained by the Public Works Department in the mountainous north, but in most of this region the limited

amount of transport called for presents much difficulty. Timber is floated down the rivers, but for other traffic pack animals, or coolies, are chiefly employed, and so great is the need, that sheep travelling from low-lying pastures to the hills may be used to carry packets of salt, or other small parcels of goods, on their backs.

Over the greater part of the plains the country cart, drawn usually by bullocks, sometimes by buffaloes, is the chief means of transport from the village to the market town. The horse is more often seen on Punjab roads than in other provinces, but with rare exceptions his load is a human one; he is not called upon to pull ordinary agricultural produce to market. The bullock carts are strongly built, as they need to be, but from the point of view of the road engineer their design is destructive, and efforts are being made to introduce wheels of a less damaging type. The peasant himself is not concerned with the effect of wheels on roads, but with their capacity to hold together on village lanes; the cart is to him a treasured possession; now and again a substantial zamindar who would think long before spending Rs.40 on a new iron plough, may be found in possession of a cart with highly decorative brass mountings, which has cost him Rs.400. It is well, perhaps, that his æsthetic sense should be gratified by contemplation of his cart, for the village lanes along which he passes could gratify no one. Unlike the wide hedge-lined lanes to be seen in some parts of India, they are usually narrow tracks, so narrow that carts pass each other with difficulty, they have thus been described to the Commission in the Punjab Government's memorandum:

"Years of wear and neglect have resulted in their becoming depressed below the surface of the surrounding fields, so that in irrigated lands they are perennially and in others periodically liable to inundation, when they are puddled by passing cattle and bullock carts into a dreadful morass, aggravated by the buffalo who in his frequent baths may soon wallow out a mud hole feet deep and yards across. The Communications Board has recently initiated a policy for the improvement of these lanes, but progress is slow. They appear to be 'no one's child,' no authority budgets for their maintenance, and even their ownership is in doubt."

In the arid western country on both sides of the Indus agricultural transport is reduced to a small problem by the fact that there is little produce to carry. Roads and lanes alike are almost non-existent away from towns and railway stations. The chief transport animal is the camel, and he takes the "desert's pathless way." Until quite recently the camel was indeed a most important means of transport throughout the Punjab plains, but the coming of the canals, with their great new areas of wheat and cotton has altered the position. The loads of wheat and cotton are greater than his numbers can

cope with, and though the camel's back may still be unbroken, the heavily watered country is breaking up his constitution. The camel is disappearing from the canal colonies; but he is still so much a characteristic beast of burden in the Punjab, that here alone in British India his claim to recognition is officially admitted. It may indeed be hoped that, in gaily caparisoned teams, he may long be seen trotting across the parade ground, or along the racecourse, of Lahore, and that on great occasions, a camel carriage may remain an appropriate means of transport for Governors of the Punjab.

In an inquiry made into the cost of rural transport in the canal colony area in 1923, it was found that the camel was then still the cheapest means of moving wheat and cotton to market. The customary rates per maund per mile were found to be: for carting wheat long leads up to 20 miles, 3 pies, and cotton, 4 pies; for camel transport, wheat, 2 pies, cotton, 3 pies. Carting causes less trouble in loading and there is less risk of damage than in camel transport; thus, apart from the difficulty of securing enough camels, carting was found to be favoured in the majority of districts.

It will be seen that where the cultivator resorts to hired transport the cost is heavy. For a distance of 10 to 12 miles he may have to pay 3 annas per maund for wheat, which in the market town may fetch about Rs.4-8. A charge of about 6 annas would carry the same wheat from the centre of the Punjab to Karachi.

Apart from the possible introduction of cheaper forms of rural transport than the cart and camel or the improvement of roads, the chief means of reducing to the cultivator the cost of marketing agricultural produce is by providing local markets where too few now exist, so that the lead to market may be reduced to one which the cultivator will negotiate with his own cart.

Inquiry suggests that markets, or *mandis* as they are termed in the Punjab, should exist at intervals of from 20 to 25 miles. If at this distance the lead is within the ambit of the average cultivator and the area served would be large enough to attract a good attendance of buyers. Very small *mandis* are to be deprecated because of lack of competition.

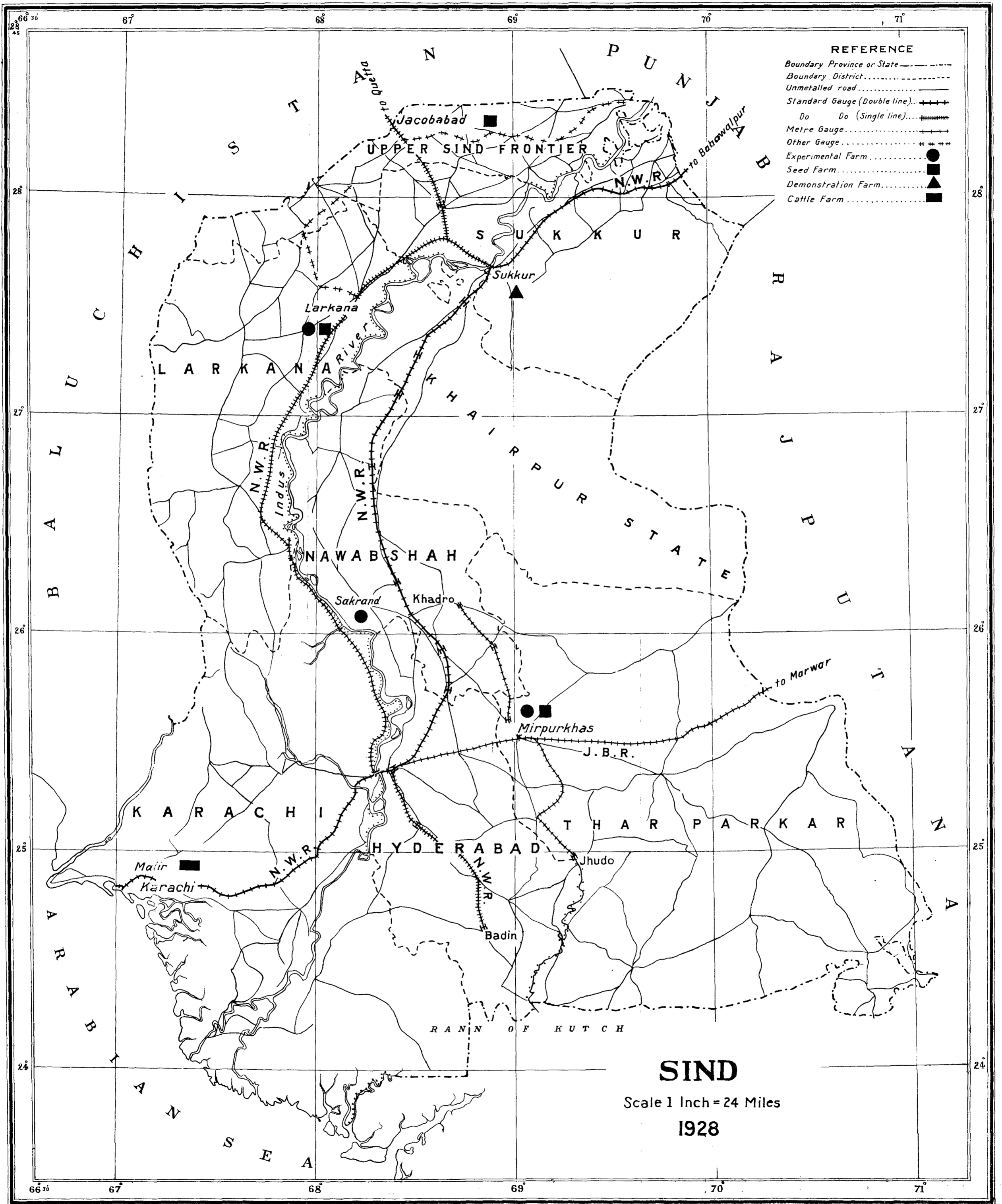
Until recent times the cultivator sold practically all his produce to the village *bania*, to whom he usually owed money, and it was the *bania* who brought it to the market town and sold it to wholesale traders; but rapid changes are taking place, and though the village *bania* is still believed to be much the largest seller of village produce in *mandis*, cultivators, in increasing numbers, themselves cart wheat, cotton and rape seed to market and sell it there. For this desirable change there are many causes, the growth in the export trade, the work of the Agricultural Department in organising sales of special products like Punjab-American cotton, the spread of education and, most of all, the extension of the co-operative movement.

To further the good work thus begun, the Communications Board of the Punjab have kept the need for new, and well-spaced, *mandis* constantly in view in developing their road policy, and the hypothesis on which they now work is that "given good roads trade will flow easily to a *mandi* from within a 12-mile radius." On this assumption the needs of the Punjab cultivator for transport facilities have been surveyed and a map prepared showing the gaps in the *mandi* system which remain to be filled.

The importance of the *mandi* to the Punjab cultivator is very great. It is believed that 90 per cent. of the exported produce passes through these local markets. The Government is, therefore, further attempting to aid the marketing of agricultural produce by constructing model *mandis* in the colony areas. The lay-out of a modern local market town is as follows. The *mandi* serves 500 square miles of canal-irrigated land; it consists of a grain market, four or five cotton-ginning factories, a market for imported timber, iron and steel, and bazaars, with shops for supplying all the cultivators' wants. (Cotton goods, edibles of all sorts, brass and earthenware pots, tin-ware, petroleum stores, sewing machines and bicycles are the things that first catch the eye of the passer by in these market town bazaars). The grain market consists of a set of shops built round three or four sides of a rectangle; there is in front of them a wide brick pavement for unloading, displaying, weighing up and bagging grain. In front of the pavement is a wide metalled road enclosing an open space for parking carts. When the *mandi* is on the railway the grain market adjoins the station and it may even have a siding of its own.

Reviewing the position of marketing in the Punjab it may be said that facilities for the sale of wheat, cotton, rape seed and other exported field crops are good. The commodities now requiring and receiving further attention are fruit, vegetables, eggs, and light perishable produce generally. Except in the case of certain fruits there does not seem to be much export of this type of produce; it is bought and sold for local use. *Mandis* take a share of the trade, but much of it is done in the villages and on the volume of the business done, or the special needs of traders, not much information appears to exist.

Livestock in the province are generally sold at local fairs, which are held at stated times in many places. The fairs, which may combine some of the elements of an agricultural show with those of a market, are attended by the general public, as well as by itinerant herdsmen, shepherds and cultivators, and they may continue for a week. The Agricultural Department use these fairs for staging exhibits of their work, and demonstrating new implements in operation: and sports such as racing, and tent-pegging may be held to add to their attractions. The fair is, therefore, an important rural event. But except for the passenger traffic it makes small demands on transport, for the livestock of the Punjab are almost all of a kind that walks to market.



**REFERENCE**

- Boundary Province or State ..... - - - - -
- Boundary District ..... - - - - -
- Unmetalled road ..... - - - - -
- Standard Gauge (Double line) ..... + + + + +
- Do Do (Single line) ..... - - - - -
- Metre Gauge ..... - - - - -
- Other Gauge ..... - - - - -
- Experimental Farm ..... ●
- Seed Farm ..... ■
- Demonstration Farm ..... ▲
- Cattle Farm ..... ■

**SIND**

Scale 1 Inch = 24 Miles

1928

such as the profession tax. The expenditure of district boards in 1925-26 was about 184 lakhs, of which about 50 per cent was on education, 12.5 per cent on medical relief and public health, and 19 per cent on roads and other district works, excluding medical and educational buildings.

A second local authority concerned with matters affecting the welfare of the rural population is the village panchayat. An Act establishing panchayats came into force in March, 1922, and in 1926 there were three hundred of them in existence. Panchayats are required to undertake the improvement and maintenance of public ways, drains, the construction and repair of wells and tanks for the supply of drinking and bathing water, and the provision of burying or burning grounds. Other duties may fall to them; if called upon they must act as school committees, and they may undertake poor relief, tree planting, the improvement of village livestock, the promotion of cottage industries, the maintenance of libraries and the prevention of nuisances. They are further empowered to exercise "local option" in respect of drink or drug shops, and they may be called upon to try petty criminal and civil cases. Under this last function some 1,170 criminal and 5,290 civil cases were disposed of in 1925-26. The average sum decreed in civil cases was Rs.20-10. It is noted by the Punjab Government that on the whole the judicial work was well done and that it appears to have been appreciated by villagers. In view of the ryot's love for litigation a cheap and expeditious method of gratifying his instincts is useful, and though no more than a beginning has yet been made, it would appear that the village panchayat had in front of it a wide field of social service.

### 13.—PUBLIC HEALTH AND SANITATION.

Taking the province as a whole, it may be stated that the Punjab peasant is the sturdiest and best-fed specimen of his kind among those who now till the plains of India; but in recent years, at least, he has reached the unenviable position of showing a higher rate of mortality than do the inhabitants of any other province. This fact is accounted for by the liability of the Punjab to suffer from epidemics. The influenza epidemic of 1918, which the Director of Public Health refers to as the "greatest epidemic tragedy in human history," is estimated to have produced a death-rate of 51 per 1,000 in the rural areas of the Punjab; an epidemic of plague in 1924 killed 250,000 people; ten years earlier there had been another severe epidemic of plague and in 1908 there was a great outbreak of epidemic malaria. Those who have attempted to account for these epidemics have shown that a number of factors are involved; some of them common to Indian peasantry, e.g., the defenceless condition of villages, unprotected by sanitary safeguards when epidemics start; others special to the province. These special conditions do not seem to be closely connected.

with the soil, or to be related directly to the recent spread of irrigation. To account for them one must literally look to the air, i.e., the predominating factors are meteorological. It is now claimed that from the rainfall of July and August it is now possible to predict with fair accuracy what the mortality from malaria will be in certain districts; and the temperature and atmospheric humidity of the months January to May are controlling factors in the spread of plague. The heavy death-rate from plague in 1924, for example, followed on a high rainfall in January and February, and abnormally cold humid weather from March to May. The epidemic was checked as soon as the weather became hot and the air dry.

In order to effect improvement in the sanitary conditions of the province, the old Sanitary Department was reorganised as a Public Health Department in 1920; and, as will be seen from the evidence of the Director, this department insist strongly on the maxim that prevention is better than cure.

The department aim at providing a medical officer of health and a sanitary inspector in each Punjab district, and in 1926 several medical officers and sanitary inspectors had already been appointed. As a reserve for dealing with epidemics throughout the province twelve epidemiologists have been appointed, and three others, with the assistance of a chemist, are engaged in laboratory studies.

The staff of the Public Health Department work in close co-operation with other departments. For propaganda the village schoolmaster is enlisted. The Rural Sanitary Board (under the Ministry of Agriculture) whose work has been referred to in connection with land drainage, is one of the department's best auxiliaries; and the engineering staff employed in sanitation, which has been increased, are in consultation with public health officers now doing much to improve water supplies. At the present time district boards are expected to take the initiative in improving water supplies and sanitation in villages; but owing to the large areas under their supervision, villages are apt to be neglected.

The Public Health Department maintain a Vaccine Institute and supply lymph for inoculation against smallpox to the vaccinators employed by local bodies throughout the province. They further maintain a staff of vaccinators who are employed in work in some of the smaller Indian States, thus incidentally protecting British districts from infection. The value of vaccination is everywhere understood, except in some small Hill States where apathy is due to ignorance. The conscientious objector is unknown in the Punjab. On the other hand, there is carelessness, as in all countries, and re-vaccination, especially of females, raises difficulties. Constant propaganda and effort are, therefore, required. At first inoculation against plague was unpopular, but the value of the protection given is now recognised and inoculation is sought for by villagers when outbreaks occur.

Some of the investigations on which the Public Health Laboratory workers are engaged are of special agricultural interest. For example, the question of the relation of malaria to rice cultivation has recently been studied. The tentative conclusion was arrived at "that rice cultivation appears to be in some measures conducive to endemic malaria." On the other hand, surveys made near towns have shown that there is no correlation between rice-growing and spleen rate. "It may, therefore, be inferred that conditions favourable to endemic malaria result not so much from the cultivation of rice itself as from the circumstances associated therewith. . . . The conclusion is in fact irresistible, that many factors are concerned in the mechanism of endemic malaria and that the anopheline (mosquito) factor, although an important and essential factor, is incapable, in the absence of other essential factors, of determining the incidence of endemic malaria."\*

The conclusion at which the Public Health Department arrive in placing an account of their activities before the Commission is indisputable; it is "if the Punjab agriculturist is to reap lasting contentment and benefit from improved methods of agriculture, the existing lack of protection from the incidence of disease will have to be considered along with improvements in regard to agriculture."

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\* Punjab Administration Report, 1924-25, p. 59.



## SIND

## 1. GENERAL FEATURES.

The Province of Sind, lying between 23° and 28° north latitude, forms the extreme north-western portion of the Bombay Presidency and consists of the lower valley and the delta of the Indus. It is bounded on the north by the Punjab and the Bhawalpur State; on the east by Rajputana; on the south by the Rann of Cutch and the Arabian Sea; and on the west by Baluchistan. The province, excluding the State of Khairpur, consists of seven British districts and covers an area of about 47,000 square miles.

The soil of the province is almost entirely alluvial, having been formed by the detritus of the Himalayas carried down by the river Indus from which it takes its name. For much of its length in the alluvial plain, the river bed is most unstable and the river prone to alter its course, sometimes by many miles, in a single flood season. There are traces of ancient river beds in many parts of the tract, and the Indus is known in past ages to have discharged its waters into the sea at a point about 200 miles east of its present mouth. For about five months in the year the level of the river rises above that of much of the surrounding country and thus enables the water to be drawn off for irrigation by canals which take off from the main river at points where its banks have for long been stable. To the west, the level valley of the Indus is bounded by the Kirthar Range of mountains which separates Sind from Baluchistan; this range has an average elevation of 2,000 ft. with some peaks rising to 7,000 feet. The hills are stony and barren but support a characteristic vegetation and afford grazing to large herds of cattle, sheep and goats.

The forests which consist mainly of *babul* (*Acacia arabica*) fringe the banks of the river for 300 miles.

The finest and most productive region lies in the neighbourhood of Shikarpur and Larkana in a long, narrow stretch extending 100 miles from north to south, enclosed on the one side by the river Indus and on the other by the hills of Baluchistan. Another great alluvial tract with an average width of 70 to 80 miles stretches eastward from the Indus. Sandhills abound near the eastern border, and large tracts remain sterile for want of irrigation.

The soil of Sind consists of a plastic clay strongly impregnated with salts and is remarkably fertile under irrigation.

No soil survey of the province has been made. Five types of soils are, however, usually distinguished: (1) *variasi*, loose sand fit only for melon cultivation, (2) *kacha*, land resulting from recent inundation, (3) *chiki* or *paki*, hard black soil which has been under water for some time and which is usually very stiff and heavy to work,

(4) *rao* or *raewari*, soil enriched by the detritus of hill torrents, and (5) *dasar*, a term widely used for soft or light coloured but productive soil. Besides these, there is also the *kallar* or salt-affected land.

Owing to the absence of monsoon rainfall, the climate of Sind ranks amongst the hottest in India. On the coast, sea-breezes render it equable but, in northern Sind, variations of temperatures are extreme. For the whole province, the average mean temperature of the summer months is 95° and that of the winter months 60°. In the north, the summer maximum frequently rises to 114° and occasionally to 125°; while in the winter, frost occurs at night and, even in the day time, the temperature falls to 40°. Nowhere in India is the hot weather so prolonged.

The rainfall of Sind is very scanty and irregular; in some years, there may be no rain, and, in others, cyclonic storms may bring 16 inches in a day. The average is about 8 inches. Except in the two areas noted below, cultivation depends not upon the rainfall, but upon the river Indus. These areas are the hilly tract of Kohistan on the west, and the tract to the south-east of the province known as the Thar desert. These tracts are above the river valley and cannot be reached by canals; rainfall is uncertain and the cultivation is most precarious. The inhabitants are chiefly nomadic cattle and camel breeders, and, to them, agriculture is only a subsidiary industry.

The height and duration of the inundation of the river is dependent on the melting of the snows in the Himalayas and on the rainfall in the Punjab, and varies greatly. If the river remains high from May to September, a bumper harvest may be reaped over an area of 4·5 million acres. If the river fails, as it did in 1918-19, the area falls to 2·75 million acres and the outturn is very poor.

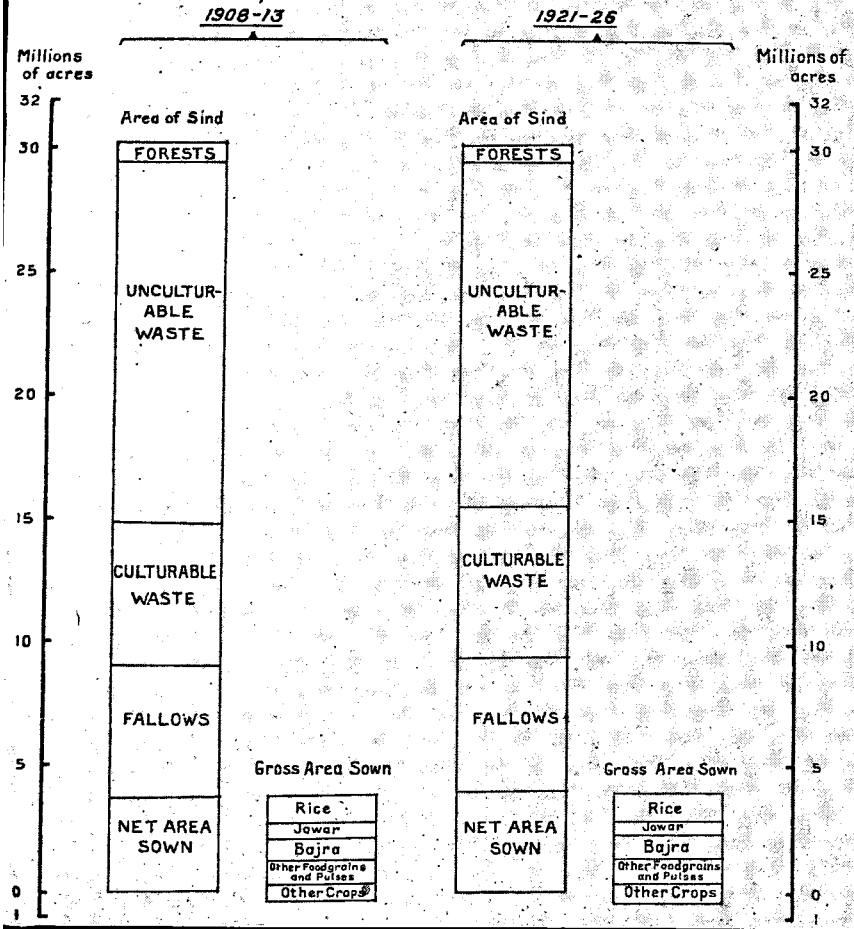
The most important crop in Sind is rice (1,000,000 acres). The next in importance is *bajri*, which covers almost the same area. The other important food crops are *juar* (600,000 acres), wheat (500,000 acres), and gram (200,000 acres). Amongst non-food crops, cotton was cultivated last year in 326,000 acres and oil-seeds in about the same area. During the decade, 1911-21, the minimum annual value of the crops in the whole of Sind was, according to an estimate made by the Agricultural Department, Rs. 11 crores in 1918-19 and the maximum Rs. 24·5 crores in 1916-17. The relative importance of the chief crops of Sind is shown by the accompanying diagram.

Rotation of crops is little practised in Sind. Large areas are kept fallow every year. The area privately owned but not cultivated exceeds the net cropped area. Government waste land including forest forms two-thirds of the entire area of the province and of this about a third is culturable waste.

# SIND

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 Year Averages)

NOTE - The difference between the Gross Area Sown and the Net Area Sown represents the area sown more than once.



