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 Bombay. Dept. of Agriculture.
 Annual Report 1941-42

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**ANNUAL REPORT OF THE DEPARTMENT OF
AGRICULTURE, BOMBAY PROVINCE,
1941-42.**

CHAPTER I.

THE AGRICULTURAL YEAR, 1941-42.

CLIMATE AND RAINFALL.

1. The agricultural season of 1941-42 may, in general, be regarded as fair over the greater part of the Province but, judged by crop growth and outturn, it was less satisfactory than the preceding one. The rainfall received during the year was unevenly distributed in most areas both as regards periodicity and locality of precipitations and was characterized by long breaks which militated against satisfactory crop growth. The monsoon commenced somewhat later than normal and, in June, the initial rainfall was generally deficient over large areas of the Province. In the first fortnight of July, however, extremely heavy rains occurred in most tracts with the exception of the south eastern districts and, as a result, cultural operations were impeded and newly germinated crops were damaged. This excessive rainfall early in July was particularly heavy in South Gujarat and in the northern regions of the Konkan where cultivated lands were flooded and, in some places, crops were washed away and destroyed. In the Thana district, plantain and betel-vine gardens were damaged considerably by the heavy rain and wind storms and cocoanut palms were blown down in the Ratnagiri district. From the middle of July, a prolonged break in the rains occurred and lasted for about a month. At mid-August, fairly substantial rainfall occurred in Gujarat, the South Konkan and in the northern and western districts of the Deccan. These rains were useful in promoting crop growth but, unfortunately, a second break in the rains occurred at the end of August and arrested the normal development of the *kharif* crops especially in the eastern districts of the south Deccan and in the Karnatak. Opportune

and welcome rains fell in September and continued until the first week of October and had a beneficial effect in renewing crop vigour and growth. These late rains also facilitated and expedited *rabi* tillage and sowings and gave promise of a successful *rabi* season. However, the absence or inadequacy of later rainfall, combined with other adverse climatic factors such as excessively high temperatures, dry easterly winds, and cloudy dull weather, nullified this early promise and crop outturns from the *rabi* crops were below normal in most areas especially on the lighter types of soils and in the south-eastern districts of the Province. The climatic conditions were also conducive to increased damage to crops by insect pests and plant diseases. Accordingly, as a whole, the agricultural season of 1941-42 proved disappointing especially in the south and east of the Province and, in some areas, scarcity conditions occurred and relief measures had to be undertaken to assist the agriculturists in these areas.

CROP STATISTICS.

2. *Area*.—Taking all crops together, there has been little alteration in the total areas sown in the Province as compared with the preceding decennium. The area under rice was almost stationary being only 2·8 per cent. and 3·4 per cent., respectively, below the area of last year and the average of the preceding ten years. The corresponding figures of reduction in the case of wheat were 10·7 per cent. and 12·0 per cent., respectively, and in the case of *bajri* 6·5 per cent. and 0·2 per cent., respectively. The acreage sown with *jowar* was respectively 6·1 per cent. and 6·5 per cent. above the areas sown during last season and the decennial average.

The area under groundnut showed a reduction of 17·1 per cent. below the acreage of the preceding year, but increased by 13·8 per cent. when compared with the decennial average. The cotton acreage was 3·9 per cent. and 6·4 per cent. above the area sown during last season and the average of the preceding decennium, respectively. Sugarcane area was 2·9 per cent. below last year's acreage but 49·9 per cent. above the average of past decennium.

The table below gives the actual acreage in the Province under the more important crops in the year under report, i.e.,

1941-42, the preceding year 1940-41 and the average acreage of the decennium 1930-31 to 1939-40 :—

No.	Name of the crop.	Acreage in the Bombay Province.		
		1941-42.	1940-41.	Average of decennium 1930-31 to 1939-40.
	<i>Cereals.</i>	Acres.	Acres.	Acres.
1	Rice	1,915,370	1,969,891	1,983,577
2	Wheat	1,563,887	1,751,617	1,777,347
3	Jowar	8,652,249	8,154,090	8,125,423
4	Bajri	3,822,111	4,086,925	3,828,211
	<i>Fibres.</i>			
5	Cotton	4,037,591	3,884,652	3,795,235
	<i>Pulses.</i>			
6	Gram	515,664	584,874	664,115
7	Tur	380,118	412,958	406,970
	<i>Oilseeds.</i>			
8	Groundnut	1,309,610	1,579,823	1,151,111
9	Sesamum	152,408	161,943	179,887
10	Linseed	115,112	111,952	125,234
11	Castorseed	37,638	41,313	53,551
	<i>Miscellaneous.</i>			
12	Sugarcane	113,401	116,836	75,643
13	Tobacco	210,207	173,935	155,300

3. *Production.*—The unsatisfactory nature of the season, noted above, is reflected in the considerable reduction in the estimated production of crops. The yield of rice went down by as much as 20·9 per cent. and 24·5 per cent., respectively, below the yield of the previous year and the decennial average. The corresponding figures of reduction in the case of wheat were 23·3 per cent. and 22·3 per cent., respectively, in the case of *jowar* 6·3 per cent. and 12·4 per cent., respectively, and in the case of *bajri* 12·5 per cent. and 4·8 per cent., respectively.