A census of cattle is taken every five years; the following Table gives a summary of the results of the last five censuses :—

No.	Details	1906	1909	1915	1919	1924
		No.	No.	No. (Figures in 000's)		No.
1	Plough cattle .. ..	551	582	601	554	582
2	Breeding Bulls .. ..	8	10	8		22
3	Cows .. ..	587	717	705	617	792
4	She-buffaloes .. ..	223	282	283	259	329
5	Cattle for other purposes .. ..	390	515	581	390	600
	Total cattle .. ..	1,709	2,106	2,178	1,820	2,325
6	Total horses .. ..	78	84	81	71	79
7	Total sheep .. ..	302	424	514	564	624
8	Total goats .. ..	909	1,074	1,101	1,028	1,511
9	Total camels .. ..	113	116	117	117	169

The decrease in the census of 1919 was due to the removal of cattle to other regions owing to the absence of grazing in the rainless year of 1918-19. One noticeable feature is the large proportion of milch cattle and cattle for other purposes. The Sindhi drinks milk in large quantities, and when suffering from dyspepsia finds a remedy in camels' milk. The desert and unirrigated parts of Sind are pastoral tracts in which the keeping of cattle is the principal occupation of the population.

According to the last census, there were in 1924, 13 plough cattle, 25 milch cattle, and 13 cattle for other purposes for every 100 acres cropped. Throughout the province, the general condition of the cattle is good.

## 2. PROVINCIAL INCOME

GOVERNMENT OF

(Figures are in

*Revenue and Expenditure*)

Receipt heads	1921-22	1922-23	1923-24	1924-25
<i>Revenue Receipts</i>				
Principal Heads of Revenue—				
Land Revenue .. .. .	144·2	83·5	72·1	62·0
Excise .. .. .	31·0	35·5	40·3	39·1
Stamps .. .. .	16·0	19·4	20·2	19·8
Forests .. .. .	8·0	6·2	6·3	6·9
Registration .. .. .	1·8	1·6	1·5	1·5
Scheduled Taxes .. .. .	....	....	0·2	0·6
Irrigation—				
Works for which Capital accounts are kept (Net receipts after deducting working expenses.)	—24·0	36·5	39·3	39·2
Works for which no Capital accounts are kept	0·5	0·5	0·1	0·1
Interest .. .. .	1·7	3·6	2·7	1·8
Civil Administration—				
Administration of Justice .. .. .	1·5	2·1	1·9	1·8
Jails and Convict Settlements .. .. .	0·8	0·8	1·0	1·2
Police .. .. .	0·2	0·3	0·2	0·4
Education .. .. .	0·7	1·0	1·0	1·5
Medical .. .. .	0·2	0·4	0·4	0·3
Public Health .. .. .	....	0·1	0·1	0·2
Agriculture (including Veterinary and Co- operation).	0·4	0·4	0·7	0·7
Miscellaneous departments .. .. .	0·1	....	0·1	0·1
Civil Works .. .. .	0·5	0·9	0·7	0·9
Miscellaneous .. .. .	1·8	2·2	3·2	2·6
Total ..	185·4	195·0	192·0	180·7

*N.B.*—1. As there is no separate budget for Sind, the above figures have been extracted from  
2. Figures for Capital Receipts in Sind are not available.

## AND EXPENDITURE.

## BOMBAY (SIND)

lakhs of rupees)

*charged to Revenue*

Expenditure heads	1921-22	1922-23	1923-24	1924-25
<i>Expenditure charged to Revenue</i>				
Direct Demands on the Revenue—				
Land Revenue .. .. .	23·0	40·1	39·2	13·8
Excise .. .. .	2·5	1·8	1·3	1·9
Stamps .. .. .	0·7	0·9	0·8	0·7
Forests .. .. .	4·2	3·5	3·6	4·1
Registration .. .. .	0·8	1·0	0·9	0·9
Irrigation—				
Works for which Capital accounts are kept	11·4	12·9	16·2	21·5
Miscellaneous Irrigation Expenditure ..	38·2	23·1	13·5	23·1
Civil Administration—				
General Administration .. .. .	14·3	20·7	19·6	44·8
Administration of Justice .. .. .	10·0	9·6	10·0	11·5
Jails and Convict Settlements .. .. .	6·3	5·9	5·2	5·9
Police .. .. .	40·8	36·1	35·1	36·0
Ports and Pilotage .. .. .	0·1	0·1	0·1	0·3
Education .. .. .	23·4	23·0	26·6	23·8
Medical .. .. .	5·9	4·6	5·3	5·3
Public Health .. .. .	3·1	3·5	2·9	2·9
Agriculture (including Veterinary and Co-operation.)	3·5	3·3	3·3	3·4
Miscellaneous departments .. .. .	0·3	0·3	0·3	0·3
Civil Works .. .. .	22·2	10·4	6·5	8·0
Miscellaneous—				
Superannuation Allowance and Pensions ..	5·9	6·1	6·9	7·1
Stationery and Printing .. .. .	1·2	1·3	0·9	1·0
Miscellaneous .. .. .	1·5	1·3	4·0	5·2
Total ..	219·3	209·0	202·2	221·5
<i>Capital Expenditure in Sind</i>				
Construction of Irrigation Works ..	5·6	19·1	51·5	124·0
Capital outlay on Improvement in Public Health.	....	5·3	0·5	....
Civil Works not charged to Revenue	....	7·1	5·5	12·2
Total ..	5·6	31·5	57·5	136·2

the budgets for the Presidency of Bombay.

### 3. REVENUE ADMINISTRATION AND LAND RECORDS

Sind is a province of the Bombay Presidency and is under a Commissioner, who has considerably larger powers than those of an ordinary Commissioner of a division. Under certain Acts, he has the powers of a local government, whilst under others he has powers which in the rest of the presidency are exercised by heads of departments. There are seven districts in Sind, of which six are under Collectors and one under a Deputy Commissioner. The Collector or Deputy Commissioner is in charge of the revenue administration of the district and is also the chief magisterial authority, and the district registrar. For each taluka in the collectorate, there is an officer called the *mukhtiarkar* who, in addition to his revenue duties, is in charge of the sub-treasury and exercises magisterial powers. An assistant or deputy collector is in charge of a revenue subdivision comprising several talukas. The collection of the land revenue is performed by the *tapedars*, each of whom is responsible for a group of villages which varies in number from five to ten. Between the *mukhtiarkar* and the *tapedar*, there is a staff of inspecting officers known as supervising *tapedars*, of whom there is one to every four or five *tapedars*. The Manager of Encumbered Estates is an officer of the Indian or the Provincial Civil Service. He is appointed under the Sind Encumbered Estates Act, which was passed to provide relief to *jahagirdars* and *zamindars* in debt. The management of their estates is undertaken by the Manager upon an application by the landholders.

The functions of the Land Records Department are to provide statistics necessary for sound administration in all matters connected with the land, to reduce and simplify litigation in the revenue and civil courts, to provide a record of rights for the protection of all who have interests in land, and, lastly, to simplify and cheapen periodical settlement operations. A branch of the provincial Land Records Department is located in Sind and is under a Superintendent of Land Records. The work in the district is carried on by district inspectors, *tapedars* and supervising *tapedars*. Control over the district staff is exercised by the Collectors, the functions of the Superintendent of Land Records being limited to inspection and advice. A complete record of rights and interests in land has been prepared for the unalienated villages in the province except the Kohistan tract of the Karachi district and the desert tract of the Thar and Parkar district, and has proved of great value to the public.

Before the advent of the British in 1843, the land revenue was levied in kind as a share of the produce. The system was continued for some time but payment in cash was introduced at an early date. Later, a survey and settlement on the lines of what had been adopted in the Bombay Presidency was introduced in Sind, but had to be altered to suit the special conditions of a province where a large part of the land is left fallow every year. The assessment is fixed by the method known as irrigational settlement. In this settlement, the villages of a taluka are divided into groups arranged in accordance with the facilities which they enjoy for obtaining water and for the disposal of produce at a market. Rates are then prescribed for the different methods of irrigation in each group of

villages. The pitch of the assessment is governed by the trend of prices, the value of land, and the state of the canals. This system has the merit of leaving the occupant the choice of the best method of irrigation, season by season, suited to the height of the river and the water supply available. Assessment is levied on each survey number only when it is cultivated; the size of the number has been reduced to the area cultivable with one pair of bullocks. No assessment is collected on lands which are not cultivated, but to prevent the land lying idle, a fallow assessment is charged once in five years. The period of settlement is normally fixed at twenty years, except in areas where important irrigational projects are under consideration or which are particularly exposed to the vagaries of the river.

There are few tenant rights in existence. The bigger zamindars cultivate the lands through *haris* who are tenants-at-will and usually pay rent in kind. The smaller zamindars cultivate themselves.

#### 4. THE CULTIVATOR.

The census of 1921 gave Sind a population of 3,280,000 which was only slightly in excess of the population of 1901. There had been an appreciable increase between 1901 and 1911 but this increase was wiped out by the influenza epidemic of 1918 which took a great toll of life in Sind, especially in rural areas. The decrease in rural population between 1911 and 1921 was highest in the Karachi district (14·7 per cent), and lowest in the Nawabshah district (6·6 per cent).

There are 27 towns in Sind and 5,107 villages. The province is sparsely populated, the average number of persons per square mile being 71. Of the population, 2·4 millions or 75 per cent are Muhammadans and 800,000 or 25 per cent are Hindus. If the population is classified by occupation, we find that 1·9 millions are landholders and tenants or agricultural labourers and their families. The non-agricultural population is 1·4 millions. The agricultural population can be divided into three classes, (1) the big zamindars, a small but very influential class, (2) the small zamindars or peasant proprietors and (3) the *haris* or ploughmen who have no direct interest in the land.

The number of holdings in Sind is about 220,000. Their size and distribution is shown in the following Table:—

1. Under 5 acres	..	..	68,819
2. Between 5 and 25 acres	..	..	93,959
3. „ 25 „ 100 — „	..	..	42,015
4. „ 100 „ 500 „	..	..	11,596
5. Over 500 acres	..	..	2,251

The total area in these holdings is a little over 8 million acres; the average area of the holding is 38·7 acres and the average assessment per holding about Rs. 54. The proportion of holdings in each class varies from district to district. The Upper Sind and the Thar Parkar districts have large estates. In Larkana and Sukkur, the proportion of large landholders is very small, but, in the former, they hold a considerable proportion of the land.

The *hari* is a tenant who pays rent usually on a share basis, the share being half the crop on flow land and one-third of the crop on lift



land. He is, as a rule, financed by the landowner himself, who also directs what is to be grown and how it is to be grown, while the *hari* provides his own men, bullocks and implements.

The problem of the consolidation of holdings was investigated but it was found that the evil of fragmentation does not exist in Sind to any large extent and that as large areas of land are still available, the problem has not yet become important.

In years of good inundation, the economic condition of cultivators in Sind is favourable. They are not so well off in the delta, as the region is malarial. The position of the farm labourer has improved very much in recent years, as there is a greatly increased demand for labour. The extension of peasant proprietorship under the Sukkur Barrage system will also benefit men who have the necessary industry and ambition to take advantage of the new conditions.

The staple food of the agrarian classes is either *juar* or *bajri*, except in the delta and the rice-growing parts of the north where rice is generally used. The consumption of wheat is increasing. All classes, except a few Hindus, eat flesh, fowl and fish. The ordinary villager lives in a low hut consisting of mud walls and a roof of thatch, with a hedge round it. Large sections of the people, however, especially in the delta, live in movable shelters of brushwood and thatch. The house of the zamindar is built of dry bricks with a flat roof, and is usually surrounded by a wall enclosing the court-yard.

The Sindhi is very hospitable and inclined to improvidence in his expenditure; and, in consequence, large numbers are in debt. Where there are no co-operative societies, the cultivator resorts to a *bania* who is both a shopkeeper and a moneylender. He advances to the cultivator whatever he requires on condition that the crop is brought to him for disposal. Wherever the co-operative movement has taken root, the cultivator is being freed from this incubus and is becoming independent. The cultivators have ample leisure after their agricultural operations are over; but are reluctant to leave their villages and go to towns to seek employment. Occupations, such as the care of livestock, goats, sheep and cattle are largely in the hands of special classes. For large works, labour has often to be imported from outside Sind. When the Sukkur Barrage is completed in 1931, and the irrigation system under it developed during the next generation, irrigation will be available for the whole year over the greater part of Sind instead of for four months, and full employment will thus be available for a large proportion of the population.

##### 5. THE AGRICULTURAL DEPARTMENT.

The Agricultural Department in Sind is an integral part of the Department of Agriculture in the Bombay Presidency and is, therefore, under the control and guidance of the Director of Agriculture, Poona. Work in connection with agricultural problems in Sind began with the establishment of an experimental farm at Hyderabad in 1884, when experiments were made with American cotton and the Egyptian date palm; the distribution of wheat and rape seed in the Nara Valley was also commenced. Very little headway was, however, made until 1903 when the construction

of a perennial canal (the Jamrao Canal) suggested the possibility of growing long staple cotton and experiments were also undertaken with wheat, *berseem* and the irrigation systems in vogue.

In 1906, a special officer was appointed to carry out investigations into Sind conditions and especially to study the problems of cultivation of Egyptian cotton. This led, in 1907, to the appointment of a deputy director of agriculture for Sind. Since then, work has developed in several directions. Excluding the lower grades of assistants and the special staff employed in connection with the experimental work undertaken in view of the Sukkur Barrage, to which reference is made below, the staff now consists of—

- (1) one deputy director of agriculture ;
- (2) one botanist. Although he is designated cotton breeder, he is also in charge of rice breeding and wheat breeding ;
- (3) a divisional superintendent of agriculture who is in charge of work in east Sind ; and
- (4) thirteen graduate assistants.

The Livestock Expert for the Bombay Presidency has control of a farm in Sind for the maintenance and improvement of the red Sindhi or Karachi breed of cattle. Sind can also indent on the services of expert officers of the Bombay Government, such as the Agricultural Chemist, Economic Botanist, etc.

The main lines of experimental work have been the following :—

(1) *The introduction of long staple cottons.*—Attempts to introduce Egyptian varieties have for the present been abandoned ; and attention is now concentrated on the introduction of American cottons. The two Punjab types, 4 F. and 285 F., have now been introduced on a large scale, especially in the Jamrao area. These are high yielding cottons, but the cotton breeder in Sind has succeeded in isolating still higher yielding strains from the general Punjab stock. These Punjab and American cottons are being multiplied as fast as possible ; and it is hoped that Sind will shortly be self-dependent in the matter of American cotton seed.

(2) *The improvement of Sind deshi cotton by selection.*—Of the several strains isolated during the last few years, the variety known as 27 W. N. has been selected for distribution and has become popular.

(3) *The improvement of wheat.*—Here the work being done is the introduction of Pusa and Punjab wheats as well as the development of high yielding strains of Sind wheat. Pusa 12 has become the standard type of wheat in upper Sind. Two new strains have, however, now been evolved which are doing even better than Pusa 12. It is now possible to recommend different varieties and improved strains of wheat for different parts of Sind, and these have already become very popular. A wheat seed farm is maintained at Jacobabad.

(4) *The improvement of rice.*—Experimental work on rice has been recently taken up ; and early and more prolific types have now been isolated which, on experimental areas, give an increased yield of 20 to 30 per cent. These are now being tried on a large scale in cultivators' fields.

(5) *Work on agricultural implements.*—Agricultural implements used in Sind are generally very crude. An appreciable advance has

now been made by the department in the introduction of the Egyptian plough and various types of implements of economic value.

The establishment of the Sukkur Barrage canal system will revolutionise the character of the agriculture in Sind. When the scheme is completed, the cropped area in Sind will be increased by two to three million acres annually, and cropping will be possible throughout the year. New and difficult problems will arise when perennial irrigation is introduced into a country which has hitherto been watered only during a small part of the year. The Government of Bombay, therefore, appointed, in 1923, a committee to make suggestions as to the best way in which such problems should be tackled. The committee recommended the starting of experimental work at once under the best and most scientific direction obtainable and the finance thereof on a liberal scale; and, in particular, (a) the establishment of three first class experimental stations: one on the right bank of the Indus, preferably at Larkana, another on the left bank of the Indus at Sakrand, and a third at Shadipalli for the Eastern Nara tract; (b) the establishment of five subsidiary stations; (c) experimental work on fruit culture and cattle breeding; (d) larger expenditure on propaganda, the provision of higher agricultural education in the province itself, and the separation of the Agricultural Department in Sind from that of the presidency proper, the former being placed under the sole control of a local Director of Agriculture. The total capital cost of this scheme is estimated at Rs. 7,69,000; and the recurring cost, Rs. 4,10,000. The Government of Bombay accepted the recommendations with certain reservations but have not yet succeeded in finding the finance necessary. For the present, provision has been made only for the new experimental station at Sakrand with a Director and a botanist, a soil physicist and chemist, a horticultural expert and six graduate assistants under him; and also for an agricultural engineer for Sind. The land at Sakrand is typical of large areas in the country. The problems which the station is required to solve are mainly three: (1) to determine what crops can most profitably be grown under Barrage conditions in central Sind, and to breed types of such crops; (2) to find the best way of using the water in the prevailing conditions and (3) to find out the effect of perennial irrigation on the soil. Experimental work on all these problems was started at the station in 1926.

*Demonstration and propaganda.*—Two difficulties in the way of introduction of agricultural improvements in the past have been the illiteracy of the people and the want of proper finance. The close co-ordination of the departments of Agriculture and Co-operation in Sind is helping the solution of the question of finance. Since 1922, the carrying out of agricultural propaganda in northern and central Sind has been entrusted to the Assistant Registrar. The general control of the work is in charge of a divisional board composed of six members of whom four are non-officials and two officials—the Deputy Director of Agriculture, and the Assistant Registrar. Taluka development associations have been particularly successful in Sind, and there are fourteen such associations now in existence. They have demonstrated

the value and extended the use of improved seed, implements, and modern methods of cultivation, have distributed large quantities of cotton and wheat in many areas, and are becoming an essential part of agricultural propaganda in the country.

*Agricultural education.*—As there is no provision for the imparting of higher agricultural education in Sind, scholarships have been given since 1907 to enable students from Sind to go to the Poona Agricultural College. Selections are made by the Commissioner, and each scholar signs a bond that he will work in the Agricultural Department for five years after graduation if his services are required by the department. From 1918 to 1922, these scholars were sent to the Punjab Agricultural College at Lyallpur instead of to Poona; but since 1923, the scholarships have again been transferred to Poona, as the Punjab authorities demanded the full cost of their training. The number of scholarships awarded at present is six per annum. Besides these scholarship-holders, there are a few private students from Sind at the Poona Agricultural College.

In 1912, a school for imparting vernacular agricultural education to boys belonging to cultivating classes was opened at Mirpurkhas with the object of enabling them to improve their own lands, to manage the estates of zamindars, or to enter agricultural service. The school never became popular and was closed in 1922. Since 1924, nine agricultural bias schools have been opened in Sind.

The cost of the department in Sind last year was Rs. 1,55,908. This is exclusive of the cost of the Sakrand farm, for which the amount budgeted was Rs. 1,35,000.

*Livestock—Cattle breeding and dairying.*—Sind is the home of three breeds of cattle of considerable merit:

- (1) the Red Sindhi or Karachi, the best milking breed in India;
- (2) the White Sindhi or Thar Parkar, a good milker and an efficient draught animal;
- (3) the Bhagnari from the borders of Baluchistan, one of the best draught breeds in India.

The department has started a farm close to Karachi for the maintenance and breeding of the Red Sindhi. This farm contains the best milking stock in the country. A few Thar Parkar animals also are kept on it but a proposal is under consideration to start a separate farm for that breed in the Thar Parkar country. There is no provision for a similar provision for the Bhagnari breed of cattle. A small herd of Murrah or Delhi buffaloes is kept at Sukkur.

Cattle breeding in Sind is under the control of the Livestock Expert who works in co-operation with the Deputy Director of Agriculture. Premium bulls are given out by the department to selected cultivators on certain conditions and this system is now specially used for the provision of good Bhagnari bulls in upper Sind.

## 6. THE VETERINARY DEPARTMENT.

The Veterinary Department in Sind is independent of the department in the presidency. Sind has a separate Superintendent who is also in charge of Ajmer-Merwara. His staff consists of two veterinary inspectors

and 21 assistant surgeons, 18 of whom are in charge of dispensaries and 3 are on reserve duty. Of the 18 assistant surgeons in charge of the dispensaries, one is a local board servant.

The number of veterinary dispensaries is 18; the total number of patients treated at these dispensaries last year was about 26,500; medicine and advice were also given in the case of 3,800 other animals not brought to the dispensaries. The dispensaries are under the control of the district local boards, the assistant surgeons in charge being supplied by Government.

Besides supervising the work of the dispensaries, the Veterinary Department is also engaged in the prevention and cure of contagious diseases, among which rinderpest is the most common. Other prevalent diseases are foot-and-mouth disease and hæmorrhagic septicæmia. Anthrax and black-quarter also occur at times. The number of animals inoculated in 1926-27 was nearly 13,000.

The Veterinary Department in Sind also supervises horse breeding operations. There are nine stallions in the province towards whose maintenance Government contributes half the cost.

The total cost of the department for last year was about Rs. 1,84,000 out of which Rs. 90,000 came from provincial revenues and Rs. 94,000 from the local authorities. The latter amount includes a sum of Rs. 24,000 paid by the Wadia Trust.

#### 7. IRRIGATION.

Practically the whole cultivation in Sind depends on irrigation by canals from the river Indus. The inundation of the river, which begins in May and subsides in September, depends on the melting of the snows in the Himalayas and, to a large extent, upon the rainfall in the Punjab and the consequent accretions to the Indus flood from its five tributaries in that province. The water carried by the river varies from 20,000 cusecs in February to 950,000 cusecs in August. The water is gauged at several points and, when the level reads above 13 feet at Bukkur and 17 feet at Kotri for the greater part of the three months June, July and August, the canals receive an adequate supply. If the level of the river rises to this height in May and does not fall below it till September, the cultivating season is prolonged and the harvest is bountiful, but such years are rare.

For some 400 miles from Kashmor in the north to below Tatta in the south, the river is confined by almost continuous earthen embankments; the height of these embankments varies from ten to twenty feet according to the height of the bank of the river; it is only at rare intervals that the bank is so high as to require no embankment. When the river level rises above 16 feet at Bukkur or 22 feet at Kotri, there is serious danger of breaches in the embankment and of grave damage by flood. As the Indus runs through soft alluvial sand in most places it is liable to change its course by several miles in rapid movements and the task of protecting the embankments calls for constant vigilance, and involves heavy expenditure by the State. These embankments have been constructed and gradually improved and strengthened in the last fifty years: at dangerous points, the earth wall is faced with brick or stone.

The system of irrigation from inundation canals existed before the British assumed control of Sind in 1843. These canals have been continuously extended and improved and new canals have been constructed so that, at the present date, 7,925 miles of canals are under the administration of the Irrigation Department. The supply of water is controlled by masonry head works. For the most part, the water runs on a higher level than the surrounding fields and flows on to them through distributaries which are also controlled by masonry outlets. Dams and regulators are constructed at suitable intervals to raise the height of the water in the canals. In certain tracts, particularly in the centre of Sind on the left bank, the land is higher than the canals and the water has to be raised by lift. The method commonly adopted is that of the Persian wheel worked by bullocks or camels.

In order to guard against the erosion of the embankments, a channel several miles wide has been left for the swings of the Indus and, in this tract, considerable areas are cultivated on the moisture left in the soil after the subsidence of the inundation. These are the winter crops, wheat, oil-seeds and pulses. Of the total present cultivation of Sind, 72 per cent is *kharif* and 28 per cent is *rabi*.

The irrigation system in Sind is now in process of being converted from an inundation to a perennial basis by the construction of the Sukkur Barrage and of a new system of canals which will run from the Sukkur Barrage on both sides of the river; on the right bank to the west for 132 miles until the Kohistan hills interpose a barrier close to Sehwan; on the left bank to the east over 205 miles past Hyderabad to the Rann of Cutch and to the elevated sand-hills of Thar Parkar. It is estimated that this scheme will alter the irrigation of two-thirds of the present irrigated area of Sind, rendering water available for the whole twelve months of the year instead of for the short inundation period of four months. The system will also supply water by flow to large tracts now irrigated at considerable expense by lift. It will also provide water to 3·5 million acres which now have no available supply for irrigation. The area commanded by this scheme is 7·5 million acres, of which it is anticipated that 5·5 million acres will eventually be cultivated annually. This area of 5·5 million acres cultivable by this scheme exceeds the present culturable area of Egypt by 500,000 acres.

The project is estimated to cost nearly Rs. 20·25 crores, of which 5·5 crores are debited to the Barrage and 14·75 crores to the new canals. The Barrage is located three miles below the gorge of the river Indus between Sukkur and Rohri. It is to be equipped with movable gates which will be raised when the inundation rises and will be lowered when it falls so that the level of the water may be retained at a height sufficient to fill the canals which take off above the Barrage. It is anticipated that with the supply of water throughout the year the cultivating season will be largely altered and two-thirds of the area will be brought under crops in the winter season and one-third in the summer season. The cultivating season for cotton will be prolonged from four

months to eight months, enabling the substitution of long staple cotton for the less valuable short staple varieties. It is also anticipated that wheat and oil-seeds will also be substituted for the less valuable crops of millet, while the area under rice will remain unchanged. The main difficulty of the cultivator at the present time is the lack of employment for many months of the year and it is hoped that, in this tract, this difficulty will be wholly relieved.

The plain of Sind is so level, having an average slope of six inches to the mile from north to south, that there are few natural drainage channels; and the problem of supplying drainage in conjunction with the new irrigation scheme is receiving the attention of the engineers.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

The area in charge of both the Forest and Revenue departments is only 1,171 square miles. The forests which are situated along the banks of the Indus run in narrow strips from a quarter of a mile to two miles in breadth. They are liable to erosion and are seriously affected by changes in the course of the Indus.

The indigenous trees consist of *babul* (*Acacia arabica*), *kandi* (*Prosopis spicigera*), *bahan* (*Populus euphratica*) and two kinds of tamarind. A valuable tree, sometimes found, is the *tali* (*Dalbergia sissoo*).

*Babul* trees produce wood suitable equally for building, fuel and ploughs; seed pods useful for feeding cattle; bark for tanning; and leaves and thorns as a favourite fodder for camels and goats; within the limits of central Sind they are a host for the lac insect. *Bahan* yields light soft wood for building purposes.

The number of cattle admitted to grazing in the forests in 1925-26 was nearly 100,000, equally divided between horned cattle and sheep and goats. About 2,000 camels were also admitted to browsing. The average expenditure on the forests in Sind for the last quinquennium came to Rs. 3·75 lakhs, while the revenue was Rs. 6,85,000.

Besides the State-owned forests mentioned above, it is not uncommon in Sind for zamindars to have private groves of their own. These are known as *kuris* which are well preserved and are a source of appreciable profit to their owners.

#### 9. GENERAL EDUCATION.

Educationally, Sind is very backward: the percentage of literacy for all communities is 4·1 only; but in the case of Muhammadans it goes down to 2·7 and amongst the advanced communities rises to 12·6. The fact that the population is widely scattered is a great obstacle in the spread of literacy. The main reason, however, is the general apathy to education of the Muhammadans who form three-fourths of the total population. Recently, however, this community has shown greater interest in educational matters, and more rapid progress may be expected in the near future.

The educational system in the province is identical with that of the presidency proper. The superior staff of the department in Sind

consists of an educational inspector, an inspectress for girls' schools, a senior deputy inspector for each district except Thar and Parkar where there is a deputy inspector and a special deputy inspector for Urdu and Mullah schools.

The changes in the administration of primary education which have been made by the Primary Education Act of 1923 have been described in the introduction to the volume of evidence for the presidency proper. All the district local boards in Sind, with one exception, have taken over the control of primary education in accordance with the terms of the Act.

Institutions for higher education are confined to :—

- (1) two arts colleges at Karachi and Hyderabad ;
- (2) a special Medical School at Hyderabad, where men are trained for the subordinate medical service ;
- (3) an engineering branch of the Arts College at Karachi ; and
- (4) a Law College at Karachi.

Sindhi students also attend the institutions in the presidency proper.

The total number of students in primary schools in 1925-26 was a little over 100,000, of whom girls numbered one-fifth. Thus about 21 per cent of the school-going population was at school. There is the same wastage in primary schools in Sind as in the other parts of the presidency, the attendance falling rapidly in the upper classes. Of 100 students attending primary schools, less than nine reach the upper primary (vernacular middle) standards.

As Sind is predominantly a Muhammadan province, special reference may be made to education amongst that community. The number of Muhammadan pupils receiving instruction in Sind last year was 66,818 of whom about 17 per cent were girls. Fifty-four thousand of these were in primary schools, 2,700 in secondary schools, 86 in colleges and 365 in special and training schools. Of the students in primary schools, about 36 per cent were in Mullah schools, in which, under the control of religious teachers, religious instruction as well as secular is given to Muhammadan boys. These schools are recognised by the State and receive grants graduated according to their efficiency. There are now 724 of these schools, and the grants-in-aid amounted to Rs. 3.25 lakhs. The expenditure on Muhammadan education in Sind was roughly estimated at Rs. 22 lakhs out of which Rs. 12 lakhs were met from the provincial funds. The total expenditure on education in Sind last year was Rs. 50 lakhs, out of which Rs. 27 lakhs were contributed from provincial funds.

#### 10. CO-OPERATION.

The co-operative movement in Sind is of comparatively recent growth. Attempts at the formation of societies started with the passing of the Co-operative Credit Societies Act of 1904. Little progress was, however made until a separate Assistant Registrar for Co-operative Societies was appointed in 1918. Up to that date, only 65 societies had been organised,



which had a membership of about 3,000 and a working capital of Rs. 1,63,000 only. Many of these societies existed only in name and did little work. The Assistant Registrar, on his appointment, carried on vigorous propaganda, secured the co-operation of all classes of agriculturists, revised the constitution of existing societies, and drafted by-laws to suit the existing conditions in Sind. The by-laws were modelled on those in force in the Punjab where conditions were more or less akin to those prevailing in Sind. The chief difference in the constitution of the societies in Sind and those in the presidency proper is that the former are organised on a share basis—a system which is described below.

The difficulties in the way of organising societies were many. The Registrar of Co-operative Societies, in 1917, reported that the societies were still "at too elementary a stage to justify a prophecy that the movement will ever take firm root in Sind." The general illiteracy prevailing in the province, the aversion of the bulk of the population, which is Muhammadan, to the taking of interest, the predominating influence of the big zamindars, and the prevalence on a large scale of the *hari* system under which the cultivator has no direct interest in the land, as well as the absence of big villages were great handicaps in the rapid development of the movement, but, since 1918, the movement has developed rapidly in the province. The co-operation of the educated leaders of the people has assisted this development. The number of societies increased from 65 in 1918 to 481 in 1923. During the same period the membership and working capital increased from 3,000 and Rs. 1,63,000 to 19,000 and Rs. 38 lakhs respectively. At the end of March 1927, the corresponding figures were 863, 39,247, and Rs. 137 lakhs. The results of the working of the movement have been very striking. Not only are members financed for their current needs, but, in a very large number of cases, they have been freed from their debts. Mortgage bonds and conditional sale deeds have been redeemed, habits of thrift have been inculcated, and several members have purchased fresh plots of land out of their savings. Most of the members have severed their dealings with the moneylender altogether. A striking feature in the movement in Sind is the large percentage of owned capital of primary societies and the large amount of share capital of the members, showing how well the lesson of thrift has been inculcated. The by-laws of these societies provide that the minimum holding of each member shall be one share of Rs. 20 payable by yearly instalments of Rs. 2. But from the beginning each member has taken up a substantial number of shares, increasing his contributions from year to year. The result has been that in practice each member holds a considerable number of shares. It is a common thing in a society of five years' standing for a small zamindar to hold Rs. 150 to Rs. 300 and for a *hari* to hold Rs. 100 to Rs. 150 in shares. The reserve fund of the societies now amounts to nearly Rs. 4·5 lakhs. It has reached a substantial figure in the older societies. Some of the societies on the Jamrao Canal now have sufficient owned capital to meet the total needs of all without any outside borrowing.

The co-operative movement in Sind had until recently catered for the needs of the small zamindars only. The big zamindars in Sind, however, are as heavily in debt as the smaller ones. These, in two districts, have now been organised into two *zamindari* banks on the co-operative model. Although they have been in existence only for two years, these banks have now a working capital of over Rs. 5 lakhs and have been of substantial benefit to their members.

The progress made would have been impossible of achievement, had arrangements for financing the movement through the organisation of central banks not been made. Till 1918-19, the societies obtained finance from the Bombay Provincial Co-operative Bank. Since then, central banks have been established in Sind itself. The first to be established was the Central Bank at Karachi. At present not only is there a bank for every district, except the Upper Sind Frontier, but the Karachi Bank, besides acting as a central bank for the district of Karachi, also serves as an apex bank for the whole province. There is now a complete network of central financing institutions in the province, and there is no difficulty in getting sufficient funds to finance the primary societies. The total working capital of the six central banks in Sind was Rs. 64 lakhs last year.

The ideal of spreading agricultural improvements through co-operative societies has also been fulfilled to a considerable degree in Sind. There are eleven seed societies organised for the distribution of improved varieties of seed. The main work of improvement, however, has been done through taluka development associations, and the few simple but substantial improvements which the associations have been able to demonstrate have been largely adopted by the members of co-operative societies. Amongst the improvements introduced may be mentioned the distribution of improved varieties of wheat (Pusa 12) and cotton (27 W. N.), the large distribution of the Egyptian plough, and the introduction of the Raja and monsoon ploughs, the Archimedean screw and various clod-crushers. The work of these associations is done almost entirely through members of co-operative societies. They appoint *kamgars* and supervisors to visit villages, to hold demonstrations of improved seed, implements, and modern methods of farming. Experiments are also being made to get the associations and supervising unions to indent for the agricultural and other domestic requisites of agriculturists and to distribute them amongst their members. So far, the experiments have proved very successful.

The whole work is done, under the general supervision of the Registrar of Co-operative Societies, by the Assistant Registrar stationed at Hyderabad. He has a deputy working under him and also six auditors. The Assistant Registrar is helped in the work of organisation and supervision by honorary organisers as well as by the supervising unions into which the societies are now being organised. The Bombay Provincial Co-operative Institute has also a divisional branch in Sind, which has been doing valuable work in the way of carrying on co-operative propaganda, holding conferences, and training classes for

members, secretaries, and honorary organisers, and conducting a co-operative magazine. District branches of the Institute are also being established.

### 11. COMMUNICATIONS AND MARKETING.

In 1851, Sir Bartle Frere found in all Sind "not a mile of bridged or metalled road, not a masonry bridge of any kind; in fact, not five miles of any cleared road." The sandy nature of the soil, the difficulty of getting metal, the liability to inundation make the construction and upkeep of roads a very difficult and expensive matter; and, in consequence, even now Sind is badly served in the matter of roads. There are no doubt recognised routes by which traffic is carried in the dry season between large towns; *e.g.*, from Karachi to Shikarpur and from Hyderabad to Jodhpur and Multan. These routes, however, were, and still are, mere tracks suited to the camel but bad for wheeled traffic. In north Sind, the use of carts is more common, but in the other parts camels, pack bullocks, donkeys and horses form the usual means of transport. Where carts are used, they are very heavy and primitive and are a great strain on the bullocks.

Before the advent of the railway, the river was one of the chief means for the carriage of produce over long distances and it is still used for that purpose. It was under the charge of a special government department known as the Indus Conservancy Department which, however, was abolished in 1906. It is now under the charge of the Indus River Commission. Although the navigation of the river has engaged the serious attention of Government since the time, nearly a century ago, when it was necessary to use the river for the passage of troops to Multan and Afghanistan, the conservancy of the river really commenced only with passing of the Bombay Act I of 1863 which provided for the registration of vessels and the levy of pilotage fees, the sums so realised to be expended in removing obstructions on the river and improving its navigation.

Sind is now connected by rail with all parts of India and through Baluchistan up to the Afghan and Persian borders. By sea, there are regular services to Bombay and to the Persian Gulf; while passenger steamers leave the port of Karachi regularly for Europe. Karachi is now becoming a port of call for air traffic.

The main arteries of traffic are now the railways, the most important of which is the North Western Railway which connects Karachi with the Punjab. A new broad gauge connection with Delhi through Rajputana is again under consideration. The first railway to be started was on the right bank of the Indus. As this line was frequently breached, an alternative line on the left bank was constructed and this has now become the main route to the Punjab. A line was opened from Hyderabad to Badin in 1904, and an extension is now proposed across the Rann of Cutch to meet the Bombay-Baroda and Central India Railway at Viramgam, thus affording through communication, without break of gauge, from Sind to Bombay. At present there is a meter

gauge connection from Hyderabad to Ahmedabad by the Jodhpur-Bikaner Railway.

There are a number of feeder lines in Sind which connect important marketing places and carry a large part of the export produce of the country. These are the Hyderabad-Badin, Mirpurkhas-Khadro, Mirpurkhas-Jhudo, Larkana-Shahdadkot, and Jacobabad-Kashmor lines.

#### *Marketing.*

Crops are ordinarily sold in the field. The trader goes round to collect the cotton, wheat, rice or oil-seeds and brings it by camel load to the nearest market or railway centre. Rice is purchased locally from producers, husked and parboiled in the chief local centres like Larkana, and then exported. A large number of rice mills have now been erected in all the rice growing centres. No grading is done for the internal trade, but traders sometimes grade for their own benefit or under pressure from the ultimate buyers.

The chief hindrances to proper marketing are the bad condition of the roads, the lack of carts, the want of standardised weights and measures, and the lack of storage accommodation.

### 12. LOCAL SELF-GOVERNMENT.

Local self-government in rural areas dates from the year 1884. The proportion of elected and nominated members on local boards was originally fixed at two-thirds and one-third respectively. The system established by the Local Boards Act of 1923 for the Bombay Presidency holds good for Sind, and the description need not be repeated here. The income of all the boards in Sind in, 1925-26 was Rs. 34·25 lakhs, while their expenditure was Rs. 32·5 lakhs. Income from local rates came to Rs. 10 lakhs, the grants from Government amounted to Rs. 16 lakhs of which Rs. 9·5 lakhs was for education, Rs. 50,000 for medical purposes, and Rs. 5·25 lakhs for civil works. The total expenditure on education was Rs. 12·75 lakhs; on hospitals, dispensaries, etc., Rs. 2·75 lakhs; on veterinary charges Rs. 42,000, and on communications Rs. 6·75 lakhs.

The greater part of the revenue is usually spent by the district local board on works of general utility to the whole district; but each taluka local board has funds at its disposal to enable it to carry out and maintain works of purely local utility for which it is primarily responsible. At least one-third of the revenue derived from the one-anna cess must be spent on education.

Local boards are bound, so far as their funds permit, to make adequate provision for education, water supply, construction and maintenance of roads, hospitals, dispensaries and markets. They have also the discretionary power to spend money on the establishment and maintenance of model farms, the improvement of breed of cattle, and the advancement and improvement of agriculture and local industries generally.

## 13. PUBLIC HEALTH AND SANITATION.

Malaria is the most prevalent disease in Sind. The proportion of deaths ascribed to this cause in Sind is greater than in the presidency. While the death rate from malaria for the presidency as a whole in 1926 was only 2·83, in Sukkur, it was 15·13 and, in Thar and Parkar, 14·50. In that year, all districts in Sind suffered heavily from malaria owing to the high floods and heavy rainfall. Quinine can be obtained through post offices and is also distributed free to school children. The efficacy of quinine in the prevention and cure of malaria is now well recognised in the province and the free distribution of the drug is popular.

Other prevailing diseases are small-pox and cholera. The latter as well as plague, which used to take a large toll at one time, have now been brought under control and Sind has practically escaped from them during the last few years. Small-pox, however, often occurs. The attacks during each of the last two years from this disease were between 5,000 and 6,000 each year and the deaths varied from 1,100 to 1,200.

The birth rate in Sind in the years 1925 and 1926 was 20·58 and 24·32 per thousand respectively, the figures for rural areas being 21·69 and 17·80 respectively. Faulty registration as well as the nomadic habits of part of the population make the figures unreliable. The death rate in the same two years was 19·29 and 16·96 respectively as compared with a rate of 15·20 for the quinquennial period. The urban rate (29·97) greatly exceeds the rural death rate (17·37), but this again is probably due to faulty registration. Infantile death rate is very high, 185 for 1,000 registered births.

Every district except the Upper Sind Frontier has a Civil Surgeon. For sanitation and vaccination there is an Assistant Director of Public Health for the province who has his own staff of inspectors and vaccinators. There are several hospitals in the district towns and numerous charitable dispensaries in the smaller towns. Vaccination has made satisfactory progress.

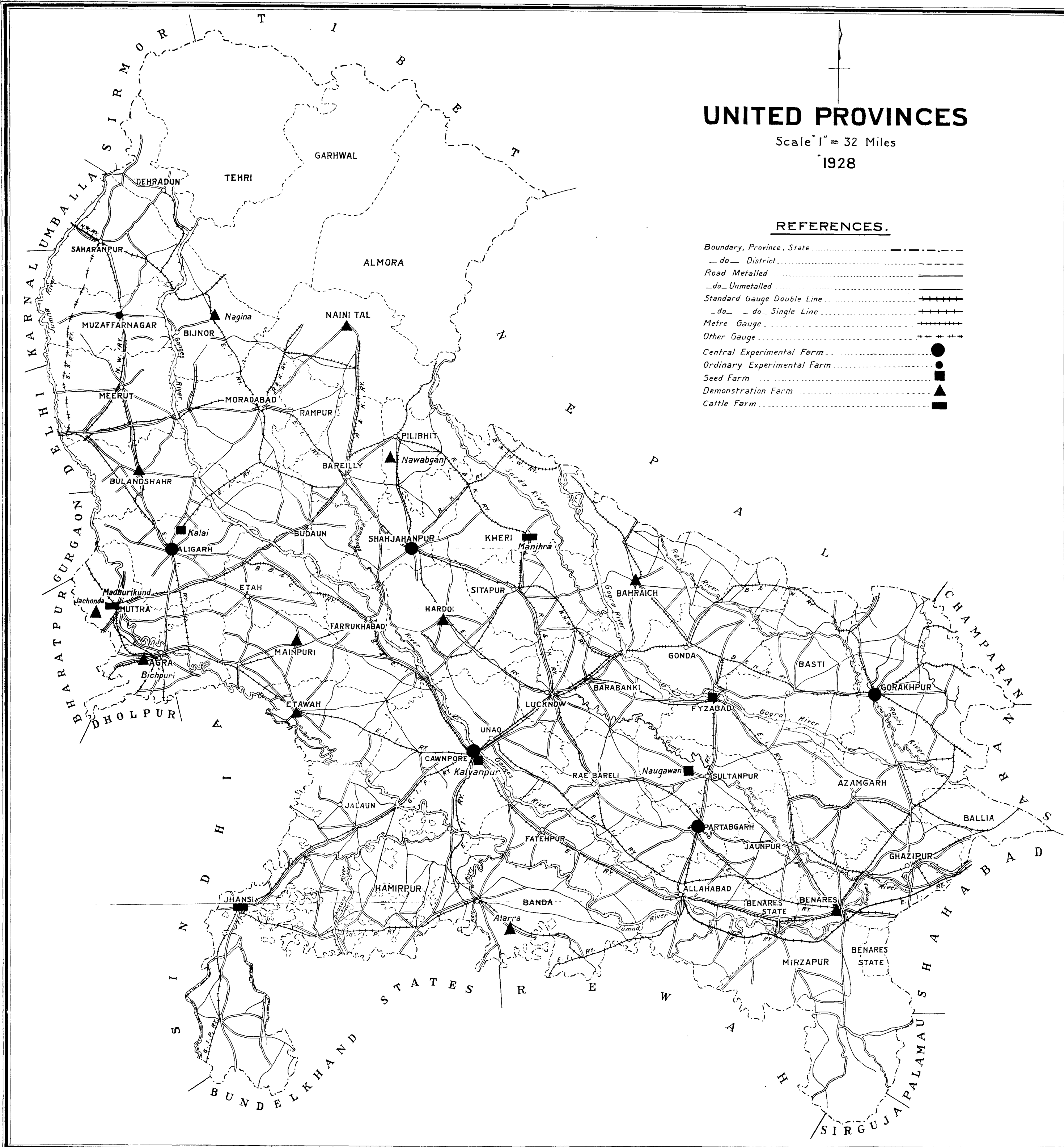
# UNITED PROVINCES

Scale 1" = 32 Miles

1928

## REFERENCES.

- Boundary, Province, State .....
- do- District .....
- Road Metalled .....
- do- Unmetalled .....
- Standard Gauge Double Line .....
- do- -do- Single Line .....
- Metre Gauge .....
- Other Gauge .....
- Central Experimental Farm .....
- Ordinary Experimental Farm .....
- Seed Farm .....
- Demonstration Farm .....
- Cattle Farm .....



## THE UNITED PROVINCES

### 1. GENERAL FEATURES.

The United Provinces cover, in all, an area of 72·6 million acres and in 1921 had a population of 46·5 million persons. Deducting 4·3 million acres from the area and 1·1 million persons from the figure for population on account of the three States of Rampur, Tehri-Garhwal and Benares, the area of the territory under direct British administration is 68·3 million acres, with a population, according to the census of 1921, of 45·4 million persons. Lands either absolutely barren or otherwise not available for cultivation take up 10 million acres and forests another 9 millions. The area at present cultivated is about 35 million acres; and three million acres are under current fallows. The total quantity of land available for extending cultivation in the future is thus about ten million acres. The possibility of any considerable expansion is, however, limited. In the Indo-Gangetic plain, there is very little land that is not already under the plough. In Bundelkhand, the soil is thin and poor, the level of sub-soil water low and rainfall very precarious. In the country lying at the foot of the Himalayas and extending from Saharanpur in the west to Gorakhpur in the east, the areas of uncultivated land at present under jungle grass or forests are unhealthy on account of malaria and in the absence of heavy expenditure on sanitation, successful agriculture cannot be carried on. The reclamation of land, lying in patches here and there all over the plains and impregnated with salts to such an extent that crops cannot grow on it, is again chiefly a matter of expenditure. The outlook for a considerable increase of the area cultivated at present is thus not very encouraging.

Of a total population of over 45 million persons, 34·8 millions directly depend upon agriculture for their livelihood, 29 millions as tenants, or as cultivating proprietors depending mainly on their cultivation, four millions as agricultural labourers, one million as landlords, agents, clerks, etc., and three-fourths of a million as stock breeders and herdsmen. There are no large scale enterprises on the western factory system, using modern machinery and producing for distant markets in the province, apart from a few concerns mostly concentrated in Cawnpore and Agra. The province is thus predominantly agricultural,—in appearance, in outlook, and in distribution of population according to occupations and localities. A railway journey through any part of it reveals a vast expanse of unenclosed cultivation, field upon field, with innumerable mud villages and hamlets. When people come together, conversation centres round crops, prices of foodstuffs, rain and the weather. As regards distribution of the population, the census figures show strikingly its agricultural character. Of every thousand persons enumerated, 894 were rural and 106 urban. Classified according to occupations, 768 out of every thousand depend directly upon agriculture for their livelihood. If the crops are good, there is more to be transported, more to be bought and sold and more available for the services rendered by the village artisans, the priests and men of law.

For such a population the chief physical factors that determine its prosperity are the nature of the soil and the agricultural water supply available. Soils will be discussed later. In this general sketch of the chief features of the province, the question of water, which is the life of agriculture in a hot country, must be briefly touched upon. Rainfall obviously is of the greatest importance in a consideration of the water supply. The province depends almost entirely upon the monsoon for the growing of the *kharif* crops. Sugarcane is on the ground in the hot dry weather from April to June and for it irrigation is therefore essential. In a normal year, the *rabi* is for the most part sown without irrigation by conserving the moisture in the soil through careful tillage, but, in years of deficient rainfall, the more valuable *rabi* crops are sown after irrigation and several waterings are necessary to bring those crops to maturity in the greater part of the provinces.