The outturn of groundnut worked out to 24·2 per cent. below the last year's figure but 1·0 per cent. above the figure of the decennial average. The cotton crop yielded 4·9 per cent. less than in the previous year but the yield was more by about 10·0 per cent. when compared with the average yield of past ten years. The production of *gul* during the year under report was 5·6 per cent. below that of last year but 49·4 per cent. above the decennial average.

The table below gives the yields of the more important crops in the Province in the year under report, i.e., 1941-42, the preceding year 1940-41 and the average yield of the decennium 1930-31 to 1939-40 :—

No.	Name of the crop.	Production of crops in the Bombay Province.		
		1941-42.	1940-41.	Average of decennium 1930-31 to 1939-40.
	<i>Cereals.</i>	Tons.	Tons.	Tons.
1	Rice	634,643	802,295	840,419
2	Wheat	245,071	319,467	315,408
3	Jowar	1,316,846	1,404,651	1,503,255
4	Bajri	457,086	522,385	480,340
	<i>Fibres.</i>	Bales. (400 lbs.)	Bales. (400 lbs.)	Bales. (400 lbs.)
5	Cotton	742,220	780,496	674,852
	<i>Pulses.</i>	Tons.	Tons.	Tons.
6	Gram	70,005	95,819	105,790
7	Tur	91,007	104,347	107,186
	<i>Oilseeds</i>			
8	Groundnut	502,620	662,929	497,556
9	Sesamum	16,641	19,631	20,553
10	Linseed	9,740	11,421	12,444
11	Castorseed	4,882	5,493	7,440
	<i>Miscellaneous.</i>			
12	Sugarcan (Gul)	284,711	301,568	190,545
13	Tobacco	51,317	47,216	34,300

CROP PRICES.

4. The influence of conditions resulting from the economic disturbances due to the War continued to dominate the trend of prices of agricultural produce which, in general, ruled high during the year under report. This upward trend of prices for major agricultural products was intensified and accelerated by the unfavourable climatic conditions which prevailed during the season and which resulted in low crop yields. Further interference with the normal development of agricultural prices resulted from transport difficulties and shortage operation by speculative elements and the general uncertainty in the international situation. As a result, the excessive rise in prices for agricultural produce and the difficulties in distribution necessitated the intervention of Government in the direction of price control and organised distribution of many agricultural products. Detailed information regarding fluctuations in the prices of important agricultural commodities during the year under report is given in Chapter VI of the "Season and Crop Report, Bombay Province, 1941-42" and need not be repeated in this Report.

AGRICULTURAL LEGISLATION.

5. The most important piece of agricultural legislation put into effect during 1941-42 is the Bombay Agricultural Pests and Diseases Act, 1941. This Act provides machinery for enforcing the adoption of measures for the prevention and control of insect pests, plant diseases and noxious weeds injurious to cultivated crops in scheduled areas of the Province. In the past, the efficacy of such preventive and control measures against specific insect pests and plant diseases has been largely nullified by the indifference shown by some cultivators in affected areas and, as a result, it has not been possible to introduce complete and co-ordinated campaigns against such pests and diseases which are essential to their effective prevention and control. Now, under the Act, compulsory powers can be taken by Government to ensure the co-operation of all cultivators in prescribed areas in measures for the control or prevention of damage to crops by insect pests and plant diseases.

During the year under report, the Nawapur Peta was included in the Surat Protected Area under the Cotton Transport Act, 1923, and the provisions of the Bombay Cotton Ginning and Pressing Factories Act, 1925, regarding the prohibition of admixture of cottons of different varieties in cotton ginning and pressing factories have been made applicable to the Surat, South-Surat and Ankleshwar areas and to the districts of Belgaum, Dharwar and Bijapur.

CHAPTER II.

SOIL AND IRRIGATION RESEARCH.

6. *Introduction.*—The most important scientific investigations at present being conducted in the Province into problems relating to the soil and to irrigation of crops are being carried out at Padegaon and Sholapur under the Sugarcane Research Scheme and the Dry Farming Research Scheme, respectively. Both these schemes are substantially assisted by grants from the Imperial Council of Agricultural Research. The former scheme deals with all problems connected with irrigated cultivation, management of soils, crops physiology, etc., with special reference to sugarcane, in the canal tracts of the Deccan, while the latter scheme has been designed for scientific investigation into improved methods of tillage, land management and crop production in "scarcity" areas liable to failure or shortage of rainfall.

A. THE BOMBAY-DECCAN SUGARCANE RESEARCH
SCHEME, PADEGAON.

7. During the year under report, the work of this scheme completed its tenth year and an extension of one year and nine months, i.e., until March, 1944, has been sanctioned by the Imperial Council of Agricultural Research. In the soil physics section, a genetic soil survey of the Girna Canal areas was carried out and the various soil types in that tract were classified and mapped. Studies of the factors resulting in soil exhaustion under continuous cane cropping were continued and, in this connection, the importance of deficiencies in minor elements was indicated. Lysimeter studies on various soil types and on the chemical changes in such soil types as a result of cane growing were carried a stage further. In rotational experiments, the superiority of sann hemp as a rotation crop preceding sugarcane over fallow was confirmed. Similarly, cotton was again found to be superior to groundnut when preceding cane cultivation in a rotational system. Reliable information is now available with regard to cane cultivation on alkali soils, particularly with regard to irrigation and manuring techniques, cane varieties, etc.

In the section devoted to the study of problems relating to crop physiology, the inter-relationship of irrigation and manurial treatment on the cane crop was investigated further and, on some soil types, definite recommendations on this

subject can now be made to cane growers. The effect of varying climatic and environmental conditions on cane yields, maturity and sucrose content, which has been studied over a number of years and crop cycles, has been investigated in detail. Biochemical research work on the mineral nutrition of the cane crop indicated the advantage of manuring with organic phosphate over inorganic phosphatic manures and the value of molasses as a manure was found to increase greatly when neutralised with lime.

In the agricultural management section, complex field experiments on different irrigational and manurial treatments and their combinations have now completed their third year. The relative importance of compost, oilcakes and inorganic manures as sources of N., P. and K in cane cultivation and the optimum quantities in which these manures can be applied for profitable cane production in relation to total irrigation is being investigated. In cane varietal trials, the varieties Co. 428, Co. 440, Co. 443 and Co. 444 have completed three years' tests and two of these, viz., Co. 428 and Co. 443, were supplied to factories for mill tests. In the agricultural management section at the Station, special attention is being given to a careful study of the economics of all improved methods of irrigation, manuring, cultural treatments, etc., evolved as a result of purely scientific investigations, as it is fully realised that any recommendations made to the cane growers as a result of research work done at Padegaon must be justified on economic, no less than on scientific, grounds.

8. *Sub-stations under the Sugarcane Research Scheme, Padegaon, Bombay-Deccan.*—In order to test out the successful results obtained at the main Sugarcane Research Station, Padegaon, on problems connected with cane cultivation, on different soil types and under differing environmental conditions, five sub-stations have been established, one on each of the major soil types found in the Deccan Canal tract. The work done at these sub-stations, which are situated at Lakhmapur, Devlali, Akhuj, Hol and Kopergaon, is financed by a grant made by the Government of India from the proceeds of the Sugar Excise Fund. The results obtained in the first year's working of these sub-stations have given valuable information in regard to the fertility status of the different soil types and have indicated modifications in manurial and irrigational treatments which different soil types may render necessary for successful and profitable cane cultivation.

9. *Genetic Soil Survey Scheme.*—The work of this scheme, which is directed towards the investigation of the technique required for a genetic soil survey in the Canal tracts, is also financed from a subsidy from the Sugar Excise Fund. As a result of experience gained, considerable simplification of the methods of soil survey and soil classification by the genetic method over large areas has been achieved and soil maps indicating soil types and fertility status have been prepared in two factory areas. This information is most valuable in drawing up cultural and manurial programmes. The work of this scheme has made a considerable appeal to the sugar factories in the Deccan and it will be continued on a commercial basis, 10,000 acres of factory land being surveyed and mapped annually at a cost of Rs. 1-8-0 per acre to be paid by the factory managements desirous of having such work done on their estates.

B. THE BOMBAY DRY FARMING RESEARCH SCHEME, SHOLAPUR AND BIJAPUR.

10. The scheme for scientific research into the problems of cultivation in the "scarcity" tracts of the Bombay-Deccan, commonly known as the Bombay Dry Farming Research Scheme, Sholapur and Bijapur, has now completed its eighth year of working. This Scheme is financed jointly by the Imperial Council of Agricultural Research and the Provincial Government.

At Sholapur, the agricultural season was somewhat unsatisfactory both for *kharif* and *rabi* crops as early rains were insufficient and a prolonged break occurred during the crop growing period in the cold weather season. The total rainfall at Sholapur, however, was 22·65" which is only 4" less than the normal at that centre. In general, temperatures were higher than usual. At Bijapur, the season was again bad the total rainfall being only 15·29", i.e., about 66 per cent. of the normal precipitation. In this area, "scarcity" conditions were accentuated as this was the second successive year of inadequate and badly distributed rainfall.