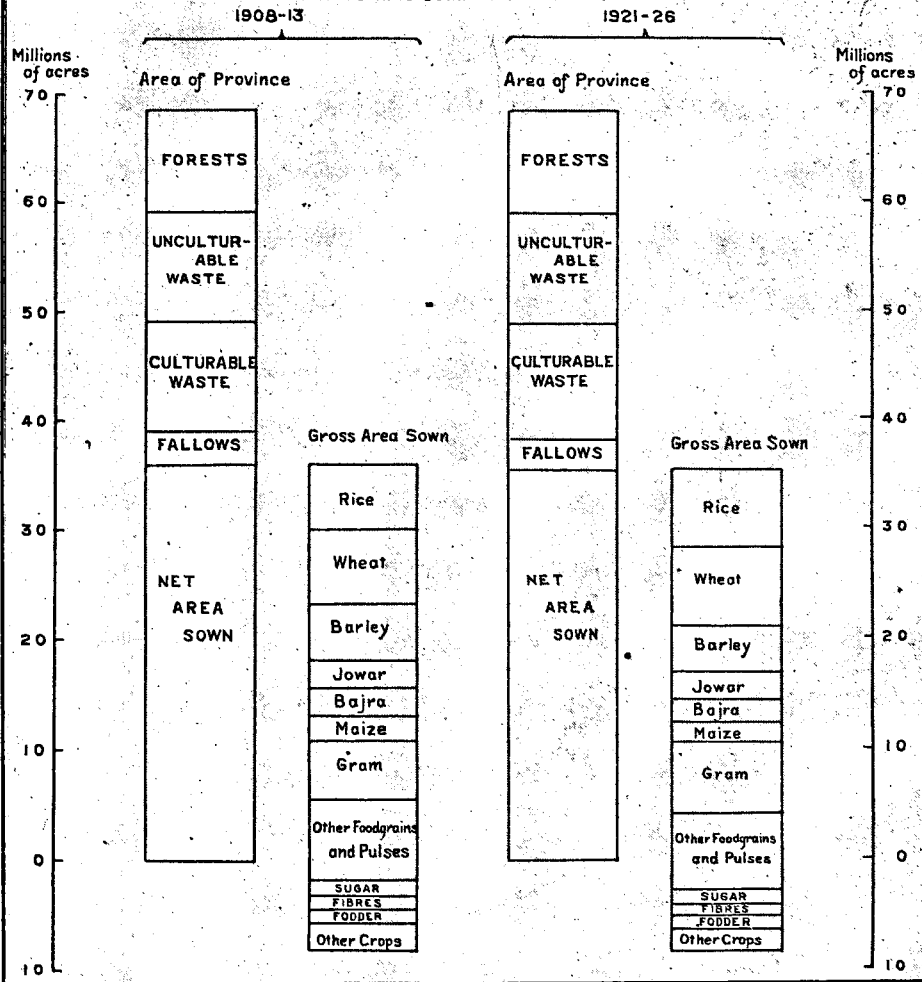
The replenishment of the supply of sub-soil water depends entirely on the monsoon except in small areas adjacent to the irrigation canals and the main source of *rabi* irrigation is this subsoil supply which is tapped by means of wells of different designs. The incidence of rainfall varies. The largest amount is received in the north, the mountainous region of the Himalayas, where most of it runs to waste either in the rivers or reappears in the tracts bordering on the foot hills of the Himalayas, to produce malaria and rank jungle vegetation. In the Indo-Gangetic plain, the incidence of rainfall increases from west to east. This variation from west to east is a marked feature of the provincial climate. In this connection it is interesting to note that density of population also increases from west to east, showing the correlation of rainfall and density of population. A few figures may be given in illustration. The normal rainfall of Muttra is 23·42 inches and the mean density of the rural population 350; Agra receives 25 inches and its density is 372. Cawnpore, with a rainfall of 31·99 inches, has a density of 392. Fatehpur with 35·06 inches has a density of 397·3. Allahabad with 37·28 inches has a density of 428. Barabanki shows a rainfall of 39 inches and a density of 585·5 and Gorakhpur a normal of 48·30 inches of rain and a density of 690 persons to the square mile. The bulk of the rainfall is concentrated in the monsoon season, from the end of June to the end of September, and only a few light showers, not more than one or two inches, are received in the cold weather. As regards means of irrigation, canals and wells play a very important part in the agricultural economy of the province. The area served by wells in 1924-25 was over 4·3 million acres and in 1926-27, 5·38 million acres. The area irrigated by canals was nearly 2 million acres in 1924-25 and 2·46 million acres in 1926-27. In the Indo-Gangetic plain, wells are not difficult to make, as the water table is not deep down and wells consequently play a very important part in irrigational facilities. Bundelkhand, on the other hand, is a tract of precarious rainfall and a precarious underground supply of water, with a severe climate and an unresponsive soil. Its agriculture is consequently also precarious and the tract as a whole is not a flourishing part of the country.



# UNITED PROVINCES

## CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS (5 Year Averages)

Note. The difference between the Gross Area Sown & the Net Area Sown represents the area sown more than once.



Large estates are a feature of parts of the province. The landlords of Oudh, known as talukdars, own more than half of Oudh. In Agra, they are known as zamindars. The large landowners do little farming on their own account. Apart from these large landowners, who are relatively few in number, the province is, in the main, a province of small proprietors. The land revenue is temporarily settled all over the province except in the Benares division, part of the Azamgarh district, and a few estates in Oudh, which are permanently settled. The holdings are small and scattered; they are on the average larger in the west than in the east but there has been no detailed analysis of the size of holdings in the different areas. Illiteracy among the rural population is general. There is no cohesion or organisation either among cultivators or agricultural labourers. The failure of the co-operative movement in the United Provinces is to a large extent due to this factor of illiteracy. The peasants have not supported that movement, largely because their ignorance has prevented them from appreciating its advantages. There is now considerable security of tenure. Occupancy tenants in Agra with heritable rights hold 50 per cent of the total holdings area and statutory or life tenants hold 21 per cent; non-occupancy tenants-at-will hold only 2 per cent. In Oudh statutory tenants hold 64 per cent of the total holdings area. The tenants pay their rents in cash. Only a very small portion of the cultivated area, 3.9 per cent in Agra and 10 per cent in Oudh, was under grain rents in 1924-25.

The normal acreage of the principal crops is as follows: rice, 7.3 million acres, chiefly in the eastern and sub-montane districts; wheat, 6.9 million acres, chiefly in the western districts and Rohilkhand; barley, 4.9 million acres; gram, 5.7 million acres; *juar*, 2.5 million acres; maize and *bajra*, 2 million acres each; sugarcane, 1.2 million acres, with the Fyzabad, Gorakhpur and Rohilkhand divisions as the chief tracts. More than half the total area under sugarcane in India lies in the United Provinces. Cotton with 1.1 million acres is grown chiefly in the dry western tracts. The gross area sown in the United Provinces amounted to 43.5 millions and the area sown more than once to 8.5 million acres, showing the net area cultivated to be 35 million acres.

A quinquennial census of cattle has been taken since 1899. According to the figures for 1925, there were 10.1 million bullocks, 6.1 million cows, and 6.1 million young stock. The numbers of she-buffaloes and young stock were 4 and 3.5 millions respectively. Both sheep and goats were numerous, their respective numbers being 2.1 and 7.4 millions. There were 212 thousand horses; 197 thousand mares; 279 thousand donkeys and 24 thousand camels. The total number of ploughs was about 5 millions and of carts one hundred thousand. Practically all the heavy work of the country, ploughing, raising water from wells, threshing grain and carrying produce is done by bullocks. The cattle of the province are mixed. Pure breeds are few. There are two great breeding grounds in the provinces, Bundelkhand in the south and

the sub-montane districts in the north. The principal cattle fairs held are those of Batesar, Kakora, Makanpur and Dadri. Batesar is one of the main sources from which the province obtains superior cattle. Kakora serves to distribute the cattle bred along the Ganges; Makanpur supplies the south of Oudh and the Allahabad division, while Dadri caters for the Benares division and Azamgarh.

## 2. NATURAL DIVISIONS.\*

The United Provinces fall into four well-defined agricultural tracts, viz., the Himalayan or montane tract; the sub-montane tract; the Indo-Gangetic plain; and the trans-Jumna tract, known as Bundelkhand, combined with Mirzapur. The characteristics of each tract are briefly treated below.

*The montane tract.*—This tract comprises 14 per cent of the provincial area and 3·30 per cent of the population and includes practically the whole of the Almora and Garhwal districts, the hill *pattis*\* of Naini Tal and the Chakrata tehsil of Dehra Dun district. It is mountainous and largely under forests and from the point of view of agriculture, is not of any great importance. Cultivation is confined to the lower hill tops, the terraced slopes and the alluvial land where the valleys widen out. The cropped area is small. Altitude and temperature are the factors which determine the type of agriculture practised. The chief crops are wheat, rice and *mandua* (*Eleusine coracana*). Ordinarily, each village endeavours to feed itself from its grain crops and to produce something for sale; its market crop must as a rule be of small bulk in order to bear the cost of carriage and is usually a spice such as red pepper. In accessible places, potatoes are largely grown and there would seem to be considerable scope for producing fruit and vegetables for the markets of the plains. The first essential in any attempt to increase the slender resources of these sturdy hillmen is improvement of communications, chiefly roads. Only then can there be a brisk exchange of goods between the mountains and the plains at little cost. The hill cattle, though well adapted to the kind of work required of them, could also be made to yield much more profit to their owners, if their milking capacity were increased. There is no dearth of fodder and grazing facilities and since there are definite limitations to increasing the cultivated area, it would appear natural to depend more on cattle than on crops for an increase of income. The people are hardy and capable of great physical exertion. They make good use of their spare time by working as carriers of persons and loads. Lately they have taken to military service and in endurance and courage the Garhwalis have shown themselves to be excellent soldiers.

*The sub-montane tract.*—The soils of this tract and those of the Indo-Gangetic plain are alike as they have a common origin. In the northern portions of the districts, there is an excess of rainfall and moisture; in the southern portions, the conditions approximate to those prevailing in the

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\* Subdivisions.

Gangetic plain. As the administrative districts cannot be split up and portions assigned to the sub-montane tract and portions to the Indo-Gangetic plain, they are included, for purposes of convenience, in their entirety in the sub-montane tract. Bearing this in mind, we may indicate broadly the boundaries of the area. It is bounded on the north-east by the foot hills of the Himalayas and the Nepal Tarai. On the south-western side, as stated above, the boundary line is ill-defined but a line drawn parallel to the foot hills of the Himalayas and the Nepal Tarai frontier and roughly forty miles distant from them would indicate the south western limit. The tract stretches from Saharanpur to Gorakhpur and includes 21·50 per cent of the area and 25·90 per cent of the population of the province. It consists of the following administrative areas : Saharanpur, Bijnor, Bareilly, Pilibhit, part of Dehra Dun and Naini Tal, Kheri, Bahraich, Gonda, Basti and Gorakhpur. The tract has a million acres under forest. Irrigation for the *rabi* crop is unnecessary in certain parts on account of the moisture. The abundance of water, however, breeds malaria and cultivation suffers in consequence from shortage of labour. The Bhabar\* and Tarai\* in particular are not prosperous. The Bhabar, a strip of country about twenty miles in width and gradually narrowing towards the east, consists of a stony slope covered by a thin layer of soil and has been brought under cultivation to relieve the pressure on the hill *pattis*. Beyond the Bhabar lies the Tarai. Both these tracts are fever-ridden. Hill-men come down into the Bhabar to sow after the rains and, after harvesting the crops, they retire to the hills to escape the ravages of malaria. Cultivation of the Tarai is done by cultivators who come in from the adjoining districts in the plains. In other parts of the tract, conditions are much better, the cultivated area is steadily increasing and the population is fairly dense and prosperous, the density varying from 400 in the west to 720 persons per square mile in Gorakhpur. The soils commonly met with are *bhur* or sand, *domat* or loam and *matiyar* or clay.

One of the features of this area is the abundance of grazing facilities throughout the year. The cattle raised in this tract are small, hardy and very active and are in great demand among cultivators especially in the rice growing areas. Where roads are bad, they are largely used for light bullock carts. Some large herds are kept by professional breeders. During the rains when conditions are unfavourable both for men and cattle, the animals are moved westward. The most valuable crops are rice and sugarcane. Holdings are small, especially in the east. Malaria is the problem of the more moist parts of this tract. The people speak various dialects of Western and Eastern Hindi and Central Pahari. Hindustani is, however, understood everywhere.

*The Indo-Gangetic plain.*—This tract, popularly known as Hindustan and from remote antiquity celebrated in religious lore and history for its fertility, its sacred streams and flourishing cities, imparting the stamp of its civilisation, institutions, and religious beliefs to the rest of India and drawing upon itself the cupidity of invaders, foreign as well as

\*The words *mara* respectively 'porous' and 'moist'.

native, is even at the present day one of the most fertile regions to be found anywhere in India. Taken as a whole, it represents provincial agriculture at its highest and is the most densely populated portion of the tracts under consideration, the density of some of the eastern districts being unparalleled in any rural tracts outside China. Its area and population are 50·70 and 64·60 per cent of the total provincial area and population respectively. Geographically it includes portions of Rohilkhand; most of Oudh, south of the Gogra; the Benares division, north of the Ganges; the districts of Muttra and Agra and the whole of the Ganges-Jumna *doab*\*. The latter has three sections, upper, middle and lower. The upper section, extending from Saharanpur to Aligarh, and including within itself 22·50 per cent and 26·80 per cent of the total provincial area and population, is the most fertile; the middle section stretches from Aligarh to Cawnpore, and accounts for 21·20 per cent of area and 26·30 per cent of the population of the province. Its soil is not so fertile as that of the upper section but it is comparatively well-cultivated, prosperous and populous. The lower section, from Cawnpore to Allahabad, situated at the junction of the Ganges and the Jumna is the least fertile portion of the *doab*. Its area and population are 7 per cent and 11·50 per cent of the provincial totals.

The soils of the Indo-Gangetic plain are alluvial. There are considerable areas cut up by ravines and rivers. By far the greatest part of the plain comes under one of three classes: *bhur* or sandy soil, *matiyar* or clay and *domat* or loam. The lowlying moist areas near the rivers are commonly known as *khadir* or *divra*. The range of density is from 500 persons to the square mile in the west to 900 persons in the east and rainfall increases from west to east. Except for twenty thousand acres of afforested area, there are no forests. Irrigation is necessary for the *rabi* and sometimes for the *kharif* also. The tract is well served by canals; wells, however, irrigate a much larger area and play a very important part in its agricultural economy. The standard of cultivation is highest in the western and northern districts. Holdings there are also larger. The sturdy Jats of the west working with their women, can make the most intractable soil yield abundant harvests. The Kurmis and Kachis, the Ahirs, Gujars, Pasis and Lodhas are also excellent cultivators. The people have an innate kindness of heart, are gentle and law-abiding. Throughout their history they have experienced vicissitudes of fortune but nothing has broken their spirit. Like their *dhub* grass they have clung to the soil and have always re-arisen after every calamity, inflicted on them by nature or man.

*The trans-Jumna tract and the district of Mirzapur.*—The four districts of Jhansi, Jalaun, Hamirpur and Banda, collectively known as British Bundelkhand, the district of Mirzapur and the part of the Allahabad district south of the Jumna account for 13·80 per cent of area and 6·20 per cent of the population of the province. The southern portion of Mirzapur is a wilderness of hill and valley and the northern a bare table land containing also a small strip of the great plain. The population

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\* Literally "two rivers." The term is used for "land lying between two rivers."

is scanty, the soil poor and the district at the mercy of the rainfall. In British Bundelkhand, there are two distinct belts of soil to be seen, the red formed from the weathering of the rock lying a few inches below and the black, which appears to be water-borne, its origin being not the Himalayas but the hills of Central India. The red soil is thin and poor and cannot hold water. The *rabi* crop is only sown in small areas usually below the embankment of a tank and is irrigated either from the tank or from wells. Elsewhere inferior millet is the utmost that this soil can bear and even that not continuously. It has to remain fallow after every two or three years to recuperate. The black soil has four types: *mar*, very dark and friable; *kabar*, a little less dark than *mar* and a good deal stiffer; *parwa*, a light yellowish loam, and *rakar*, consisting of bare, denuded slopes easily passing into ravine-land and growing only the most inferior crops. Only *parwa* resembles the soils of the Gangetic plain in its behaviour towards water, where it is available. The better types of *mar* are fertile soils and easy to work though not responsive to irrigation. Inferior *mar* and *kabar* are difficult soils to work. A slight excess or deficiency dislocates completely their preparation. Since they are retentive of moisture, a few inches of rain beyond the normal turns them into a sticky mass, rendering impossible the preparation of a seed bed for the *rabi*, and a few inches less reduces ploughing into an operation of drawing mathematical straight lines. So much for the *rabi* crop. As regards the *kharif* crop, again a slight excess or deficiency may result in its rotting or shrivelling up. The normal amount is rarely received and it is the abnormal that strikes at the fortunes of the people. Wells are few, except in limited areas near storage tanks, where there are groups of wells worked by Persian wheels. The depth to water is, in general, great, the sub-soil rocky for the most part and the construction of wells is, therefore, a difficult and costly operation. The only canal irrigation is from storage reservoirs formed by damming the Betwa, Dhasan and Ken rivers. Elsewhere, irrigation depends upon storing rainfall in tanks which also raise the water level in their neighbourhood sufficiently to facilitate the construction of wells.

The people have to struggle constantly against adversity with scanty resources. Holdings are large, and tenants are not in the grip of the landowners. If the conditions appear unreasonable to them, they throw up their holdings and find others at no great distance.

There is a sufficiency of grazing grounds but the cattle are not specially noted for their excellence.

The crops grown in the red soil are usually the inferior millets and pulses. The darker soils give good crops of the better millets in favourable years. Of the *rabi* crops, gram is the main crop and little wheat is grown. Little sugarcane and cotton is now grown and artificial dyes have abolished the cultivation of *al* (*Morinda citrifolia*), a lucrative crop formerly grown for dyeing purposes.

The tract has suffered heavily in the past. The resources of the people have been strengthened considerably during the last thirty years by the

provision of irrigational facilities and loans, and the adoption of a considered policy of land revenue remissions and of a land revenue assessment varying with the area cultivated. Much, however, remains to be done if Bundelkhand is to attain to a real measure of economic security.

### 3. PROVINCIAL INCOME AND EXPENDITURE.

It is not intended to discuss in detail the figures of provincial income and expenditure. One or two features of general interest, however, deserve to be noticed. The United Provinces have not, like the Punjab and Sind, been amply endowed by nature with unoccupied areas of good cultivable land at the disposal of Government. There is not much Crown waste available for development. Few buyers would look at the little that there is. The provincial purse cannot therefore be filled, from time to time, by the sale of such land. Further, there can be no additions to the annual provincial income, by way of land revenue, from the development of such lands. The lands of the United Provinces are more or less taken up. The annual income of the people may be reduced by the destructive interference of nature. Collective effort, however, is being directed towards reducing such losses to a minimum by strengthening the resources of the people in their fight against nature. Apart from such occasional interferences, there is reason to suppose that the national dividend is increasing. Not, however, that portion of it which is allotted to the community organised as a State. Taking first the most important source of provincial revenue, the term for which the land is settled has been extended from thirty to forty years; the percentage of the share taken by the State, as pointed out in another section, has been reduced. The water rates are rigid. The revenue from excise may fall. Stamps must bear some relation to the cost and value of the services rendered. It would thus appear that, in the existing arrangements, inelasticity is the word written across that side of the statement which deals with provincial income.

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REVENUE AND EXPENDITURE CHARGED  
TO REVENUE

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GOVERNMENT OF THE  
(Figures are in  
*Revenue and Expenditure*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Revenue Receipts</i>						
<b>Principal Heads of Revenue—</b>						
Land Revenue ..	681	680	692	671	690	688
Excise ..	149	141	131	131	133	131
Stamps ..	151	161	175	174	176	169
Forests ..	86	84	74	69	64	58
Other heads ..	38	12	12	13	14	13
<b>Railways :</b>						
Subsidised Companies ..	1	1	2	2	2	1
Irrigation ..	93	86	99	66	85	99
Debt Interest ..	15	22	18	18	13	9
<b>Civil Administration—</b>						
Administration of Justice ..	9	10	12	13	14	14
Jails and Convict settlements ..	5	4	5	5	7	8
Police ..	2	5	3	3	3	3
Education ..	7	9	10	10	10	11
Medical ..	1	1	1	1	1	1
Public Health ..	1	1	2	1	1	2
Agriculture (including Co- operation and Veterinary) ..	5	5	5	5	5	5
Industries ..	.	.	.	2	1	1
Other departments ..	1	1	1	1	1	1
Civil works ..	5	5	5	6	4	4
Miscellaneous ..	14	20	24	47	46	41
Miscellaneous adjustments between Central and Provincial Governments ..	..	..	..	2	1	..
Extraordinary Receipts ..	..	..	..	..	..	31
<b>Total, Revenue Receipts ..</b>	<b>1,264</b>	<b>1,248</b>	<b>1,271</b>	<b>1,240</b>	<b>1,271</b>	<b>1,290</b>

## UNITED PROVINCES

lakhs of rupees)

*charged to Revenue*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Expenditure charged to Revenue</i>						
Direct Demands on the Revenue—						
Land Revenue ..	78	78	81	80	82	86
Forests ..	73	62	44	38	38	34
Other heads ..	16	15	16	14	23	21
Irrigation—						
Revenue Account ..	47	50	56	64	72	75
Irrigation—						
Capital Account charged to Revenue ..	5	3	3	2	4	6
Debt services ..	42	33	30	30	33	41
Civil Administration—						
General Administration ..	141	141	134	136	137	142
Administration of Justice ..	67	63	70	72	74	77
Jails and Convict settlements..	37	39	31	30	35	38
Police ..	184	176	162	164	166	169
Education ..	153	139	160	172	187	189
Medical ..	24	26	25	26	31	35
Public Health ..	29	14	13	17	46	23
Agriculture (including Co-operation and Veterinary)..	28	26	24	24	27	31
Industries ..	9	9	11	10	11	12
Other departments ..	2	3	4	3	1	1
Civil Works ..	104	79	75	82	71	69
Miscellaneous ..	111	110	108	79	79	85
Provincial Contributions ..	262	240	240	240	184	151
Miscellaneous adjustments between Central and Provincial Governments ..	..	2	..	1	..	..
Total, Expenditure charged to Revenue ..	1,412	1,313	1,287	1,284	1,301	1,285

## GOVERNMENT OF THE

(Figures are in

*Capital Receipts*)

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Receipts</i>						
Revenue Surplus ..	..	..	..	..	..	5
Permanent Debt Incurred ..	419	1	..	..	..	..
Famine Insurance Fund ..	32	33	39	4	17	74
Loans and Advances ..	64	81	371	87	19	15
Deposits of Sinking Funds for Provincial Loans ..	..	3	..	..	..	..
Advances by Central Governments ..	23	..	104	..	..	..
Advances from Provincial Loans Fund ..	..	..	..	149	200	227
Appropriation for reduction or avoidance of Debt ..	..	..	6	5	4	4
<b>Total, Capital Receipts ..</b>	<b>538</b>	<b>118</b>	<b>520</b>	<b>225</b>	<b>240</b>	<b>275</b>
<b>Opening Balance ..</b>	<b>89</b>	<b>302</b>	<b>141</b>	<b>145</b>	<b>75</b>	<b>53</b>
<b>Total ..</b>	<b>627</b>	<b>420</b>	<b>661</b>	<b>370</b>	<b>315</b>	<b>328</b>

## UNITED PROVINCES

lakhs of rupees)

*and Expenditure*

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
<i>Capital Expenditure</i>						
Revenue Deficit ..	148	65	16	44	30	..
Forest Capital outlay ..	3	1	..	2	3	1
Construction of Irrigation Works ..	46	57	103	118	119	131
Outlay on Agricultural Improvements ..	..	..	..	1	..	2
Other Capital outlay ..	..	..	..	2	-2	..
Famine Insurance Fund ..	..	8	6	46	36	34
Loans and Advances by Provincial Government ..	70	77	346	45	15	25
Staking Fund Investment Account ..	..	3	6	3	6	4
Advances by Central Government ..	48	25	25	25	25	26
Civil Works not charged to Revenue ..	3	14	6	6	58	50
Other Capital Expenditure ..	7	29	8	3	-28	6
Discount on Loans (U. P. Development Loan) ..	..	..	..	..	..	29
Total, Capital Expenditure ..	325	279	516	295	262	308
Closing Balance ..	302	141	145	75	53	20
Total ..	627	420	661	370	315	328

## 4. REVENUE ADMINISTRATION AND LAND RECORDS.

By revenue administration is meant the administration of land revenue. It is proposed to consider in this section the principles underlying the question of its determination and to give a sketch of the agency employed for its collection. In official parlance in India, determination of the amount is effected periodically by a procedure known as the "Settlement." Before discussing this, it is necessary to give an account of the system of land records, as they supply the data which are of great help in expediting settlement work.

The elaborate system of land records rests on a humble official known as the *patwari*, or the village accountant. He resides in a village, draws a small salary and prepares, and has the charge of, the records of a village or group of villages, the number varying with the area cultivated. His important papers are, (i) the map of the village lands, (ii) the *khasera* or field book, (iii) the *khatauni* or the register of cultivating rights, (iv) the *jamabandi* or record of rents demanded by the landlord and payments of rent received by him from the tenant. He measures the village lands with the help of a chain, a right angle and a compass and reproduces his measurements on a map showing the boundaries of the village and the fields with their numbers. All alterations in boundaries which are necessitated by a division or sale of land are continuously noted by him and incorporated in the map. The map gives a bird's eye view of the fields. Detailed information about the area of each field, the name of the cultivator, the rent, the method of irrigation, the number of wells, the irrigated and unirrigated area under each crop are given in his *khasera* or field book. This is the source from which he prepares his other statistical registers, e.g., the *khatauni* or register of cultivating rights, and the *jamabandi* or rent roll. Besides these permanent records, the *patwari* has to prepare seasonal crop statements known as the *kharij*, the *rabi*, the *zaid* or extra crop, and the area statements. The object of these statements is to acquaint the higher authorities with any changes that may be taking place in the total cultivated area, the area sown, the kind of crops grown and their condition, the proportions of the irrigated and unirrigated area under each crop in each season, the number of wells, the nature of the season—all details, as a matter of fact, which throw light on the state of cultivation. At the tehsil headquarters, the statistical information supplied by the *patwari* is compiled, abstracted and abbreviated into registers arranged according to villages, groups of villages, known as parganas, and then for the tehsil as a whole. These registers are written up year by year and constitute a permanent record of great statistical value.

The seasonal statements forwarded from the different tehsils to the district headquarters are consolidated into a statement for the whole district and then sent to the Director of Land Records. The staff of the Director compares these statements with those for the previous years, asks for explanation of any marked changes and splits up areas under a mixture of crops according to conventional formulæ accepted

by the department. The information is then taken down in permanent registers and also published every year in reports known as the "Season and Crop" reports.

It will be seen from the above account that the whole pile of records, both seasonal statements, and those of a more permanent character showing rights of ownership and cultivation of the lands of a village rests on the *patwari*. His work is examined and checked, not only by his immediate superior, the *kanungo*, but also by officers of the revenue establishment in charge of the tehsil. The naib tahsildar and the tahsildar send for the *patwari* constantly and also go out into their administrative charges to verify the information on the spot. Their work in turn is checked by the subdivisional officer who is a member of the Indian Civil Service or of the Provincial Civil Service. He is stationed at the headquarters town of the district, but has to move out every now and then for carrying out his duties of inspection and supervision. The Collector receives reports from and checks the work of his lieutenants, the subdivisional officers. He also goes out into the district to the fountain of information, viz., the *patwari*. There is nothing which the latter does not know, nothing for which he has not an explanation. He is the ultimate source of all official information relating to land and the entries made by him are valuable evidence, and often the only real evidence, in case of disputed rights. This humble individual, with his bundle of papers, is the very spirit of obedience and of detail and very often entries made by him come up in a law suit before the Privy Council.

The determination of the amount payable by owners as land revenue is carried out by an officer known as the "Settlement Officer" who is detailed for this duty in each district coming under settlement and who may be a member of the Indian Civil Service or of the Provincial Service of deputy collectors. In any one year there may be a number of districts falling due for settlement. Settlement is usually preceded by a revision of records, for which work the settlement officer is also gazetted as record officer. The revision of the records and the overhauling of the village map is the first preliminary operation. This work is done under the supervision of a deputy collector. In settlement operations proper, the settlement officer joins the district when this work has been completed for part of the area and he then inspects the villages for the purpose of classifying soils and villages. The soil classification is not an affair of test tubes, retorts and the microscope, but a division into broad grades recognised by the people. Natural composition, facilities for irrigation, nearness to the village or to a town are all factors which are taken into consideration in fixing the classification. The settlement officer then proceeds to plan out his rental or assessment circles formed of villages possessing a general similarity of soil or physical character or rent paying capacity. The next stage is the most difficult part of his work, viz., the determination of the standard rates of rent for each category of soil. These rates are based on the actual rentals of each circle, but, in working them out,

he omits from the calculations those rentals which he finds to be either excessive and unstable having regard to the general standard of the village, not genuine owing to the exclusion of premia or other reasons, or inadequate as being materially below what the landlord could at once claim under the Land Revenue or Tenancy Acts. In Oudh, the standard rates are based on the "genuine, adequate and stable rents which are paid by substantial tenants of average skill and industry, who depend for their livelihood on the produce of their holdings." In the province of Agra, on account of the existence of occupancy and statutory tenants and of the passing, in 1926, of a new Tenancy Act, the position is a little complicated. In general two sets of circle rates have to be calculated, one set for occupancy tenants and the other for statutory tenants, the rate for the former being as a rule considerably below that for the latter.

The difference is due to the fact that occupancy rents have been controlled for many years and are now much below economic rents, while statutory rents have only been brought under control by the new Tenancy Act and are, therefore, still competition rents.

Under the rules, standard rates for occupancy tenants must be based on rates which have proved themselves stable and suitable for this class of tenants. They are fixed with special regard to the rates paid by tenants whose period of tenure is twenty years but the rates paid by old occupancy tenants and by tenants of twelve years' standing are also taken into consideration. Circle rates for statutory tenants are determined on the same principles as in Oudh.

The next step is to calculate the gross assets of each *mahal* or area for which a separate land revenue engagement is taken. The area assessed is that which is found by the settlement officer to be the normal cultivated area, having regard to the fluctuations which occur in a series of good or bad seasons. Certain areas are exempt from assessment. These include: (1) land occupied by buildings with their appurtenances which has hitherto not paid revenue; (2) permanent threshing floors; (3) grazing grounds from which no rent or grazing fees are derived; (4) market and village sites which have hitherto not paid revenue; (5) permanent roads and pathways; (6) such other lands as are not ordinarily used for cultivation and yield no income; and (7) old fallow or land which has been out of cultivation for more than three years.

The gross assets of a *mahal* consist of the accepted rental of the cash-rented area, together with a valuation at standard occupancy rates of proprietary cultivation and of the other areas not paying cash rents together with an estimate of the receipts from manorial dues of an agricultural character such as the sale of grass. Assessment on prospective assets is forbidden.

Next, certain abatements and deductions have to be made. As regards cash rentals, the main abatement is an allowance on account of the caste privileges of certain castes in applying the standard rates to lands held by them. This allowance is practically confined to Oudh as in Agra the

low rates for occupancy tenants give a more than equivalent concession. In valuing proprietary cultivation, a deduction is made of from fifteen to twenty-five per cent according to the circumstances of the zamindars. For improvements such as the sinking of wells and making of embankments within thirty years of settlement an allowance is made, either by deducting ten per cent of the estimated cost of the improvement or by valuing the area benefiting from it at the rates which would have been applied if the improvement had not been made. The net assets having thus been determined, the assessment of land revenue is made. The percentage taken by the State in recent settlements has been between forty-five and forty-three of the net assets. At the beginning of the nineteenth century it was ninety, eighty-three in 1822, sixty-six in 1833, fifty in 1855.

A Bill was introduced providing for fixing the general standard of assessment at forty per cent and for limiting the enhancements in any *mahal* to thirty-three per cent. It failed to pass the Legislative Council but rules to the same effect have been brought into force. The term of settlement has hitherto been thirty years, but will now be forty years.

For revenue purposes the unit is a *mahal*, which means the area for which a separate agreement to pay the land revenue is taken. A *mahal* may be a single village, part of a village or a number of villages. Revenue is collected and paid by a representative of the co-sharers of a *mahal*, called the *lambardar*. In the eastern districts, individual co-sharers pay the land revenue direct.

The Collector and his staff of revenue officials keep the collections close to the amount demanded in normal years. Remissions, or, in the less serious cases, suspensions, are granted for total or partial failure of crops.

Restrictions on the sale and transfer of land exist in the whole of Bundelkhand, and in parts of the districts of Etawah, Allahabad and Mirzapur.

##### 5. THE CULTIVATOR.

The United Provinces with an agricultural population of thirty-five million people (or, counting five persons to a family, comprising seven million households) present many differences in natural conditions. The conditions prevalent in Bundelkhand are different from those in the alluvial plain; the western part of the plain differs from the eastern and the province of Oudh from that of Agra. The mountainous region of the Himalayas has conditions and problems of its own. Apart from these differences due to natural conditions, there are the various interests connected with land of which account must be taken. For example, an analysis of the legal rights of six million people classed as tenants, making with their families thirty million persons reveals a great complexity of interests. Again, striking differences appear if the effort and skill in the cultivation of land are taken into account. This being the position, generalisations about the cultivator of the United Provinces have to be made with great



care and caution. They would have to be so hedged round with qualifications in their application to the circumstances of cultivators of a particular tract, that they would lose their character. Apart from these difficulties, there is the obstacle that the cultivator, typical of a tract of the province as a whole, lies buried in the bundle of village papers kept by the *patwari*. One does not know how the cultivated area is distributed in holdings of various sizes nor the size of holding which is most numerous and typical. In the absence of such information no estimate claiming the definiteness of a quantitative measurement of the economic position of the typical cultivator can be made. In the memoranda prepared for this Commission by various officers of the United Provinces Government, figures relating to the size of the average holding in the different districts have been given. The average holding is arrived at by dividing the cultivated area of a district by the number of households of agriculturists. The cultivated area is definitely known. As regards the number of families, they are found by dividing the agricultural population of a district by the division 5, which represents the average number of persons in a family. The figure for households is an estimate and depends upon certain assumptions. The average holding as estimated by the Revenue Department in the different districts is given in the Table below :—

	Average size of tenants' holding (in acres)		Average size of tenants' holding (in acres)
<i>Sub-montane</i>		<i>Central Doab—contd.</i>	
Pilibhit	.. 6.5	Etawah	.. 6.0
Kheri	.. 6.8	Hardoi	.. 5.6
Sitapur	.. 6.8	Unao	.. 4.7
Bahraich	.. 6.6	Cawnpore	.. 6.3
Gonda	.. 5.3	Lucknow	.. 4.9
Basti	.. 4.0	Bara Banki	.. 4.8
Gorakhpur	.. 4.1	Rae Bareli	.. 4.5
		Fatehpur	.. 6.6
<i>Upper Doab</i>		<i>Eastern Doab</i>	
Saharanpur	.. 10.4	Fyzabad	.. 4.2
Bijnor	.. 9.1	Sultanpur	.. 4.2
Moradabad	.. 6.7	Partabgarh	.. 4.0
Muzzaffarnagar	.. 11.5	Allahabad	.. 5.7
Meerut	.. 8.7	Azamgarh	.. 3.4
Bulandshahr	.. 7.9	Jaunpur	.. 3.5
Aligarh	.. 9.8	Benares	.. 4.6
Muttra	.. 10.3	Ghazipur	.. 4.9
Agra	.. 7.6	Ballia	.. 5.1
<i>Central Doab</i>		<i>Trans-Jumna</i>	
Bareilly	.. 5.3	Jhansi	.. 11.7
Budaun	.. 5.7	Jalaun	.. 12.4
Etah	.. 6.5	Hamirpur	.. 11.9
Mainpuri	.. 5.9	Banda	.. 10.9
Shahjahanpur	.. 5.7	Mirzapur	.. 5.0
Farrukhabad	.. 5.3		

It would appear from this Table that the size of the average holding is largest in the western districts, *e.g.*, Muzaffarnagar, Saharanpur and Muttra. In the central districts, holdings are of intermediate size. In the east, the size of the average holding shrinks to very small proportions, *e.g.*, 4.1 acres in Gorakhpur, 4.0 acres in Basti and 3.4 acres in Azamgarh. In the west, chiefly in the Meerut division, the average holding would consist of about forty per cent superior land with a good water supply and well-manured and sixty per cent inferior or unirrigated land. Of the latter, about one-third would be irrigated and manured, and the rest unirrigated and unmanured. In the east, *e.g.*, in the Gorakhpur division, about one-fifth of the typical holding would consist of single-cropped rice land, about one-fifth superior and three-fifths inferior land. In Lucknow, there would be rather less rice land and rather more loam. In the Jhansi division, conditions are peculiar. On account of the nature of the soil, a much smaller proportion of the land is utilised for the growing of crops and these are chiefly of an inferior type requiring little irrigation. The economic position of a cultivator depends not only upon the quantity of land he holds and its quality, but also upon the conditions attaching to his tenure. He may be (1) a proprietor, (2) an inferior proprietor, (3) a superior tenant, (4) an ordinary tenant, or (5) a sub-tenant. His rights vary according to the tenure on which he may be holding land. If he is a proprietor, he has no rent to pay but only land revenue to Government, which is moderate. His economic position as proprietor is strengthened by the legal rights which he possesses in land under his proprietary cultivation. They are of two kinds, *sir* and *khudkashi*. *Sir* land is the home farm or land which the landlord or co-sharer holds directly in his own management, either cultivating it himself, or by his farm servants or personal tenants. *Khudkashi* is also land cultivated by the proprietor for himself but for this he pays rent to the whole body of co-sharers. If the landlord or co-sharer loses his proprietary right in his *sir* land, as he may do in certain circumstances defined in the laws, he retains possession of it as an occupancy tenant, with a certain privilege as to reduced rental. The value to the cultivator of such a right is, therefore, that he cannot be without land to cultivate on favourable terms. It is not unreasonable to assume that, with a progressive reduction in the level of the land revenue, with no rent to pay to a superior landlord and with a steady rise in the price of agricultural produce, the peasant owner in the United Provinces is in a position of undoubted economic advantage.

A cultivator holding land as inferior proprietor may be an under-proprietor in Oudh or Agra, or a permanent tenure holder or a fixed rate tenant in the permanently settled districts, or a lease holder in Oudh. The point of importance in connection with these tenures is that the cultivator possesses under them a transferable right conferring absolute security of tenure. Subject to the payment of rent to a superior proprietor, a cultivator has full proprietary rights and his rent cannot be varied during the currency of a settlement after it has been determined by a settlement officer.

As a superior tenant, a cultivator may be an occupancy or an ex-proprietary tenant in Agra; and in Oudh a privileged holder, an occupancy tenant, an ex-proprietary tenant, or holder of a heritable, but non-transferable, lease. About 53·1 per cent of the holdings area in Agra is held by these two classes of superior tenants. In Oudh the area held under these tenures is small and unimportant, being about 1·6 per cent only.

Both in Oudh and Agra the security of tenure enjoyed by tenants, of the categories mentioned above, is more or less complete. Their rents are controlled and rarely are they ejected for arrears of rent.

The majority of ordinary tenants in Oudh held on short leases previous to the passing of the Oudh Rent Amendment Act of 1921, when life tenancies were created. Similarly, in Agra, life tenancies were conferred by the passing of the Agra Tenancy Act in 1926. Before the enactment of these two great measures of agrarian reform, the security enjoyed by ordinary tenants both in Agra and Oudh was small and could rarely be obtained except by the payment of a heavy price, known as *nazrana*, for continuance of a tenancy. The policy of landowners in general was directed against the acquisition by tenants of rights of occupancy and so they had to change tenants or give fresh leases. In giving these leases they exacted the premium known as *nazrana*. One consequence of this practice was that rents on which the land revenue is based were kept nominally low. In Agra, the non-occupancy tenant had no security and made no improvements. In Oudh, under the system of seven years' leases, the tenant on the better managed estates had in practice a fair degree of security and constructed a large number of wells, but he had no legal guarantee of security and depended entirely on the good will of the talukdar. No one takes the trouble to repair the roof of a caravanserai, in which shelter is enjoyed for a night only. Many landlords were also opposed to the sinking of wells as they gave rise to claims for compensation and thus interfered with their right of ejection.

All this has now been changed. The statutory tenants in Oudh who held 66·4 per cent of the holdings area in 1924-25 and the ordinary tenants who had 22·9 per cent in Agra now enjoy security of tenure for their lives and their successors for five years after their death. The incentive to careful cultivation of land and the making of permanent improvements has now been provided in the shape of life tenancies and beneficial results are sure to follow in course of time.

The interest of the tenant in land revenue is only indirect. His concern is with the rent he pays. The striking fact about rents in the United Provinces is their gradual decrease in amount as we pass from west to east. Rents are rather low in the sub-montane districts, and very high in the Upper Doab, except in the trans-Jumna portion of Muttra and Agra, moderate in the central, and very low in the eastern portions of the Doab. Holdings are large in the western districts and the high rents per acre are due to a large extent to the large size of holdings.

In the sub-montane districts, except Gonda, Basti and Gorakhpur, holdings are large but rents are kept down by the relative scarcity of tenants and the unhealthiness of the tract. Some castes, *e.g.*, Brahmins and Thakurs in Oudh, by custom pay low rents.

The cultivators who till the land of the United Provinces belong to the following castes and tribes : Bhar, Bhoska, Jat, Kachhi, Kisan, Koeri, Kurmi, Lodha, Murao, Saini, Tharu and Meo. The graziers are represented by Ahars, Ahirs, Gadariyas, Gujars and Ghaddis. Agricultural labourers are drawn chiefly from the Chamars, Dhanuks, Dusadhs, Koris, Luniyas and Pasis. The landowners are Bhuinhars, Rajputs, Sainthwars and Tagas. There is no clear cut division in respect of all these classes. Members of the same caste or tribe very often are found in the category of landowners, tenants and labourers. The cultivating classes are, from the point of view of race, of mixed origin. The Aryan has blended with the aborigines and waves of later invaders have produced new complications. The majority of the cultivators are Hindu by faith. It is difficult to disentangle the various strands of the popular religion, but a few features, which have an important influence on practical morality, may be briefly noticed. For example, belief in the doctrine of Karma is universal. As a man sows, so shall he reap in another existence. The hill people believe in the power for evil of the ghost of injured persons. The effects of dying in debt are very much dreaded. These beliefs have an important influence in restraining people from wrong-doing and their practical result is seen in the fact that in the hills hardly any police are required. Both in the plains and in the hills, caste also has an important bearing in keeping people to right conduct. Fear of caste penalties acts as a powerful deterrent. The peasant is devout in observing religious ceremonies and rituals, performing pilgrimages, and bathing in the sacred rivers of the province. Veneration of the cow is entwined in the heartstrings of the peasant, but the cow derives little practical advantage from the existence of this excellent sentiment. The peasant receives little religious instruction. The book which has most influenced him is Tulsi Das's Ramayana, which he cannot read but knows from recitations, which he frequently listens to at night. The cultivator gives away a fair amount in charity and, considering his income, his expenditure on social and religious ceremonies is heavy. He frequents the law courts, also, but not willingly. Very often he is drawn into a law suit to defend his rights. There are such matters as ejectments, arrears and enhancements of rent, for which he is summoned and for which he has to pay. He understands little of the language or the argument or of the decision except the word "Dismissed". There are a number of dialects spoken in the provinces but the people with whom he comes into contact speak or write a language which to him is unintelligible. An amusing example of the style of language as used in books, newspapers and for oral instruction is given by Mr. (now Sir) Richard Burn in his Census Report of 1901. He quotes a passage from a High Hindi book which, with its Sanskrit verbiage, would be almost as intelligible to the peasant of the United Provinces as its

translation with the substitution of Latin for Sanskrit words would be to an English peasant. The original passage and its rendering into English with the appropriate stuffing of Latin are given below :

“*Parantu us men ek Kathinai parti thi. Manushya matra ki ganana ki apeksha thori hi ganon ko yih yog tha ; is karan is chepka bahudha abhaw bana rahta tha.*”

*Translation* : “*Autem there was a difficultas in this. Visus the numerus of the humanum genus, few cows had this disease (cow-pox) ; for this ratio there continued to be magna paucitas of this serum.*”

High Urdu shows similar absurdities. The natural ability of the peasant of Hindustan is bound to wither under the shade of such verbiage. No wonder the peasant's education has not gone far and he is not to blame if he discards this kind of education as soon as he comes out of the village school.

There is reason to believe that the standard of living is rising. There is no outward sign of change in the mud hut of the Indian cultivator ; he consumes the same kind of foodstuffs as before, but he is beginning to sell his *rabi* crops. The money so obtained is spent in paying his rent or revenue, in meeting the claims of the moneylender who finances him, and in buying with the surplus commodities of ordinary comfort and convenience ; *e.g.*, tea, cigarettes, matches, lanterns, buttons ; pocket knives, looking glasses, cotton cloth, foreign or Indian. The peasant indulges in railway travel also.

The household utensils inside the mud hut are not the same as they were, say, forty years ago. Brass and enamelled ware take the place of leaves and the pots made by the village potter. The chief feature of importance, however, is the sense of economic security which has come into his life. He is not so helpless as he was before. A continued rise in the standard of living depends upon two factors : an increase in purchasing power due to higher productivity and, secondly, some control in increase of numbers.

No definite answer can be given to the question whether ultimately the standard of living will break under the stress of population or whether some conscious check will be imposed for maintaining intact the standard of living.

## 6. THE AGRICULTURAL DEPARTMENT.

The United Provinces took the lead in establishing a provincial department of agriculture in 1875. The first model farm was started on rented land near Cawnpore in 1881 ; a school of agriculture was opened in 1893, also at Cawnpore, with the object of training teachers and revenue officials. The superior staff consisted of the Director of Agriculture with a deputy and an assistant up to 1905. The province was divided into two circles with Cawnpore and Partabgarh as centres, for purposes of administration. The collection of facts and figures rather than investigation and research constituted the main work of the department in its early days. The grant of a donation of Rs. 3 lakhs by the

Government of India enabled the department to expand its activities and to strengthen its personnel. An agricultural engineer was appointed in 1908. Between 1914 and 1918, rapid development was hindered by the exigencies of the great war. In the three years after the termination of hostilities, a number of officers were appointed to the Indian Agricultural Service. Research work was started in various new directions and many new farms were opened. Work in connection with cattle-breeding was made over to the Agricultural from the Veterinary Department. In 1920, the Agricultural Department, after its separation from that of Land Records, was placed under a Director chosen from the expert staff.

The organisation of the department at present is based on the division of the provinces into six circles, each in the charge of a deputy director. In a circle there are one or two officers of the United Provinces Agricultural Service, besides the field staff for demonstration work and managers of demonstration farms. The circle is a self-contained unit. The cattle-breeding work, extending over the entire provinces, is under an expert deputy director. Similarly, the engineering section embraces the whole of the provinces. Operations in connection with well-boring and installation of small power plants are carried on by an expert staff under the control of the agricultural engineer.