Under the adverse seasonal conditions outlined above, the cultivation technique evolved as a result of the scientific research work done under the Scheme—and known as the "Bombay Dry Farming Method"—again proved its great superiority over the local cultivators' methods, especially on deep and medium deep soils. At Sholapur, the *jowar* crop grown under the improved system of cultivation yielded 367 lbs.

of grain and 526 lbs. fodder per acre in comparison with 85 lbs. grain and 189 lbs. fodder on areas cultivated according to usual local practices. At Bijapur, the corresponding figures were 431 lbs. grain and 636 lbs. fodder as against 234 lbs. grain and 519 lbs. fodder. At Sholapur, cotton grown according to the "Bombay Dry Farming Method" yielded 236 lbs. *kapas* per acre which was over three times the yield obtained by the cultivators' methods. These results, though low in themselves, are highly encouraging under the very adverse conditions of the season and fully confirm the great economic advantages of the improved system of cultivation evolved under the Scheme.

During the year under report, periodic determinations of soil moisture were made and confirmed the utility of the "Bombay Dry Farming Method" in maintaining a higher level of soil moisture in the soils under this improved system of cultivation. In addition, studies of the run-off of rain-water and consequent loss of surface soil from experimental plots under different treatments were continued. Work on murum decomposition and on the water requirements of the *jowar* crop was carried a stage further.

Most interesting and important results were obtained at Sholapur where experimental work on "strip cropping", i.e., the cultivation of crops in bands or strips along the contour lines and across the slopes of fields, was commenced. As a result of the checking of the run-off of rain-water and the increased conservation of soil moisture which this system of field tillage results in, the yields of crops grown as "strip crops" were considerably higher than those obtained on similar soil in fields cultivated under one crop only and, in addition, the effects of soil erosion were negligible over the area under "strip cropping". There is little doubt that the wide-spread introduction of this simple alteration in cultural technique, which involves no additional cost and little, if any, added labour or inconvenience to the cultivators, would go a very long way towards solving the problem of continued loss of soil by erosion in the Deccan tracts.

11. *Sub-stations under the Dry Farming Research Scheme, Sholapur.*—The work done by the scientific staff at the Dry Farming Research Stations at Sholapur and Bijapur has reached a stage when it is essential that the results obtained should be tested out in other "scarcity" tracts in order to ascertain what modifications in the "Bombay Dry Farming System" may be required to adapt it to different soils and varied environmental

conditions. Accordingly, two Dry Farming sub-stations, entirely financed by Government, have been established at (a) Jeur, in the Sholapur district and (b) at Chas, in the Ahmednagar district.

During the year under report, the rainfall failed completely at both these centres and *kharif* crops could not be taken but, in the *rabi* season, the "Bombay Dry Farming System" was applied most successfully and considerably higher yields of *jowar* grain were obtained than those resulting from local and unimproved tillage systems. These sub-stations are also serving as valuable demonstration centres of scientific dry farming to the neighbouring cultivators and, particularly at Chas, the adoption of the improved methods is being undertaken by nearby agriculturists who have been convinced of the utility of the system by the results obtained in crop yields during the year.

CHAPTER III.

BOTANICAL RESEARCH.

12. *Introduction.*—Botanical research on the improvement of the main cultivated crops of the Province constitutes one of the main activities of the Agricultural Department. Such work is in progress at the Agricultural College, Poona, on nearly all the Government Farms in the districts and at a number of research stations and sub-stations throughout the Province. The results of such scientific work have, in many cases, enabled the Department to introduce and extend over wide areas improved varieties of crops which give higher yields per acre or fetch better prices in the market or which achieve both of these objects. The dividend which such scientific work returns to the cultivator is most appreciable and is highly appreciated. For instance, the evolution of "Jarila" cotton and its wide extension in the Khandesh cotton-growing tract is conservatively estimated to have put over 80 lakhs of rupees of additional profit into the pockets of the Khandesh cotton-grower during the past two years, a sum which is equivalent to the total expenditure on the Agricultural Department over the past four years.

13. *Departmental Plant Breeding Committee.*—This Committee has now been working for two years. The Director of Agriculture is Chairman and the Crop Botanist to Government is secretary. The Committee, which met four times during the year under report, is proving a most valuable medium in co-ordinating plans for scientific work on crop improvement throughout the Province and in ensuring full technical examination and guidance in such work at regular intervals. The Committee has already taken steps to standardize methods of field trials of improved crops both on Government Farms and in the districts and has dealt with a wide variety of technical subjects dealing with crop improvement in the Province.

A. Cotton.

14. *Gujarat.*—The work of cotton improvement in Gujarat is centred at Government Research Stations at Surat, Broach and Viramgam. In general, scientific investigations at all these centres is designed towards the evolution of high yielding, high ginning, better stapled and disease resistant varieties of cotton which will give the cotton-growers of the tracts concerned more monetary returns per acre from their cotton cultivation. At Broach and Viramgam, the cotton breeding work is subsidized by grants from the Indian Central Cotton Committee.

15. *Cotton Breeding Work at Surat.*—The main object of the botanical work on the improvement of the cotton crop at Surat is to evolve an improved variety of cotton which will possess the highly valued fibre properties of the existing improved type, i.e., 1027 A.L.F., but which will excel it in yield per acre and in ginning percentage and thus bring increased profit per acre to the Surat cotton-grower. This object has not yet been completely achieved. The nearest approach to the desired variety is an improved strain, known as, Segregate 8-1, which is at present under district trials on cultivators' fields. This new and improved variety is higher yielding and higher ginning than 1027 A.L.F. and is definitely more wilt resistant. All evidence available from yield figures, mill tests, etc., indicate that it will be a more profitable cotton than either 1027 A.L.F. or its inferior quality, but high ginning, rival, viz., 1. A Long Boll.

16. *Broach Cotton Breeding Scheme.*—This scheme, which is subsidized by the Indian Central Cotton Committee, has now completed its ninth year of working. As a result of the scientific work done during that period, two promising segregates, viz., 1-2 and 1-6, have been obtained and are now in the stage of village trials on cultivators' fields. In most of their economic characters, these segregates have shown themselves to be superior to both Broach local and B.D. 8, i.e., the improved variety now being extended by the Agricultural Department in the Broach cotton-growing tract. Other four promising segregates are under trial at the Government Farm, Broach. Further work is in progress with the object of still further improving the quality of the most promising of these segregates by hybridization with quality cottons, e.g., 1027 A.L.F., and of obtaining earlier maturing strains.

17. *Wagad Cotton Breeding Scheme.*—The work of this scheme, also subsidized by the Indian Central Cotton Committee, has been in progress at Viramgam for five years. It aims at the evolution of improved strains of cotton for extension in the Dholleras-Wagad cotton growing area of 13 lakhs of acres, particularly with regard to yield, quality and early maturity. In addition, the scheme is designed to replace the short-stapled local Mathio cotton by an improved Herbaceum type. Botanical work in this tract presents particular difficulties on account of seasonal and environmental conditions but improved strains evolved from (a) local Wagad cotton, by selection and (b) from crosses of Wagad with Surti Broach varieties and Iranian quality cottons have been obtained and are under

study. One improved strain, Segregate 4-1, which proved most promising in large scale variety trials and which has given good results over a number of years at the Government Farm, Viramgam, and in field trials in talukas of the Ahmedabad district, is being released for extension in the Wagad tract. A new sub-station has been opened at Dholka from May, 1942, to facilitate the testing of promising material under a wider range of climatic and environmental conditions.

18. *Kaira Cotton Breeding Scheme*.—In 1939, the Indian Central Cotton Committee sanctioned a scheme for scientific research work on the improvement of the cotton crop in the Kaira district. The work of this scheme, which commenced in July, 1941, is being done at Anand. A preliminary survey of the cottons now grown in the Kaira tract has been made and field selections carried out as a basis for future botanical work. The local cotton crop consists of two distinctly different types, viz., (a) Kanmi cotton, a high-ginning mixture of Goghari types and (b) Rozi cotton, a perennial variety with inferior staple and low lint outturn. There appears to be ample scope for the rapid improvement of the cotton crop in this tract either by selection among local cottons or by the introduction and acclimatization of superior types.

19. *Khandesh—Jalgaon Cotton Breeding Scheme*.—The main object of the Jalgaon Cotton Breeding Scheme which has now completed its fifth year of working and has been extended for a further period of three years, is to evolve a strain of cotton which will be superior to "Jarila" in ginning percentage and, at the same time, will be in no way inferior to that famous improved variety in yield, staple length and wilt resistance. Further selection work in "Dokras" cotton gives promise of progress in this direction. In addition, botanical work on hybrid strains, notably the cross (Jarila \times N.R. 5) and the composite cross [(Jarila \times N.R. 5) \times New Million Dollar], has given cultures which approach "Jarila" in most of their main economic characters and actually surpass it in some. Hybridization work under this scheme is being carried on in collaboration with the Plant Pathologist to Government, Poona, in view of the importance of wilt immunity or resistance in any new variety of cotton found suitable for extension in the Khandesh tracts.

20. *Southern Division—Cotton Breeding Work at Dharwar and Gadag*.—The improvement of the Kumpta and Dharwar American types of cotton grown in the Southern Division of the Province is the main work at these stations which is now

being directed towards the evolution of improved strains of cotton which might replace the improved varieties, Jayawant and Gadag No. 1, which are now widely grown in this tract. The main objects of the botanical investigations are to secure higher yield and ginning percentage and increased disease resistance in the improved varieties. Hybridization work in Kumpta cottons was continued and field trials of promising strains were carried out in the district. A sub-station for scientific work on the improvement of Dharwar American cottons has recently been opened at Gadag with the financial assistance of the Indian Central Cotton Committee.