The ideals which the department has placed before itself are, firstly, to introduce improvements in the existing system of agriculture and, secondly, to develop, as far as possible, a better system. It seeks the attainment of these ideals by the following means: (i) organised research work; (ii) demonstration and propaganda; (iii) provision of agricultural education and (iv) assistance to the public.

Research is carried on by experts and also by officers in charge of circles.

Cotton was the first crop studied and work on it has been carried on along two definite lines (i) hybridisation and (ii) selection. Hybridisation seeks to evolve a plant combining the two desirable characters of high yield in lint and long staple.

It has been established generally that cottons capable of spinning the higher counts have a low ginning percentage and *vice versa* but recently varieties have been produced by hybridisation in the botanical section and are under trial on a fairly large scale on cultivators' fields which give a distinctly better staple (capable of spinning 10s-12s counts) than the indigenous cottons which have a high ginning percentage (38 to 40).

Experts are of opinion that this work has not yielded practical results as quickly as it was at one time hoped.

Selection work has yielded Aligarh 19 and JN 1. Aligarh 19, being most profitable to the ordinary cultivator is in great demand. It has a moderate staple, a good colour and a high ginning percentage. In the most important cotton tract of the United Provinces, *viz.*, the dry districts between Meerut and Fatehpur, along the course of the Jumna

this variety is rapidly displacing the inferior cottons grown hitherto. JN 1, which has a better staple than Aligarh 19, is spreading in the districts south of the Jumna.

The pink and spotted boll-worms have also claimed much attention. The pink is more destructive than the spotted boll-worm. Its ravages may reduce the value of a crop from 25 to 50 per cent. Experiments carried out by heating the seed to a temperature of 140° Fahrenheit and protecting the growing plant by means of wire cages have produced startling effects in coping with these pests.

Large experiments on the heat treatment of seed are being carried out on several controlled areas.

The sugarcane crop requires more detailed notice on account of its importance. The area normally put under this crop in the United Provinces is 1,200,000 acres, being about half of the total area in India. The crop is grown in a large belt of country, parallel to the Himalayas, which may be divided into three tracts, *viz.*, (i) the western, or Meerut; (ii) the central, or Bareilly and (iii) the eastern or Gorakhpur tract. The great bulk of the canes of the United Provinces are of the thin variety, either red or white in colour. They are reed-like, of medium height, have a hard rind and are very fibrous and hardy. They survive in climatic conditions fatal to canes of the medium and thick varieties. The red canes predominate in the Meerut tract and the white ones in the eastern districts. The central tract grows both varieties, red and white.

Medium canes require more careful cultivation and are more susceptible to damage by animals and to diseases such as red-rot and mosaic. The yield per acre is about fourteen tons of cane.

Thick cane, introduced from the tropics, is grown near large cities on account of the manure available from large centres of population. It is largely used for chewing. The area under this type is 75,000 acres and the yield per acre is about twenty tons of cane.

The crushing of canes is done in small two and three roller mills worked by bullocks. The manufacture of *gur* (solidified juice without having been purified) and *rab* (juice reduced to a stiff syrup) is a cottage industry.

The percentage of extraction of juice is poor and the strain on the animals heavy, the task being beyond their strength. The exhausting labour disables the animals for ploughing and other work connected with the proper preparation of the soil for the sowing of the *rabi* crops.

The questions before the Agricultural Department were firstly, to improve the quality of the canes; secondly, to evolve a small power plant for the proper crushing of the canes and so to relieve the cultivator's bullocks of the heavy strain, and, thirdly, to provide an economical and effective furnace for the preparation of the juice.

Agricultural research tackled the question of improvement of the cane and the skill of the mechanical engineer had to find a solution for the difficulties involved in the processes of manufacture.

Serious research on sugarcane dates from the year 1908. After four years of preparatory study, the agricultural chemist began work on the lines laid down by the Board of Agriculture in 1907, on a special farm, opened in 1912 in Shahjahanpur. His investigations showed that indigenous canes did not respond to good cultivation and high manuring.

It became necessary to import varieties of foreign canes for trial. Careful selection yielded valuable types, the chief of which are S/48, Uba, and Mauritius 16. These three varieties are now widely distributed and their cultivation to be profitable requires deeper tillage, regular watering and good manuring. Hybridisation work carried on at Coimbatore has also yielded valuable results and it is expected that this work will revolutionise the cane industry of northern India. These Coimbatore canes are of various types; some are suitable for intensive cultivation and others have been evolved for conditions in tracts in which cane-growing has not been successful.

A farm was established in the hills with a view to investigating the possibility of producing disease-free and vigorous seed for the plains. Later investigations indicate that deterioration was mainly due to mosaic disease and that the production of mosaic-free planting material can be carried out successfully in the plains.

Poor crushing is the result of lack of power. Many farms with oil engines for lifting of water for the purpose of irrigation are installing power-driven mills. The McGlashan furnace which enables boiling to keep pace with crushing is being extensively taken up. Its merits are that it boils the juice more quickly and consumes less fuel. In many areas in the United Provinces, oil engines, tube wells, pumping plant, and power-driven mills, now make up the equipment of a farm. An industrial atmosphere is beginning to pervade the countryside. The small holder has not benefited as yet from these modern appliances. It is hoped that co-operation, the cure for so many of the ills of the small man, will enable him to reap the advantage associated with improved processes and the use of mechanical power.

The normal area under wheat amounts to seven million acres. The crop needs thorough tillage, is sown in the latter part of October, and ripens in March or April. Three varieties of wheat have been introduced, (i) Muzaffarnagar; (ii) Pusa 12 and (iii) Pusa 4. The Pusa wheats are good yielders but since they are beardless, the ears shed the grain. The Muzaffarnagar variety is bearded but suffers from rust, particularly in Oudh and Rohilkhand. Cloudy weather in February produces the evil in the dry tracts also. Further research on wheat is necessary.

Research on rice was started only four years ago. The work of classification and separation of unit species is now proceeding. Chemical studies of the soil are also being made. Selection has yielded good results.

In 1923, a preliminary survey of castor and sesamum was undertaken. Investigation, in close association with the Technological Institute at Cawnpore, is directed towards separation of pure strains and



determining the quality, percentage and acidity of the oil. As regards linseed, the United Provinces require a variety which has a high yield and is also rust resistant.

Among fibres, an improved variety of *sann* hemp has given good results. Retting, on which depend the lustre and quality of the fibre, is also receiving attention. In the absence of large quantities of clean water, decortication has been proposed as an alternative, to save the colour of the fibre. Jute has now been established on thousands of acres in the districts of Kheri and Sitapur, where the climatic conditions approximate closely to those of Bengal.

The potato is becoming an unfailing companion of the *chupatti* (Indian bread). Investigation has shown that the rot which affects the potato when stored can be prevented by adopting cold storage.

The formation and loss of nitrates in the alluvium has also been studied and the accumulation of nitrates as the result of green manuring is being investigated. The process is most active in June and July and in October.

*Usar* land can be reclaimed at reasonable cost in the eastern districts. As regards the western dry tracts, the question is whether water can be more profitably used for the irrigation of good land or for flooding *usar* land and making it available for cultivation. As an alternative; raising of fuel and fodder opens out very good possibilities.

So much for investigation and research. Demonstration and propaganda take various forms. Considerable use is made of the annual district fairs, at which improved seeds, implements, pumping machines and other paraphernalia are displayed prominently and audiences of rustics are exhorted by lecturers. Conviction is carried home to them by actually growing the crops right under their eyes. The department is moving away from demonstration farms to demonstration plots, situated in the fields of the cultivators. The method consists in sending down an energetic and persuasive man who knows the rustic mind and the art of cultivation. He hires a plot, sows it with the improved seed, makes use of the improved methods of cultivation he wishes to introduce, interests the people in his work and leaves conviction to the harvest. The improvements are talked about and spread in the group of neighbouring villages. This is the group method of influencing the customary practices. Another procedure is to hire a plot, share expenses with the owner and divide the profits. This method makes zealous cultivators and ardent friends who have experienced the weight of extra profits in their pockets. In other cases, when the department is helping the more substantial man, the landholder undertakes to reserve a certain area for a term of years, as a condition of the subsidy which he receives from the department for sinking a tube well on his estate. The department gets the land free of cost, manages it as a demonstration farm and expects that it will influence the neighbouring cultivation. The next stage is reached when landholders come to the department for help and advice for starting similar farms themselves, thus creating further nuclei of influence.

By the provision of good seed from its own seed farms through its seed stores which numbered 148 in 1926-27, by drawing upon seed raised on private farms under supervision of the department and by making use of the methods of propaganda sketched above, the department has been able to put 750,000 acres under improved wheats and 200,000 acres under improved cottons. It is estimated that the extra profit has been Rs. 15 per acre from each of those improved varieties. The work of seed distribution now entails a heavy burden on the department.

Assistance to the public is given generously by the engineering section. It is divided into four circles with headquarters at Cawnpore, Meerut, Partabgarh and Hardoi, each in charge of an assistant agricultural engineer. Wells are a very important means of irrigation. The water of the rivers of the provinces has been fully used for irrigation by means of canals and only the underground supplies remain. The work of this section is to make those supplies available by effecting improvement in the existing masonry wells and by sinking tube wells, which will bring forth larger quantities of water. Since 1910, 16,000 borings for ordinary wells have been made and, between 1913 and 1926, 200 tube wells have been sunk and 97 were in course of construction in 1927. Government subsidise the construction of tube wells and pumping plant to the extent of Rs. 6,000 per well, exclusive of assistance in the form of *taccavi* and grants-in-aid.

The running cost of a single irrigation works out to Rs. 7-10-9 per acre where the water has to be lifted 40 to 50 feet to the surface. A comparison of this figure with the pitch of water rates is illuminating. The seasonal charge for the irrigation of sugarcane is Rs. 10 per acre when the canal water flows on to the land. Where it has to be lifted, the rate is Rs. 4 only. For rice the seasonal flow rate is Rs. 7-8 and the lift rate Rs. 3. For wheat and barley the flow rate is Rs. 5 and the lift rate Rs. 2-8 respectively per acre. The canal rates given above are those in force on the Upper Ganges and the Eastern Jumna canals. It would appear from the comparison made above that where canals and tube wells are in competition, the latter do not pay unless the water is used for a high priced crop, grown under an intensive system of cultivation.

Cattle-breeding work is carried on at the Madhurikund farm in the district of Muttra and at the Manjhra farm in the district of Kheri. The quality of the United Provinces cattle leaves much room for improvement. The cows give very little milk; for this article chief reliance is placed on the she-buffalo, specially of the Murrah breed of the dry western districts. The draught power of a pair of bullocks does not go beyond an area of 7·7 acres. The problem in the United Provinces is to raise the efficiency of the cow as a giver of milk and that of the bullock for purposes of draft. The cattle-breeding section is tackling this problem along the following lines: (i) improvement of the existing breeds by keeping up a supply of selected bulls; (ii) exploring the possibility of developing a dual purpose type of animal and (iii) studying the technique of dairying. For improving the cattle a scheme of controlled breeding areas is in operation. The

section concentrates its attention on small areas, to which it has loaned its bulls. As the inferior stock is replaced and as the offspring of bulls from the government farms grow up, they are bought back and distributed over other areas. The farms cannot provide the large supply of bulls required for grading up the cattle of the provinces. Hence advantage is taken of the willingness of cultivators to raise young stock for extending the improvement to other areas. A provincial cattle committee keeps the department in touch with the requirements of the provinces.

The educational institutions maintained by the department with the object of providing technical education in the science and art of agriculture are a college, equipped both for research and teaching, at Cawnpore, and a vocational school at Bulandshahr.

The college offers two courses: one is a four years' course, divided into parts, leading to the diploma of L.Ag. with an intermediate diploma controlled by the United Provinces Board of High School and Intermediate Education. The examination for the final diploma of L.Ag. is conducted by the department.

The second course is in the vernacular. Its duration is two years and it is meant for the sons of large landholders, who may not possess the educational qualifications necessary to enable them to profit by the course in English. The ideal before the authorities of the Agricultural Department is to offer a training at Cawnpore to the sons of zamindars equal to that which they could obtain at a university, to make the college, in fact, into a university of the landholding classes. The college has five sections and maintains a farm of 381 acres, a portion of which has been converted into a dairy farm. Estate management and the economics of agriculture form a prominent part of the course. The college is residential.

The numbers on the rolls during the last two years were :

	1926	1927
For the diploma course .. .. .	78	115
For the vernacular course .. .. .	50	46

A Governing Body, of which the Director is the chairman and the Principal its secretary, manages the institution.

The vocational school at Bulandshahr was opened in 1921. It is meant for the sons of tenants of substance and those of the smaller zamindars. The course lasts two years and is in the vernacular. The students themselves cultivate the land of the farm. Since 1924, a teachers' training class has been opened. District boards are introducing the subject of agriculture in vernacular middle schools and this course, lasting for one year, is meant to provide technical training to those who are going to teach the subject of agriculture in these middle schools.

A fieldmen's class has also been opened, its object being to provide a short course of instruction for those who cannot attend the regular school course for two years or who desire to learn special methods of cultivation. In addition to this, there is a class for engine drivers, its object being to train men to work oil engines and power plants and to carry out the simple repairs required in modern farm machinery.

It is intended to open two more schools of the Bulandshahr type. The initial cost is estimated at Rs. 2·75 lakhs and the annual at Rs. 30,000.

The institution of short courses in special subjects, *e.g.*, dairying, and intensive cultivation of sugarcane on certain farms, is also under contemplation.

Training in horticulture is to be given at the Cawnpore Agricultural College. Horticulture has been in the executive charge of a deputy director since 1922. There is considerable scope for the development of the fruit industry in the plains and in the hills. The substitution of market gardening for farming on the small holdings in the provinces, as a possible future development, is not to be underrated.

The budget of the department increased from Rs. 7·14 lakhs in 1913-14 to Rs. 20·13 lakhs in 1925-26 and Rs. 24·46 lakhs in 1926-27. The amount voted in 1926-27 was distributed among the various branches as follows:—

(i) General : Rs. 5·4 lakhs ; (ii) agricultural circles : Rs. 6·1 lakhs ; (iii) cattle breeding : Rs. 2·1 lakhs ; (iv) agricultural engineering : Rs. 3·4 lakhs ; (v) agricultural education and research : Rs. 3·9 lakhs ; (vi) gardens : Rs. 2 lakhs and (vii) works : Rs. 1·6 lakhs.

## 7. IRRIGATION.

The two large rivers, the Ganges and the Jumna, which traverse the United Provinces, are holy. The reason why they are and have been so considered is not far to seek: their waters make life possible. The people depend for their livelihood upon agriculture and agriculture, without water, is out of the question. Over the greater part of the Indo-Gangetic plain, irrigation is necessary for the *rabi* and sometimes for the *kharif* crops also, when breaks occur in the monsoon. The sources of water are (i) rains ; (ii) canals, bringing water from the great rivers ; (iii) local streams, *jhils* (lakes or depressions) and tanks and (iv) wells.

Canals play, and have played in the past, a great part in ameliorating the conditions of the people. When the first great project was sanctioned by the Directors of the Honourable East India Company in 1841 they laid down a policy which is still applicable to the conditions of to-day. Canals, they said, should be constructed to remove the horrors of famine, to assure the cultivator the means of existence and to ameliorate the conditions of the people.

They were thus constructed, not primarily for revenue, but to protect the people. Throughout the nineteenth century, State effort centres round construction of canals.

The backbone of the canal system in the United Provinces is formed by the Eastern Jumna, the Upper Ganges, the Agra and the Lower Ganges canals. The Eastern Jumna takes off from the river, in the north of the Saharanpur district, about 100 miles from its source. It is the most remunerative canal in the province and, with one exception, the most remunerative in India. In 1926-27, it irrigated 350,000 acres.

The Upper Ganges Canal, the greatest in the province, was completed in 1854. In 1926-27, it irrigated 1,180,400 acres. In 1920, its permanent headworks were completed at a cost of Rs. 39 lakhs. The unsatisfactory system of throwing temporary dams across the river every year for diverting supplies of water into the canal was thus rendered unnecessary.

The Lower Ganges Canal, opened in 1878, was constructed to irrigate the lower portion of the *doab* and to supplement supplies to the tail portions of the Upper Ganges Canal. In 1926-27, it irrigated 776,300 acres. The two canals, the Upper Ganges and the Lower Ganges, form one system.

The Agra Canal takes off from the Jumna near Delhi. It was opened in 1874 and was designed to irrigate 280,000 acres in years of drought. It actually irrigates an average area of 111,000 acres of *rabi*, and 123,000 acres of *kharif* crops.

Between 1840 and 1860, smaller canals, drawing their supplies from hill streams, which had fallen into disrepair, were reconstructed and considerably extended in Rohilkhand.

Since 1880, attention has been directed to the rivers in the south of the province. The rivers of Bundelkhand, the Betwa, the Ken and the Dassin, do not, like the Ganges and the Jumna, receive abundant supplies of water from the snows of the Himalayas. They are subject to floods in the rains but shrink to very small dimensions in the cold weather and would be entirely ineffective for irrigation but for the fact that the configuration of the country and the presence of rock make the construction of reservoirs, for impounding the flood waters, possible. These reservoirs involve the construction of huge dams and submergence of extensive areas of land and are expensive. The following protective works have been opened in this part of the province: the Betwa, in 1885, with a storage capacity of 3,000 million cubic feet; the Ken, in 1906 in the district of Banda, with a supplementary reservoir at Gangao, completed in 1917; and the Dhasan, in 1910, protecting the district of Hamirpur. The district of Mirzapur is served by the Gorai and the Ghagar canals, completed in 1918. The reservoir of the Ghagar has a storage capacity of 5,000 million cubic feet, commands an area of 250,000 acres and is the largest lake in the province. In 1926-27 it irrigated 13,300 acres.

Smaller works and extensions of old productive works have also been undertaken. The Majgawan tank and canal in Hamirpur and the Barwar lake and canal were completed between 1917 and 1923.

Since 1880, no productive works of any magnitude have been completed. One productive work, however, which is the largest in the province, is now under construction and will be completed in 1930. The Sarda

Canal project, combining in itself the two projects of Sarda-Kichha and Sarda-Oudh, with headworks at Banbassa, on the border of Nepal, is designed to irrigate the Sarda-Ganges *doab*. The canal will have a discharge of 9,500 cusecs as compared with the 8,000 cusecs of the Upper Ganges. The estimate of its cost is Rs. 9.5 crores; the return 7.7 per cent on the capital outlay; and the area it will irrigate will be 1.7 million acres. The average area irrigated at present from canals amounts to a little over 3 million acres. With the completion of the Sarda project, this area will be increased by more than fifty per cent. If the scheme proves successful, its complementary work, the lower Sarda Canal, will be taken in hand.

Supplementary storage reservoirs for the Betwa, the Ken, the Dhasan and Ghagar canals and small projects taking off from the Paisani and Ohen rivers in Bundelkhand might add another two or three hundred thousand acres in future to the irrigated area of the province.

The maximum area irrigated from canals will be nearly four-and-a-half million acres. This limit is fixed by the supplies of water available. Any further expansion of the area irrigated can only take place by a more economical and scientific use of the limited supplies of water. It is estimated that fifty per cent of canal water is at present wasted, chiefly by the cultivator.

The statistics relating to the system of government irrigation works are summarised below. In 1926-27, the length of main canals was 1,903 miles, that of distributaries 10,216 miles, of drainage cuts 3,680 miles and of escapes 344 miles. The total length was thus 16,143 miles in 1926-27. In 1931, it will be 22,530 miles and in 1941, 22,600 miles. The capital outlay on all government irrigation works up to 1926-27 was Rs. 19.69 lakhs. By 1931, it will be Rs. 2,230 lakhs. The gross revenue in 1926-27 was Rs. 163 lakhs. It is estimated that it will rise to Rs. 175 lakhs in 1931 and to Rs. 240 lakhs in 1941. Working expenses were Rs. 65.5 lakhs in 1926-27, and for 1931 and 1941 they are estimated at Rs. 75.0 lakhs and Rs. 82.0 lakhs, respectively. The net revenue in 1926-27 was Rs. 97 lakhs. For 1931 and 1941, the estimated amounts are Rs. 100 lakhs and Rs. 158 lakhs, respectively. The interest charge amounted to Rs. 73.7 lakhs and will be Rs. 88.0 lakhs in 1931 and 1941. The net profit was Rs. 23.3 lakhs in 1926-27 and for 1941 it is estimated at Rs. 70 lakhs. The total area of crops irrigated by all sources of irrigation, both government and private, in 1926-27 was 10,816,000 acres or 26 per cent of the total cropped area.

The direct benefits of canals are: (1) an increase in the cultivated area; (2) substitution of the more valuable for less valuable crops; (3) avoidance of famines; (4) increase in land values; (5) increase in out-turn of crops. In regard to increase in land values, it may be mentioned that, in 1877-78, the price of land varied between Rs. 30 and Rs. 80 per acre for land near the Deoband branch of the Upper Ganges Canal. In 1909 the branch was remodelled and Government had to pay from Rs. 88 to Rs. 146 per acre. In some areas, the increase has been fourfold.

Supplementary benefits consist in the provision of power produced at the canal falls for mills, the raising of plantations for fuel and timber, production of grass on the canal banks for cattle and supply of water to the tanks in Bundelkhand for the use of cattle.

The charges for water are fixed in relation to (1) the amount of water necessary to bring a crop to maturity, and (2) the value of crops. Rates are higher for the more valuable crops, grown usually in the *rabi* season. Sugarcane, which is on the ground for a whole year, pays the highest rates. In America, the ratio of water rate to the value of the crop is one-fifth or one-sixth; in Egypt one-seventh and in India about one-tenth. In 1926-27, the average value of an acre of sugarcane grown under irrigation was about Rs. 150 and the charge for water on the main canals only Rs. 10 per acre. The average value of wheat raised on an acre was Rs. 73 in the same year and the water rate Rs. 5; the value of rice Rs. 46 and the water rate Rs. 7-8. It may be mentioned here that the charge for water for any one crop is not uniform on all the canals. Each tract served by a system of canals has its own rate which is uniform throughout that tract. Again, flow rates are higher than lift rates.

Careful attention has been paid in the past to the question of drainage. Construction of canals has been undertaken in such a manner as to avoid interfering with the drainage of the area. No waterlogged areas have consequently manifested themselves.

The attention of the Irrigation Department of the United Provinces is being directed more and more towards questions of research. Prevention of avoidable losses, *e.g.*, through seepage, faulty design and construction of the water courses of the cultivator, defective preparation of the fields for receiving the canal water by the omission to divide the fields into suitable compartments, and determination of the amount of water necessary for a crop, should result in spreading the benefits of canal irrigation over a wider area.

The second source of irrigation is from small streams and *jhils* (lakes). The use of water from these is governed by customs, which are recorded in the village papers. These customs secure to the different interests something like a fair share of the limited supply available. This source serves to help the late maturing rice and there may be enough for a first watering of the *rabi* crops. Generally, it gives out when the need for water is greatest, *e.g.*, in a dry year.

The third source is tanks, a word which may cover a huge modern reservoir impounding the flood waters of the vast catchment area of a river in Bundelkhand or it may mean an excavation in the level ground covering a few acres of land in the *doab* proper. Tanks in the latter sense are usually shallow and are not capable of providing irrigation on a large scale. The cost of excavation increases with the depth and thus water cannot be stored in large quantities. These tanks provide water for the use of man and beast, besides giving a first watering to a certain amount of *rabi*. Like *jhils*, they cannot be relied upon in periods of drought, when the need for water is greatest. The cultivator

understands from long experience the technique of their construction. Their bed is of clay, to reduce the loss of water to a minimum.