21. *Scheme for Research in Interspecific Hybridization of Cotton, Surat.*—This scheme, which is financed by the Indian Central Cotton Committee, aims at exploring the possibilities of combining the superior qualities of American cottons with the hardiness, adaptability and disease resistance of Asiatic cottons. Generally, hybrids between the two species, when obtained, are self sterile but fertility has been induced by "back-crossing" to American cottons and by treatment with colchicine. Selections from such fertile back-crosses and newly synthesized polyploid forms obtained as a result of colchicine treatment are now being tested with regard to their economic characters in breeding investigations.

22. *Scheme for breeding of wilt immune varieties of cotton, Poona.*—This scheme, which is now in its fifth year, is financed by the Indian Central Cotton Committee and represents co-operative research work by the Plant Pathologist to Government and Cotton Breeders in the districts. In pot culture tests at Poona, fresh material from Broach back-cross segregates, supplied by the Cotton Breeder, Broach, have been found to be highly wilt resistant and there are good prospects of obtaining 100 per cent. wilt resistant types for the Broach tract. Promising segregates of the cross (Seg. 8-1 \times 1027 A.L.F.), combining high wilt resistance with desirable economic characters, are also under study. Work on the isolation of 100 per cent. wilt resistant strains of Jarila and Gaorani cotton is also in progress.

23. *Trial of long stapled cotton cultivation in the Deccan Canal Tracts.*—In order to test the possibilities of the introduction of long stapled cotton cultivation under canal irrigation in the Deccan Canal tracts, twenty five varieties of long stapled cottons were obtained from Sind, Punjab and Madras and cultivated at the Sugarcane Research Station,

Padegaon, and at its ancillary sub-stations throughout the canal irrigated areas. As a result of this year's experiments, fifteen varieties have been retained for further trial, almost all the American cotton varieties imported suffered severely from red leaf blight.

B. Rice.

24. *Deccan—Rice Breeding Work at Karjat and sub-stations at (a) Vadgaon and (b) Igatpuri.*—The scientific work on rice crop improvement in progress at the Rice Breeding Station, Karjat, and its sub-stations at Vadgaon and Igatpuri is designed to deal with the rice crop in the Deccan tract and in the Thana and Kolaba districts of the Konkan. These areas produce about one half of the total rice production of this Province and, therefore, the importance of such research work is obvious. Such investigations are of particular importance at present as it is probable that any appreciable increase in rice production in this Province must result from the extension of high yielding varieties into general cultivation rather than from any increase in the areas under rice cultivation..

At Karjat, selection work among local rices was continued and the seed of the most promising strains is being multiplied for distribution in the districts after effective village trials have been completed. Useful hybrid material is also now available and further purification and testing are in progress. Special attention is being given to the improvement of the coarse rices of the Thana and Kolaba districts. At the Vadgaon sub-station, selection among scented rices has been commenced. The new rice breeding sub-station at Igatpuri was opened during the year and selection work among the main rice varieties of the Nasik and Ahmednagar districts has been started at this centre. Part of the area is also being utilised for the multiplication of improved rice varieties evolved at Karjat.

25. *Konkan—Rice Breeding Work at Ratnagiri and Kumpta, Government Farms.*—The rice breeding work for the Ratnagiri and Kanara districts, which grow about $4\frac{1}{2}$ lakhs of acres under rice annually, is done at the Government Farms, Kumpta and Ratnagiri. Selection work in paddy varieties of the Ankola-Karwar tract and other types suitable for the coastal tract was continued and promising strains are under further study. Hybridization work between the best Kumpta strains and high-yielding Mugad strains have resulted in five promising crosses being obtained. Village trials of improved Varangal and Waksal rice varieties have confirmed their superiority in yield

over local types and steps are now being taken to multiply and distribute the seed of these improved varieties in the Ratnagiri district.

26. *Southern Maratha Country—Rice Breeding Work at Mugad.*—The improved Dodagya selection, viz., D. 6-2-2, has now fully proved its superiority in yield over local varieties and will be introduced into cultivation in the district. Further yield trials of selections among local fine rices were continued and high yielding strains in early, mid-late and late varieties have now been evolved and are being put under field trial in the rice-growing areas. Hybridization work was continued with the object of combining drought resistance with high yield, earliness and other desirable economic characters and to evolve a strain with purple colouring in leaf and stem to facilitate roguing out of wild rices in the field. Promising segregates, resulting from such work, are under study.