Wells, however, form the most important source. In 1926-27, the total net area irrigated was 10·3 million acres out of which wells were responsible for 5·4 million acres. South of the Jumna, wells are sunk into rock to a great depth. In the Indo-Gangetic plain, the conditions are specially favourable for the successful digging of wells. The depth at which water is found may vary from 10 to 100 feet. The ordinary wells are of two kinds, percolation and spring wells. The depth of the latter is the greater; they draw water from beds of saturated sand, enclosed in clay; they are more reliable in times of drought, since the water exists in larger quantities and, even if they dry up, they remain serviceable afterwards. Percolation wells are cheap, but not durable, and, since only the percolation level is tapped and not the more abundant supply found in beds of coarse saturated sand, the quantity available for irrigation is limited. The cost of a well is determined chiefly by the need for lining. No lining is ordinarily necessary for stiff clay soil; with sand or loam, it is different. The whole or only a part of the well may require a lining. If it is a part only that requires protection, either twigs, (usually *arhar* stalks and coarse grass) are fixed in, or pieces of wood, or a cylinder of bricks. If the entire well is to be protected, cylinders of masonry, cemented or uncemented, are either built up from below or sunk down from above.

The methods in common use for lifting of water are: (1) an ordinary basket, closely woven, held at both ends by ropes, for lifts of less than four feet. Two men are necessary for working the basket and four for a full day. This method is wasteful of effort, as much of the water spills back, but it is cheap. (2) An alternative method to the basket lift is the chain pump, which consists of a series of discs on an endless chain passing over a wheel and through a pipe. As the wheel is turned, the discs bring up a constant stream of water. (3) For shallow percolation wells, the water is lifted by means of a *charkhi* or a *dhenkli*. These are simple arrangements consisting of a wooden frame and a pole, at one end of which there is a weight to counterpoise a jar or bucket which is dipped in. For lifts under twenty feet no other method has yet been devised which can compete with these indigenous contrivances. (4) For deeper wells, a huge leather bucket drawn by bullocks, walking down on inclined plane by the side of the well, is used. In the western districts, two pairs of bullocks are used and in the eastern, one pair. (5) In the extreme north and extreme south, the Persian wheel is used. (6) Lastly, mechanical power, chiefly from the use of oil engines, is slowly coming in. The ordinary cultivator cannot afford the initial cost and its economical use requires a minimum supply of water which must be kept up. The expense of raising water is very much less than that involved by the indigenous methods.

The amount of water required per watering and the total number of waterings necessary to bring a crop to maturity vary with the soil and the crop. Very sandy soils absorb a very large quantity. Heavy clay does not require irrigation. Between these two extremes there are



well-drained sandy soils and rich loams. The former require more water than the latter.

The cultivator does not use canal water with that care and economy which he shows in the case of water drawn from wells. In his use of well water, he prepares the land first with great skill, dividing it into small compartments and the more valuable the crop the smaller the size of these compartments. For instance, a poppy field will have much smaller divisions than a barley field. Compartments are much larger in tracts served by canals than in those under irrigation from wells. Again, within irrigation tracts, the size of the compartments will be larger for flow than for lift irrigation.

The grant of life tenancies is expected to induce the cultivators to increase the number of wells and, if the co-operative movement develops in the province, the question of the supply of capital will not be such a hindrance as in the past.

#### 8. FORESTRY IN RELATION TO AGRICULTURE.

The cultivator dwelling in that small part of the United Provinces in which forests exist looks upon them as a source for the satisfaction of his immediate needs. He does not realise that needs have an awkward tendency to recur. He sees no point in a judicious and economical exploitation of forests, with a due appreciation of all needs, of the future as well as of the immediate present and of the general public as well as of the dweller on the forest borders. Such matters as the value of timber supplies to the economic welfare of the whole province and the steady and unseen influence of forests in retarding the rapid flow of water, and thereby saving agricultural land from injury and destruction produced by erosion, and floods, are hardly appreciated. Further, the cultivator perceives no connection between forests and well-regulated supplies of water in canals, which are so important for the welfare of the people in the plains. These matters pre-suppose a degree of insight into scientific treatment of forests which he does not possess.

State action in the interests of the general welfare and to protect the cultivator from the consequences of his own recklessness has taken the form of control of forest areas. Forests have been divided into two classes, reserved and protected. Greater latitude is usually allowed in protected than in reserved forests.

The area under forests controlled by the Forest and Revenue departments amounts to some 12,267 square miles, being eleven per cent of the total provincial area. Out of this total, 5,167 square miles are classed under reserved and 7,100 under protected forests.

With the exception of some small forest areas on and near the Central Indian hills of Bundelkhand, all the forests lie in a narrow belt along the borders of Nepal and along the foot of the Himalayan hills and within the hills. There are no forests in the Gangetic plain proper. In the plains, thousands of acres of good agricultural land have been destroyed by the destructive action of water in the past. In one district alone, it

is estimated that 400 *bighas*, equivalent to 133½ acres of land, are eaten up by water every year. In such areas, known as ravine lands, the Forest Department is attempting the policy of afforestation, the objects of which are (1) to prevent the further erosion of agricultural land by water and the spreading of ravines, (2) to create a local supply of fuel, (3) to improve the grazing and (4) to create fodder reserves where none existed before.

The special afforestation division has had on hand a yearly programme of 2,000 acres. There are other large areas in the plains which can be made to serve the needs of agriculturists, if only the Forest Department can control reckless grazing by devising a suitable system of rotation, and if stall feeding becomes common. Afforestation is proceeding in the districts of Etawah, Agra, Cawnpore, Unao and Aligarh and also in Bundelkhand.

Apart from ravines and waste land, there are interspersed all over in the plains considerable areas of heavy clay soil, impregnated with salts to such an extent that cultivation is impossible. Attempts are being made to afforest such areas and, even if they do not prove financially successful, it has been demonstrated that good crops of fodder grass can be produced by simple protection. The fuel and fodder supplies would be considerably increased, if progress were more rapid and public opinion realised the importance of action in its bearing on the advancement of agriculture.

In the montane and sub-montane tracts lie the bulk of State-managed forests. Reserved forests are always under the direct management of the Forest Department. Protected forests are in some places in the charge of the Revenue and, in others, of the Forest Department. The chief species of trees in these Himalayan forests are *sal*, deodar, oak and pines.

The benefits which cultivators derive from forests are firstly, grazing, which may be free, or at privileged, or at full rates; secondly, the right to extract timber, possessed by cultivators living in or near forests; thirdly, such right-holders may take away fuel; fourthly, they may appropriate bamboos, within limits, for the satisfaction of their requirements. Minor forest products, *e.g.*, leaf litter and humus are also taken without let or hindrance. Building stone, lime, slates, fibre for ropes, materials for baskets, berries and fruits for various uses are also available for the use of cultivators in forest areas.

Grazing is provided annually for over a million animals, excluding large numbers in Kumaon, which are never counted. The value of free or privileged grazing foregone by the Government comes to nearly Rs. 3 lakhs a year and that of forest produce, given away, to about Rs. 2½ lakhs.

To meet the requirements of the bulk of the population, which lives in the plains, a more active policy of afforestation of uncultivable waste, ravine and *usar* lands is necessary. The forests cover only eleven per cent of the total area, and their distance from the chief agricultural tracts is a serious obstacle. The needs of the population in the plains

can be met satisfactorily if production of fuel, timber and grass is in their immediate neighbourhood.

The question of communal management of small village forests is receiving attention in the Kumaon Hills.

### 9. GENERAL EDUCATION.

There are in the United Provinces 5 universities, 34 intermediate colleges, 127 English middle and 188 high schools. Four of the universities are teaching and residential; the fifth, that recently created at Agra, is an affiliating and examining institution. For the supply of teachers to the English school system, three training colleges are maintained by Government and one each by the universities of Benares and Aligarh. The rural population does not frequent any of the higher institutions in which instruction is given through the medium of English. Education for the mass of the people is provided by the vernacular school system. It is, therefore, proposed to consider only this system.

The vernacular schools for boys are of two grades (1) primary and (2) middle. In 1927, the total number of primary schools managed by district boards was 13,759 and of middle schools 576. In addition there were 4,201 primary and 12 middle schools, which were aided by local boards.

The district boards spent on education Rs. 100 lakhs, of which Rs. 73 lakhs came out of provincial revenues and Rs. 27 lakhs were provided out of their own resources. The boards' expenditure was almost entirely on the education of boys (Rs. 96·7 lakhs) and only Rs. 3·3 lakhs was spent on the education of girls. The total number of boys attending district board vernacular schools is 879,000, of whom about 822,000 are in primary and 57,000 in vernacular middle schools. The total number of boys of school-going age, between 6 and 11 years, is estimated by the Education Department at 2,500,000. With their present expenditure, the boards can provide education for one million boys. For the education of the remainder, 1·5 millions, another Rs. 1·5 crores would be required (excluding additional expenditure on direction, inspection, training of teachers, buildings and equipment). If the boards used fully their powers of taxation it is not expected that they could raise more than Rs. 14 lakhs. The difference between the amount necessary for giving education to 1·5 million boys and the additional amount which it is estimated the boards might be able to raise would fall on provincial revenues. It has been pointed out already in the section on Provincial Income and Expenditure that one characteristic of provincial revenues is their inelasticity and, should the present tendencies continue, this feature will become more marked. The above calculation takes into account only boys of school-going age. The girls whose number cannot be less, if educated apart from boys, would require another Rs. 2·5 crores, recurring. The total annual recurring expenditure on the education of both boys and girls in rural areas, would be about Rs. 5 crores, if the provisions of the District Boards Primary Education Act were generally enforced. The problems of financial ways and

means thus loom large in any scheme of free compulsory primary education for the mass of the agricultural population. So much for future developments.

In the vernacular school system, the aim is to spread literacy and to develop faculty. For the attainment of both objects, the teacher is much more important than mere syllabuses, courses of study and curricula. Unfortunately, the scholars do not remain long enough at primary schools to attain either of these objects. Attendance during the period of enrolment is also unsatisfactory. The course in primary schools lasts for five years and in middle schools for three years. The Director of Public Instruction has estimated that, out of every 100 boys who enter a primary school, 58 complete the course meant for infants, 44 reach class I, 31 class II, 22 class III and only 16 class IV. The system is thus wasteful, since boys do not stay long enough to derive permanent advantage. The reasons for this diminution in the successive classes are stated to be (1) the demand for child labour; (2) the prejudice against schools as rendering boys unfit for the occupation of their fathers, *viz.*, agriculture; (3) the inefficient system of teaching and (4) unwillingness of parents to send their children to schools outside their own village.

Irregular attendance arises from inclemencies of the monsoon, prevalence of malaria and other epidemics after the rainy season, and from the occurrence of numerous feasts, festivals and marriage ceremonies. The long drawn out harvests, the inadequate and unhygienic buildings in which schools are held and the inefficiency of the teaching, especially in the infant classes, also interfere considerably with regularity of attendance.

It is considered that these two evils of low enrolment in higher classes and irregular attendance during the period of enrolment can be largely diminished by introducing compulsion gradually. It is expected that the District Boards Primary Education Act of 1926, under which power has been given to district boards to introduce compulsion in the whole or any part of the areas under their jurisdiction, will materially eliminate this waste. The Director of Public Instruction considered it also desirable to amend the District Boards Act, with a view to conferring larger powers on the education committees of district boards. Nomination of public spirited gentlemen, with a keen interest in primary education, to the committee is also necessary. The members of district boards concern themselves more with questions of promotions and transfers of the teachers than with the improvement of education.

Vernacular schools are administered for the boards and inspected on behalf of the Education Department, by officers of the department. In each revenue district there are four or five sub-deputy inspectors with one deputy inspector to control and supervise the work of his subordinates. An officer of superior status, called an inspector of schools, is stationed in each revenue division, consisting of four or five administrative districts. He controls the agency for inspection working in the different districts, with the help of an assistant inspector.

The extent of literacy may be judged from the following figures which include the urban as well as the rural population, and are taken from the

Census Report of 1921. Out of every thousand of the population, there are only 37 literates : out of every thousand males, 65 and out of every thousand females, 6. The figures in 1911 were 34, 61 and 5 respectively. Measured by reference to natural divisions, Himalaya West is far more literate than any other division, the reason being that the majority of the people are of approximately equal and fairly high status. The western portion of the plain has gone ahead of the central. The plateau and the eastern plain have made considerable progress. There is retrogression in Sub-Himalaya East, in comparison with the figures for 1911.

Literacy among cultivators may be gauged by reference to figures of literacy by caste. Cultivators in the United Provinces belong chiefly to the following castes : Jat, Kachhi, Kurmi, Lodha and Tharu. The numbers of literates per 1,000 of males and females are :

Caste				Male	Female
Jat	..	..	..	51	2
Kachhi	..	..	..	10	4
Kurmi	..	..	..	30	1
Lodha	..	..	..	13	1
Tharu	..	..	..	54	2

For pastoral castes, the figures are given in the following Table.

*Number of literates per 1,000*

Caste				Male	Female
Ahir	..	..	..	12	0·5
Gadariya	..	..	..	6	0·4
Gujar	..	..	..	19	1·0

For castes, from which agricultural labourers are chiefly drawn :

*Number of literates per 1,000*

Caste				Male	Female
Chamar	..	..	..	2	0·2
Kori	..	..	..	8	0·3
Luniya	..	..	..	11	0·1
Pasi	..	..	..	3	0·1

For castes, members of which chiefly own land, the figures are :

*Number of literates per 1,000*

Caste				Male	Female
Bhuinhar	..	..	..	166	10
Rajput	..	..	..	114	12
Taga	..	..	..	69	4

The only inference that can be drawn from these figures for the various castes is that literacy in a caste varies directly with its economic and

social position. If the social position is high, the figures for literacy are also high. The more submerged a caste is in position, the worse off it is as regards literacy.

Efforts have been made in the last three or four years to introduce specially trained teachers into certain vernacular middle schools managed by district boards, to give instruction in agriculture as a separate subject. Government bear the whole of the cost of training the teachers and half the initial cost of purchasing cattle, equipment and land (about five acres) for the farm attached to each of the schools. The non-recurring cost for equipping a school to provide teaching in agriculture is Rs. 4,000. The boards bear the recurring cost, estimated at Rs. 350 per annum, and half of the non-recurring cost, i.e. Rs. 2,000. Manual training has been introduced into 29 vernacular middle schools, with a view to making the course less literary and more practical; a further extension of this scheme is being considered. English is being taught in about 150 vernacular middle schools thus making easier the path of boys desirous of joining English high schools from vernacular schools.

The problem of improving rural education in the United Provinces resolves itself into improving the method and quality of teaching by the provision of more and better teachers and by improving their prospects.

Better buildings for schools are also necessary. More than half of the schools managed by district boards have only a borrowed habitation. It is not the school building of the village but the house of a moneylender or the premises of the village police station, which attract a visitor's attention. A very large non-recurring expenditure, estimated at a crore of rupees at least, is required to provide adequate buildings for existing primary schools.

#### 10. CO-OPERATION.

The beginnings of co-operation in the United Provinces go back to the year 1901, when a few credit societies were organised by Mr. Dupernex, I.C.S. A Co-operative Department was established in 1904 after the passing of the Co-operative Societies Act in that year. At the end of 1926-27, there were in existence 75 central societies, 287 non-agricultural primary societies, chiefly credit, and 5,880 agricultural primary societies, of which 5,874 were credit and 6 non-credit societies. There is no Provincial Co-operative Bank. The department is managed by the Registrar who then had the help of 2 deputies, 2 assistants and 27 inspectors. The auditors, who then numbered 52, were paid by Government but central banks and societies contributed the greater part of the expenses of their maintenance; in addition, central banks and societies maintained a staff of managers and supervisors who were not paid out of public funds and were not under the orders of the Co-operative Department. The government expenditure upon the movement in 1925-26 was Rs. 2·23 lakhs as compared with Rs. 6·36 lakhs in the Punjab and Rs. 6·28 lakhs in Madras. In 1926-27 the cost to Government was Rs. 2·15 lakhs. The progress of the co-operative movement since the organisation of the department is set out in the

following Table, taken from the provincial memorandum prepared for this Commission.

Year	Total number of societies and central banks	Total membership of primary societies	Total capital involved in the movement	Total owned capital of central banks and societies.
	No.	No.	Rs.	Rs.
1904-05 .. ..	150	12,215	....	....
1905-06 .. ..	123	10,234	....	47,018
1906-07 .. ..	170	17,404	....	1,67,612
1907-08 .. ..	187	38,985	....	2,79,431
1908-09 .. ..	369	55,067	....	4,76,136
1909-10 .. ..	789	49,963	....	5,63,862
1910-11 .. ..	1,258	63,035	....	7,63,189
1911-12 .. ..	1,946	76,812	....	10,25,452
1912-13 .. ..	2,530	94,042	....	13,58,282
1913-14 .. ..	2,800	108,023	....	17,82,066
1914-15 .. ..	2,962	107,781	....	23,15,601
1915-16 .. ..	3,190	113,251	....	28,47,691
1916-17 .. ..	3,246	109,233	76,66,966	33,76,462
1917-18 .. ..	3,087	97,638	73,21,910	36,31,206
1918-19 .. ..	3,406	98,527	75,22,107	40,70,571
1919-20 .. ..	3,721	97,086	75,74,992	42,33,713
1920-21 .. ..	4,493	110,620	80,83,433	46,04,540
1921-22 .. ..	5,137	128,113	80,73,042	51,62,101
1922-23 .. ..	5,609	136,423	1,00,80,342	57,50,738
1923-24 .. ..	5,755	144,482	1,05,14,167	64,34,263
1924-25 .. ..	6,000	155,149	1,12,51,865	72,05,319
1925-26 .. ..	6,238	159,647	1,88,49,170	77,04,460
1926-27 .. ..	6,242	163,983	1,97,75,823	82,99,282

It is an interesting Table, with its array of figures. No conclusion can, however, be drawn from them. They are merely arithmetical numbers and they can tell us nothing about the societies, whether they are good or bad, dead or alive, co-operative or un-co-operative. The figures for membership may include good co-operators as well as those who may never have heard of co-operation, its principles, practice or message. The capital involved in the movement may represent either genuine or merely paper transactions.

These doubts and difficulties have been brought to light recently by a committee appointed by the Government of the United Provinces. It examined the whole movement and its findings on matters of fact make dismal reading. Briefly, the main conclusions of the committee are that (1) the co-operative movement is not spreading by the momentum of its success and the moneylender is not having sleepless nights; (2) central banks have drawn all threads of authority into their own hands; (3) primary societies are generally effete; (4) the principles of co-operation are not understood; (5) the staff is insufficiently trained and unsuited for work in the villages; (6) the staff is very often corrupt and has in many cases succeeded in corrupting the headmen of the *panchayats* also.

The main concern of central banks is to recover their advances. They are not carrying out satisfactorily the duties devolving upon

them in connection with the organisation, and supervision of primary societies.

The officials of central banks interfere too much with primary societies and have practically killed all co-operative spirit in them. In the opinion of the committee, the primary societies have sinned and are sinning against every canon of co-operation. The members understand neither the purpose nor the business of their society and as their education in co-operative principles is defective, the affairs of the society get into the hands of either servants, who are very often corrupt, or the headmen of *panchayats (sarpanchas)* who batten on the members. There is no careful selection of members; loans are not granted for productive purposes only; when granted they are not applied to the purpose stated; there is no supervision by members; loans are recorded as repaid when they are, as a matter of fact, only renewed. Further loans are not recalled and sureties are not held to their obligation; loans are monopolised by *panchas* and their friends. The obstacles to the spread of co-operation in the United Provinces are (1) illiteracy, (2) lack of honorary workers, (3) the hostile attitude of moneylenders, landlords, and the indifference of others, who should be the leaders of their tenantry, and (4) the lack of government staff, the dishonesty of the bank staff and group secretaries, and the tenancy law and social conditions which, till recently, gave very little security of tenure to the tenants.

Some instances of outrageous malpractices have been recorded by the committee. In the district of Budaun, there were 159 societies under the district bank; there are none now. The manager of the central bank had swindled the primary societies for a number of years. When the Registrar came to inspect these societies, the manager sent out a message to the members not to show their pass books, otherwise they would have to pay. No pass books were shown and no redress was consequently obtained. In Sultanpur, the managing director, who was an honorary magistrate as well, enrolled litigants who appeared before him as members of primary societies and advanced loans to them which he took back as his remuneration for selling justice to them. Similarly he would enrol defaulting debtors, give loans to them and thus recover bad debts for his friends. In Moradabad an easy way was discovered of realising irrecoverable arrears of rent due to bad seasons. Societies of tenants were formed and loans instead of being paid to members were retained by the director and others in lieu of their rental demands. Bad seasons came again. The members sank under this load caused by adversity and added to by human ingenuity.

In the words of the committee "if facts are not faced, if drastic action to rid the movement of make-believe is not taken and if supervision is not made real and effective, the collapse of societies in many other areas is inevitable."

## 11. COMMUNICATIONS AND MARKETING.

The economic changes which have resulted from the introduction of modern means of communication, *viz.*, roads, railways, the post and the telegraph, are seen in the knitting up of internal markets among



themselves and in linking the local to the wider markets of the world. Before 1850, the price of any agricultural staple varied by much more than the costs of transportation from one internal market to another. At the present day it does not. There is a uniformity of price for all markets in the United Provinces. Again, as there was no connection between internal markets, similarly there was none between local and foreign markets. To-day, variations of price in wheat, cotton and oilseeds are felt by the cultivator. Moreover, the means of communications have rendered an exchange of goods easy. The surplus means now so much purchasing power. Formerly, it represented no economic gain. All these changes are, in the main, due to roads and railways, which have been and are influencing, unseen, the traditional economy of the village. The railway lines in the United Provinces are either broad or metre-gauge. In the first category are the East Indian, North Western and the Great Indian Peninsula railways. The East Indian Railway traverses the provinces from south-east to north-west; the North Western passes through the Meerut and Muzaffarnagar districts and the Great Indian Peninsula Railway connects Bundelkhand with Lucknow and Delhi and Allahabad with the Central Provinces.

Among metre gauge railways are (i) the Bengal and North Western, connecting the north-eastern districts with Bengal on one side and Cawnpore, the commercial and industrial centre of the provinces, on the other; (ii) the Rohilkhand and Kumaon Railway bringing into touch the north-west of Oudh, Rohilkhand and the high lands of the Himalayas; and (iii) the Bombay, Baroda and Central India Railway, which passes through the western portion of the province. Mention may also be made of the Shahdara and Saharanpur Light Railway which opens up the rich tract of the country served by the Eastern Jumna Canal. The province is now opened up except in the montane tract in which there are no railways.

The complaints of traders relate mainly to a seasonal shortage of wagons, on account of which agricultural produce is sometimes held up for a few days more than the patience of traders will allow.

The next agency which has facilitated the free circulation of goods is roads. There are at present 7,710 miles of metalled and 27,670 miles of unmetalled roads. The roads fall into two classes, provincial and local, the major portion of the latter being unmetalled. The first class is comprised of the main arteries of communication. The agriculturist relies mainly upon the unmetalled roads of the second class, before he gets on to the principal roads. There is a provincial Board of Communications, the activities of which are handicapped by the absence of funds. Motor traction is slowly coming in. Its progress would be more rapid if finance permitted an active programme of improvement of old, and of construction of new, roads.

The cultivator sells his produce either to the village shopkeeper, to whom he is very often indebted and thus does not get the benefit of free sale in a market, or to itinerant buyers, called *bhartivalas* (literally, corn-gatherers), who also squeeze him out in the matter of a fair price.

Sometimes the cultivator may have sold his crop in advance to big firms dealing in raw produce. These firms may be indigenous or foreign. If the crop is an exhausting one like sugarcane, there is the risk of the cultivator being forced to put his land for a second season in succession under that crop, if he has not been able to deliver the stipulated amount of the produce owing to an unfavourable season. With an increase in his resources and with an improvement of the local roads, the cultivator is getting more and more into the habit of trying his luck in the nearest market, which very often is the headquarters town of the district. In such a market, the cultivator experiences all the influences of distant markets.