C. Wheat.

27. *Wheat Breeding Work at Niphad.*—There is only one centre in this Province where scientific botanical work on the improvement of the wheat crop is being undertaken. This centre is the Cereal Breeding Station at Niphad in the Nasik district. In view of the fact that the annual acreage under wheat in the Province is well over a million and a half acres, the need for further facilities for scientific work on wheat crop improvement, especially in the Karnatak, is urgent. Trials of the improved wheat, Vijay (Niphad-81), evolved at the Niphad Station, were carried out in the Khandesh, Ahmednagar and Nasik districts during the year. The results indicate that this improved variety is superior to all others in the Ahmednagar and Nasik districts and there is now a large demand for the seed of this variety from these tracts. A new and improved irrigated wheat, viz., Niphad-4, has proved better than Pusa-4 in the canal tracts and its seed is being multiplied for distribution on Kopergaon Government Farm. A special scheme for the genetic improvement of irrigated wheats has recently been sanctioned by Government. The demand for the seed of improved varieties of wheat, evolved in the past at Niphad, continues to increase rapidly and a further extension of the Station area to provide for increased multiplication of the seed of these varieties is most necessary if their extension is to proceed in a regular and ever-expanding system of multiplication and distribution.

D. Other Cereals.

28. At the Cereal Breeding Station, Niphaḍ, the genetic improvement of the *bajri* crop was continued. Three promising improved strains have been evolved as a result of mass selection and group breeding and will be tried out next season in cultivators' fields. A large number of crosses between inbred strains and top crosses are being tested to find out high yielding combinations which may be utilised for the production of hybrid seed. In view of complaints from the districts regarding the damage to the *bajri* crop by birds, work on the evolution of awned types is being taken up.

Scientific botanical work on *jowar* crop improvement is in progress at Viramgam in North Gujarat. The selection, Type 10-2, made from local *jowars* has maintained its superiority over the unselected material and is estimated to give an increased profit of Rs. 8 per acre over the local varieties. The quality of fodder of this improved variety is much appreciated by the cultivators and its seed is being multiplied for distribution to meet the increased demand for it in the districts.

Scientific work on *bajri* improvement to meet Gujarat requirements is in progress at Nadiad and the improved strain No. 207, was tested under cultivators' conditions at fifty-seven centres in all districts of North Gujarat. Its average yield in all these field trials was over 20 per cent higher than the local crop.

Maize breeding work is being done at Dohad in the Broach and Panch Mahals district of Gujarat and at Mohol in the Sholapur district of the Deccan. This work includes both selection and hybridization and promising cultures are now under trial and observation at both centres.

E. Tobacco.

29. The area under tobacco in the Province is approximately two lakhs of acres and this crop is mainly grown in two regions, i.e., Kaira in Gujarat and Belgaum in the Karnatak. Two research stations for scientific work on tobacco cultivation, curing, etc., have been established, one at Nipani in the Belgaum district and the other at Nadiad in the Kaira district. The main lines of work at these centres consist of the evolution of high yielding and superior quality strains from local varieties, experimental work on improved methods of tillage, manuring

and rotational cropping, seed multiplication of improved types and research work on the processing of the tobacco crop after harvesting.

(a) *Nipani*.—Thirty-eight selections made from local varieties of tobacco were studied with regard to yield, growth and economic characters. As the year under report was only the second year of such work, it is being continued. Six varieties of cigarette tobacco were grown and studied with regard to their yield and suitability for cultivation under local conditions. The "Bonanza" variety gave the best performance. No experimental work on curing cigarette tobacco was done as the curing barn has not yet been erected. The work at this centre is now being transferred to Saundalga five miles from Nipani.

(b) *Nadiad*.—The improved variety, K. 49, which has now been released in the district, continued to prove satisfactory and a model seed distribution scheme for its further extension has been approved by the District Rural Development Board, Kaira. Seed sufficient for 7,200 acres was raised under this scheme during the year under report. The improved Kelii selection, K. 24, will be tested under irrigated conditions. Botanical work on the Saijpurii variety of tobacco was continued and selections, No. S 57 and No. S 98, seem promising as high yielders. Owing to excess of sodium salts in the well water, the Nadiad Station is not suitable for the cultivation of cigarette tobacco and the transfer of the botanical work on tobacco in Gujarat from Nadiad to Anand is under consideration.

F. Other Crops.

30. *Linseed*.—The area under linseed in the Province is approximately 1½ lakhs of acres and is capable of much extension especially in the Deccan and Karnatak. Scientific work on the improvement of this crop is financed by grants from the Sir Sassoon David Trust Fund and is carried on under the Economic Botanist to Government. The year under report was the fourth year during which this work has been in progress and further selections from hybrid progenies, combining high yield, earliness and large seed size have been made. Inter-strain crosses between Nasik and Deccan types of linseed have given high yielding progenies. District trials of selected types of Nasik linseed have shown their superiority in outturn over local varieties.

31. *Other Oil-seeds*.—The Economic Botanist to Government is also in charge of an Oil-seed Breeding Scheme, financed by the Sir Sassoon David Trust Fund, an which has now completed its fourth year of working. Selection work in the important oil-seed crops of sesamum, niger-seed and safflower has resulted in individual plants being obtained which combine high yield, high oil percentage and earliness of maturity, all most desirable economic characters in these crops. The most promising of these selections have been retained for further experimental work next year.