The busy months are naturally after the *kharif* and *rabi* harvests. The people with whom the cultivator comes into contact are (1) weighmen, (2) commission agents and (3) dealers. The following particulars are taken from the Census Report of 1921 and are applicable to a market typical of the poorer rural areas. In the market of Mau, in the Jhansi district, Bundelkhand, the weighmen's dues are two pies per rupee for grain and one anna per *maund* for *ghi*. The commission agents charge twelve annas to one rupee for their labour. The rate of net profit may be half to three-quarters of an anna per rupee for wholesale and twice as much for retail dealers. The commodities which the cultivator buys are salt, tobacco, *gur*, kerosine oil, cotton yarn and cloth. The rates of profit are summarised below :—

Commodity	Rate of net profit per cent			
	Wholesale		Retail	
	Rs.	a.	Rs.	a.
(1) Salt .. .. .	3	2	6	4
(2) Tobacco .. .. .	6	4	from 9	6
			to 12	8
(3) Gur .. .. .	from 1	9	from 6	4
	to 6	4	to 11	8
(4) Kerosine oil .. .. .	3	2	4	6
(5) Cotton yarn .. .. .	3	2	6	4
(6) Cotton cloth (imported) .. .. .	6	4	12	8

The value of these figures lies not in their absolute correctness but in the relation which they tend to indicate between wholesale and retail prices. The purchases of the cultivator are retail. Consequently he has to pay far higher prices. The real benefit of an increase in his purchasing power is to be judged in relation to the prices he has to pay.

## 12. LOCAL SELF-GOVERNMENT.

Local self-government includes both municipalities and district boards. District boards only will be considered in this section, as they are mainly concerned with the welfare of the rural population. Under the District Boards Act of 1922, the boards were reconstituted. Their

number is 48; the total sanctioned number of members is 1,503, of whom 1,407 are elected and 96 nominated. All the boards are under non-official chairmen, elected by the vote of members.

The matters to be administered by the boards are laid down in the Act and include, among other things, the construction, repair and maintenance of roads, bridges and other means of communication; the planting and preservation of trees; the establishment, management and maintenance of hospitals, schools, pounds, works of public utility, e.g., ferries, wells, drainage works, etc.; the holding of fairs and shows; and works and measures likely to promote the health, comfort and convenience of the public.

The income of the boards, exclusive of balances for the year ending March 31st, 1926, was 190·84 lakhs of rupees and the total expenditure 191·41 lakhs. The main sources of income were (i) government grants, (ii) local rates and (iii) receipts from pounds, ferries and schools. Grants-in-aid amounted to Rs. 85 lakhs and Rs. 72·37 lakhs were raised from local rates. The bulk of the expenditure was on education, Rs. 95·39 lakhs; public works (i.e. engineer, staff, roads and buildings), Rs. 48·46 lakhs; medical relief, Rs. 18·44 lakhs; public health, Rs. 5·74 lakhs; veterinary assistance, Rs. 2·94 lakhs, apart from Rs. 10·15 lakhs for general administration and collection charges.

*Panchayats* were constituted in the United Provinces under Act VI of 1920, mainly for the purpose of providing the villages with local courts and checking the volume of litigation in the courts of the stipendiary magistrates and the munsifs. The *panchayats* in the United Provinces are almost entirely judicial in character and very little use has hitherto been made of *panchayats* for village administration. Nor is the *panchayat* supported in any effective way by powers for raising a village rate. The *panchayats* discharge their official duties and their income consists mainly of fines which are imposed and realised by them. The question of developing an administrative *panchayat* is now being specially considered. Departmental or special committees at headquarters of the district boards have met with success.

The district boards held in the year 1925-26 altogether 945 meetings. There is a tendency to multiply their number. This practice is inconvenient and expensive; it discourages regularity in attendance and is largely responsible for the great number of abortive and adjourned meetings. The average percentage of attendance in 1925-26 was 62·60.

The incidence of taxation was Re. 0-2-8 and of income Re. 0-7-10 per head of the total population in 1925-26.

### 13. PUBLIC HEALTH AND SANITATION.

Until 1919, the Public Health Department consisted of a Director, four assistant directors for general duty and one assistant director for work on malaria. There was no whole-time personnel working in rural areas except the staff for vaccination. Civil surgeons were supposed to look after prevention, as well as cure, of disease in such areas.

Twenty-six of the forty-eight districts have now been brought under the district health scheme which will be extended to the remaining districts as funds allow, and as doctors and sanitary inspectors who have passed the special public health course become available. The province is now completing a fully equipped hygiene institute which gives complete facilities for the training of men in adequate numbers. As funds allow, a trained health staff will then be appointed to the remaining districts and a supplementary staff will be attached to those districts which are already under the health scheme.

The object of the health scheme is that public health questions in each district should be directly in charge of a specially trained medical officer who will be able to instruct the local boards in public health duties and by practical work carry out health propoganda all through the district. The district medical officer of health has one assistant and, in later stages, will have more than one. He also has a trained sanitary inspector for each subdivision, and a special gang of workmen at his disposal. Travelling dispensaries are attached to the district staff for special duty in the case of plague.

The district health staff have been appointed at first in those districts which are specially liable to epidemics of cholera and plague. Their services in checking cholera epidemics have already been most marked and the incidence of cholera mortality has been reduced to half the figure at which it stood five years ago. Epidemic work is under the direct charge of the Collector of the district and arrangements are made by which the subordinate revenue staff and the village watchmen assist the public health staff in reporting and in dealing promptly with the outbreak of any epidemic. It may be mentioned that this epidemic work is in addition to that which is done by the Public Health Department at the big fairs and on occasions when large bodies of pilgrims move about the province.

The district health staff are also intended to devote much time to village sanitation. They are systematically examining each village. They are introducing more sanitary methods of disposing of sullage water, they are teaching the villagers to copy these methods themselves, to clean up waste spaces and to remove manure heaps to a more suitable distance from the inhabited sites. They examine the condition of the wells in each village and are steadily taking action to improve these wells and to protect them from pollution. The simple measures which the public health staff are taking have already had considerable effect and are appreciated by the villagers though the latter are not as yet prepared in many cases to spend money or labour on this class of improvement. Progress is, however, being made and the example will, it is hoped, spread gradually over the province.

For the cure of disease there are fixed dispensaries in every district but their number is low and seldom exceeds ten dispensaries for a rural population of a million. These dispensaries are staffed partly by government servants and partly by district board officers all of whom have received training in the medical colleges and schools of the province.

The expansion of dispensaries is checked by the lack of funds, but a general scheme is slowly being put into operation by which, if the district board contribute half the cost, recurring and non-recurring, of a dispensary, the Government contribute the remainder. This applies also to dispensaries founded by philanthropists; a few dispensaries are added every year by the bequests or grants of private individuals. The larger towns have their dispensaries, but there are still a number of small towns which have at present no dispensary and, as has been indicated, the village population is far from adequately served with medical relief. Special attention has been given to the reduction in the cost of buildings in order that the limited funds at the disposal of Government and the boards may be used as widely and effectively as possible. Another scheme in which assistance is given from provincial revenues is intended to establish doctors in the outlying villages, but this so far has not met with any general success as the doctors are usually unwilling to leave the towns and settle in the rural area.

The central administration of public health now comprises a Director, three assistant directors in charge of ranges, and three assistant directors in charge respectively of the malariology branch and the training at the research institute of hygiene and the publicity bureau.

The institute has two lecturers and there are two other medical officers at the bureau in addition to the assistant director. The bureau occupies itself with preparing short stories and lessons, posters, sets of magic lantern slides, for distribution to all public health officials and travelling dispensaries. The lines of future development are indicated by the intention to divide the rural areas into blocks of convenient size, to replace travelling by fixed dispensaries for the cure, and to station a public health staff for the prevention, of disease. It will then be possible to undertake active propaganda work for removing from the rural population the fatalism which is responsible for so much misery, low efficiency and low output.

The chief causes of ill-health are (i) malaria, (ii) cholera, (iii) plague, (iv) small-pox, (v) other infectious diseases and (vi) respiratory and intestinal disorders. Cholera, plague and small-pox are short and sharp in their devastation.

The general death rate is two-and-a-half times as high as in the United Kingdom. The average excess of the birth over the death rate is 6 per mille. With this rate of increase, population should multiply considerably but it is kept down by epidemics of one kind or another. The influenza outbreaks carried off millions in a few days.

Apart from these epidemics with their terrible destruction, the chief cause of much chronic health and debility is malaria. It is prevalent all over the United Provinces but is much worse in some districts than in others. About one million are reported to die every year of malaria. There are reasons for supposing that this estimate errs considerably on the side of excess, as the village watchman ascribes every case of death which he cannot understand to malaria. Making allowance for such errors, the death rate cannot be less than one hundred thousand

from this cause, which, in addition, is responsible for a considerable proportion of deaths, as a predisposing cause for other diseases ending in death.

One-fourth of the total population of 45 millions get two attacks of malaria every year and only one per cent receive proper quinine treatment. Twenty-five per cent of the population are totally incapacitated for work for two months, besides having a lowered vitality for the rest of the year. The loss of efficiency for the workers, estimated at 18 millions in a total agricultural population of 35 millions, is put down at fifty per cent.

The chief requirement for an effective programme of combating this disease is a very much larger quantity of quinine available at a very much lower price. In 1921, the total stock available for the whole of India was 160 thousand pounds. Double this quantity would be required for the United Provinces alone.

The price of quinine is high and the supplies are totally inadequate. The rural population is now aware of the great efficacy of quinine, but high prices and limited stocks are restricting its more extensive use.

The other measures, the adoption of which would considerably lessen the incidence of malaria, are : (i) proper drainage schemes for the whole province ; (ii) filling in of shallow depressions near every village ; (iii) inducing the cultivator to keep his irrigation channels clean ; (iv) proper draining of valuable agricultural land.

Above all, the villager has to be educated and convinced by effective propaganda, so as to create in him the will to make small improvements himself, the labour cost of which would be trifling.

Hookworm is another agent responsible for lowered vitality. The moist eastern districts suffer much more than the dry western districts. About eighty-six per cent of the people in the eastern districts are infected. The incidence of infection becomes less as one proceeds from east to west. Leather foot-wear is the best protection.

Dysentery is another disease which lowers vitality and hence productive efficiency. Better methods of storing manure and proper attention to keeping the drinking water pure in wells should reduce the prevalence of this disease. Powers of taxation have been given to villages with a population of over 2,000 to improve their water supply under the provisions of the Village Sanitation Act.

Grants are also made by Government. Only a very small amount is raised by taxation in villages to which the Act has been applied. For improving the water supply in all the villages, a much greater amount would have to be raised by taxation. The villager has not reached the stage at which he can realise the benefits of improvements so keenly that he is willing to pay for them himself.

## GLOSSARY

Abadi	..	..	A village site, an inhabited area; also, settled, cultivated.
Abwab	..	..	An illegal addition to rent demanded by a superior from an inferior holder of land.
Adatya	..	..	A commission agent or broker.
Ain	..	..	Rent-paying value.
Al	..	..	The Indian mulberry ( <i>Morinda citrifolia</i> ).
Aman	..	..	A long-stemmed variety of rice.
Anna	..	..	One-sixteenth of a rupee; equivalent to 1½ d. at the exchange rate of one and six pence to the rupee.
Arain	..	..	A tribe of market gardeners, mostly Muslim.
Arhar	..	..	A variety of pulse ( <i>Cajanus indicus</i> ).
Arisi	..	..	Rice ( <i>Oryza sativa</i> ).
Asra	..	..	A coarse variety of rice grown in Assam.
Aus	..	..	Summer rice, generally sown on high land.
Babul	..	..	A common tree ( <i>Acacia arabica</i> ).
Bahan	..	..	A large deciduous tree met with on the banks of the Indus in Sind ( <i>Populus euphratica</i> ).
Bajra (Bajri)	..	..	A small millet ( <i>Pennisetum typhoideum</i> ).
Bania	..	..	A Hindu trader who is generally also a moneylender.
Bara	..	..	Land containing a high percentage of salt.
Barani	..	..	Unirrigated land depending on rain for its water supply.
Bargadar	..	..	A cultivator who pays his landlord a fixed share of the produce as rent.
Barind	..	..	A tract of high land extending through certain districts in the north of Bengal.
Basmati	..	..	A fine variety of summer rice.
Bazaar	..	..	A market.
Beldar	..	..	A labourer.
Berseem	..	..	Egyptian clover ( <i>Trifolium alexandrinum</i> ).
Bhadralog	..	..	Gentleman.
Bhartiwala	..	..	Literally, a corn gatherer; an itinerant buyer of agricultural produce.
Bhur	..	..	Sandy soil.
Bigha	..	..	A measure of land varying widely; the standard bigha is generally five-eighths of an acre.
Birpak	..	..	An improved variety of <i>asra</i> (coarse rice).
Boro	..	..	A variety of rice transplanted in January and harvested in March; grown in marshy land.
Brahmin	..	..	The priestly caste amongst the Hindus.
Bund	..	..	A dam, a field embankment.
Charkhi	..	..	A lever used in raising water.
Chavdi (or chawadi)	..	..	A shelter house for travellers.
Chettyar	..	..	A moneylender.
Chiki	..	..	Hard muddy soil.
Chipari	..	..	Marshy land, left more or less dry by a river changing its course.

Cholam	..	..	The large millet ( <i>Andropogon sorghum</i> ).
Chowkidar	..	..	A village watchman.
Chupatti	..	..	A cake of unleavened bread.
Crore	..	..	Ten millions.
Cumbu	..	..	A millet ( <i>Pennisetum typhoideum</i> ).
Dahia	..	..	A heavy yielding variety of rice in Bihar and O.
Dai	..	..	A midwife.
Dalal	..	..	An agent or broker.
Dalali	..	..	Brokerage.
Dasar	..	..	A soft or light coloured but productive soil.
Desi	..	..	Native to the country; indigenous.
Dhaincha	..	..	A leguminous fibre plant often grown for manuring ( <i>Sesbania aculeata</i> ).
Dhenkli	..	..	A lever used in raising water.
Dhub	..	..	Couch grass ( <i>Cynodon dactylon</i> ).
Diara	..	..	A low-lying moist area near a river.
Doab	..	..	The tract between two rivers.
Domat	..	..	Loam.
Drammar	..	..	Soil with a thin surface layer of sand.
Firka	..	..	A group of villages in Madras, forming the circle charge of a revenue inspector.
Ganja	..	..	The unfertilised flowers of the cultivated hemp plant ( <i>Cannabis sativa</i> ); used for smoke.
Gaonbura	..	..	A village headman.
Gas	..	..	Light loam.
Gaungbaung	..	..	The Burman silken head covering.
Georgesail	..	..	An improved variety of rice grown in Assam.
Ghi	..	..	Clarified butter.
Gola	..	..	A grain store.
Gowshala	..	..	A refuge home for cattle.
Guar	..	..	Cluster bean ( <i>Cyamopsis psoralioides</i> ).
Gur	..	..	Unrefined Indian sugar; jaggery.
Haor	..	..	A hollow.
Hari	..	..	A peasant.
Hat	..	..	A market (held on fixed days in the week).
Huri	..	..	A tree plantation or reserve.
Inam	..	..	A grant of land wholly or partially rent free.
Indrasail	..	..	An improved variety of paddy grown mainly in Bengal, Bihar and Orissa, and Assam.
Jahagirdar	..	..	The holder of an assignment of land revenue.
Jamabandi	..	..	An annual account of lands held in a village and the amount of land revenue due on them.
Jamadar	..	..	An officer subordinate to the Agricultural Assistant in the Central Provinces.
Jari	..	..	A mixture of varieties of cotton belonging principally to the <i>Gossypium neglectum</i> group.
Jat	..	..	A cultivating class inhabiting North India.
Jazail	..	..	An old match-lock gun.



Jhil	..	..	A natural lake or swamp.
Jhum	..	..	Shifting cultivation in jungle clearings.
Juar (jowar)	..	..	The large millet ( <i>Andropogon sorghum</i> ).
Kabar	..	..	A type of stiff black soil.
Kacha	..	..	Land resulting from recent inundation.
Kaipad	..	..	Sowing of early and late varieties of rice together.
Kaiya (kyah)	..	..	A class of merchants and traders (Marwaris) coming from Marwar.
Kala-azar	..	..	A malignant fever caused by infection by a parasite ( <i>Leishmania Donovanii</i> ).
Kallar	..	..	Saline efflorescence.
Kamdar	..	..	A fieldman.
Kandi	..	..	A moderate sized, deciduous thorny tree ( <i>Prosopis spicigera</i> ).
Kanji	..	..	Millet gruel.
Kankar	..	..	Nodules of limestone found in the soil.
Kanungo, Quanungo	..	..	A subordinate revenue official.
Kapas	..	..	Cotton with seed still adhering; unginned cotton.
Kar	..	..	Sowing of early and late varieties of rice together.
Karnam	..	..	A village accountant.
Karunganni	..	..	A species of cotton ( <i>Gossypium indicum</i> ).
Katha	..	..	A small tributary.
Khadi	..	..	Home-made cloth.
Khadir	..	..	The low lying moist area near a river.
Khari	..	..	A hard variety of sugarcane.
Kharif	..	..	The autumn harvest; crops sown at the beginning of the rains and reaped from October to December.
Khasera	..	..	A field book.
Khas-mahal	..	..	An estate owned and managed by Government direct.
Khatauni	..	..	A register of cultivating rights; a ledger.
Khel	..	..	A territorial group of communities.
Khudkasht	..	..	Land cultivated by the proprietor himself, for which he pays rent to the whole body of co-sharers.
Khula vesh	..	..	Periodical distribution of land, sometimes also of houses.
Kist	..	..	An instalment of the land revenue.
Korangusamba	..	..	A variety of rice immune to disease.
Korra	..	..	Italian millet ( <i>Setaria italica</i> ).
Kulkarni	..	..	A hereditary village accountant.
Kunbi	..	..	A cultivator.
Kwin	..	..	An arbitrarily fixed area of about 600 acres (in Burma).
Lakh	..	..	One hundred thousand.
Lakhābatta	..	..	An ancient custom in the Chhattisgarh division of the Central Provinces whereby the land was re-distributed periodically in order to ensure to each cultivator a fair share of each class of land in the village.
Lambardar	..	..	A village headman who collects and pays the Government dues of the village and has other duties.
Latisail	..	..	An improved variety of rice.
Lichi	..	..	An evergreen fruit-tree ( <i>Nephelium litchi</i> ).

Longyi	..	..	The dress of the male Burman : a voluminous attire.
Ma-bap	..	..	Literally, mother and father ; a protector.
Mahajan	..	..	A merchant ; a creditor.
Mahal	..	..	A separate unit of land for purposes of revenue.
Mahali	..	..	A disease, a form of phytophthora which affects the fruit of the areca palm.
Mahar	..	..	One of the depressed classes.
Malguzar	..	..	Literally, revenue payer. A term applied to a proprietor or co-sharer in a village held in ordinary proprietary tenure.
Mamlatdar	..	..	A revenue officer in charge of a taluka (a revenue division of a district).
Mandi	..	..	A market.
Mandua, Marua	..	..	A small millet ( <i>Eleusine coracana</i> ).
Mar	..	..	Dark and friable black soil.
Matiyar	..	..	Clay.
Mattiwali	..	..	Soil enriched by silt.
Maund	..	..	A weight varying in different localities. The standard (railway) maund is 82·88 lbs.
Mauza	..	..	A small group of villages.
Mauzadar	..	..	A revenue collector who generally collects revenue on a commission basis.
Mhote	..	..	A water bag.
Modan	..	..	Hill rice.
Muafi	..	..	Land held free of revenue.
Mukhtiarkar	..	..	A revenue officer in charge of a taluka.
Mullah	..	..	A Muhammadan religious preacher.
Mung	..	..	Green gram ( <i>Phaseolus radiatus</i> ).
Murali aus	..	..	An improved variety of summer rice, grown in Assam.
Naib tahsildar	..	..	Assistant to the revenue officer in charge of a revenue division of a district.
Namasudra	..	..	One of the depressed classes in Bengal.
Nazrana	..	..	A due paid on succession, transfer of land or on certain ceremonial occasions.
Nidhi	..	..	An indigenous banking institution in Madras.
Nullah	..	..	A watercourse.
Ottadam	..	..	Sowing of early and late varieties of rice together.
Paddy	..	..	Unhusked rice ( <i>Oryza sativa</i> ).
Paki	..	..	Hard muddy soil.
Pan	..	..	The betel vine.
Panch	..	..	A member of a <i>panchayat</i> .
Panchayat	..	..	Literally a committee of five. Used to describe an association of any number of persons instituted for objects of an administrative or judicial nature.
Parwa	..	..	A light yellowish loam.
Paso	..	..	A waist cloth.
Patel	..	..	The headman of a ryotwari village.
Patsala	..	..	An indigenous primary school.
Patta	..	..	A document showing the area of land held under it and the revenue payable.

• Pattadar	..	..	A registered holder of ryotwari land.
Patti	..	..	A subdivision.
Patwari	..	..	A village accountant.
Pial	..	..	A verandah.
Podu	..	..	Shifting cultivation in jungle clearings.
Pongal	..	..	A harvest feast.
Punasa	..	..	An early crop.
Pwe	..	..	A theatrical entertainment.
Rab	..	..	The burning of leaves and branches of trees on ground which is being prepared for a seed bed or for sowing generally.
Rabi	..	..	The spring harvest; crops sown in the autumn and reaped at the end of the cold weather.
Ragi	..	..	A small millet ( <i>Eleusine coracana</i> ).
Raja	..	..	A ruling prince.
Rakar	..	..	Bare, denuded, sloping land growing very inferior crops.
Ramayana	..	..	A dramatic epitome of the adventures of Rama.
Rao or Raewari	..	..	Soil enriched by the detritus of hill torrents.
Retli	..	..	Soil with a large admixture of sand.
Roseum	..	..	A coarse short-staple cotton ( <i>Gossypium neglectum roseum</i> ).
Ryot	..	..	A cultivator.
Ryotwari	..	..	A system of tenure under which the cultivator pays the revenue direct to Government.
Sal	..	..	A useful timber tree in Northern India ( <i>Shorea robusta</i> ).
Salami	..	..	A fee payable to a person, generally a zamindar or a landlord, for the recognition of a transaction in property in which he has an interest.
Sanad	..	..	A charter, a certificate of honour.
Sann hemp	..	..	A leguminous fibre ( <i>Crotalaria juncea</i> ).
Sarpanch	..	..	The chief member of a <i>panchayat</i> .
Seer	..	..	A weight (usually 2.057 lbs).
Senji	..	..	A fodder crop ( <i>Melilotus parviflora</i> ).
Shum	..	..	A miser.
Sir	..	..	Home farm land; or land held by the landlord directly in his own management.
Taccavi	..	..	An advance made by Government to cultivators for agricultural purposes.
Tahsil (Tehsil)	..	..	A local revenue division of a district.
Tahsildar	..	..	A revenue officer in charge of a tahsil.
Talati	..	..	A village accountant.
Tali	..	..	A tree largely grown in the north of India ( <i>Dalbergia sissoo</i> ).
Taluka	..	..	A local revenue division of a district.
Tanna	..	..	A variety of sugarcane.
Tapedar	..	..	A village accountant in Sind.
Taungya	..	..	Shifting cultivation in jungle clearings.
Tenai	..	..	Italian millet ( <i>Setaria italica</i> ).
Tila	..	..	An elevated piece of land.

Udu	..	..	The practice of sowing early and late maturing varieties of rice together.
Uppam	..	..	A variety of cotton ( <i>Gossypium herbaceum</i> ).
Usar	..	..	Soil made barren by saline efflorescence.
Viss	..	..	A weight=3.6 lbs.
Wariasi	..	..	Open, sandy soil.
Wunsa	..	..	The amount of paddy set aside for domestic consumption.
Zaid	..	..	Extra crop.
Zail	..	..	A group of villages in a tehsil.
Zaildar	..	..	A revenue officer in charge of a group of villages.
Zam	..	..	A small patch of land, dependent for cultivation upon perennial hill streams.
Zamin	..	..	Land.
Zamindar	..	..	A landowner, a peasant-proprietor.
Zamindari	..	..	An estate; the rights of a zamindar.
Zan	..	..	A woman.
Zar	..	..	Money.

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