At the Cereal Breeding Station, Niphad, the Crop Botanist to Government is undertaking scientific work on the improvement of the *til* and safflower crops and improved high-yielding strains have been obtained by selection. These strains are now being fully tested under district conditions and, if found to continue to maintain their superiority over local varieties, will be multiplied for extension in the districts.

Botanical work on the improvement of the castor crop was continued at Nadiad where further field trials confirmed the superiority of the selections, S-20 and S-5, over local types in regard to yield. A model seed multiplication scheme for the extension of the improved S-20 variety is being organised in the Ahmedabad district.

32. *Gram*.—The famous improved strain of gram, Niphad-816, now renamed "Chafa", continued to give higher yields over the local varieties in the Nasik district. It has also proved superior to the local crop in the Ahmednagar district and has done well both in Khandesh and in Gujarat. Other high yielding selections have been obtained and are under trial. The seed of the improved "Chafa" variety is being multiplied at Niphad as there is a great demand for pure seed as the basis of model seed multiplication schemes in the districts.

33. *Tur*.—Work on this important pulse crop is also in progress at Niphad under the Crop Botanist to Government. The improved strain, T.84, continued to give higher yields than the local varieties. Work on the improvement of *tur* varieties from Khandesh has resulted in promising selections being obtained.

34. *Other Pulses—Scheme for botanical research work on the improvement of pulse crops in the Bombay Province*.—This new scheme, which is financed jointly by the Imperial Council of

Agricultural Research and Government, was commenced during the year. Botanical investigations on *udid* and *mug* are in progress at Jalgaon, on gram and *matki* at Poona, on *kulhi* at Dharwar and on *tur* at Arbhavi. Individual selections from local varieties of all these pulse crops have been made. Special attention is being paid to the evolution of wilt-resistant types of *tur* and gram at Arbhavi and Poona.

35. *Potatoes*.—Varietal trials of different types of potatoes, obtained from all parts of India, were continued in the Poona district under the control of the Plant Pathologist to Government. The "Numbri" variety of potato, from Simla, maintained its superiority over other varieties, both in regard to vigour of growth and yield and this type is obviously well suited for cultivation in the potato-growing tracts of the Deccan. The percentage of loss due to rot was much less in Numbri potatoes stored in pits for over two months than when stored by the ordinary cultivators' methods.

36. *Sugarcane*.—Botanical work on the improvement of sugarcane is not carried on in this Province. At the Sugarcane Research Station, Padegaon, however, varieties of improved cane obtained from other cane-growing tracts of India, notably Coimbatore, are rigidly and scientifically tested in order to determine their respective suitability for extension under different types of cane cultivation, e.g., plant, *adsali* and ratoon, in the Deccan Canal tracts. Two improved Coimbatore varieties, viz., Co. 428 and Co. 443, which gave promising results at the Padegaon Station, have now been given out for field and mill trials on the estates of two sugarcane factories. Other improved varieties are under test at Padegaon.

37. *Agave (Sisal)*.—In May, 1941, a scheme for experimental work on agave cultivation was sanctioned by Government. Suckers of *agave sisalana* and *agave cantala* have been collected from all parts of the Province and from other Provinces and planted on the Government Farms at Dohad, Poona, Dharwar and Kumpta.

G. Grazing and Fodder Crops.

38. The scheme for research work on Rotational Grazing and Ecology of Forest Grasses, sanctioned by the Imperial Council of Agricultural Research, could not be commenced during the year under report but will be started shortly.

Trials on the acclimatization of exotic grasses and leguminous fodder crops were continued in large scale plots during the year.

Tests of the palatability and feeding value of Giant Star Grass are in progress.

39. *Provincial Fodder and Grazing Committee.*—This Committee held one meeting during the year under report. The main items discussed were (a) a proposed survey of grass lands and fodder resources in three selected talukas and (b) the establishment of Grass Breeding Stations in the Province.

In the districts, eighteen District Fodder and Grazing Committees have now been established and nine of these met and discussed local problems relating to grass land and fodder crop improvement, storage of fodder, preparation of silage, tree planting, etc.

CHAPTER IV.

CROP PROTECTION.

40. *Introduction.*—The annual loss to the cultivators of the Province as a result of the damage and destruction caused to crops by the attack of insect pests and plant diseases is immense. Much of this loss is avoidable as scientific investigation and research work have devised effective and economic measures for the prevention and control of many of the most important and destructive of these pests and diseases. While much more scientific work on the elimination and control of crop pests and diseases is essential and urgent, the time is now fully ripe for the establishment of a wide spread expert organisation in the districts to enable timely action to be taken in the early stages of attack on crops by insect pests and plant diseases, to advise and assist cultivators in the application of preventive and control measures and to organise and conduct widespread and intensive campaigns against these enemies of crop production when and where they are most vulnerable. Such an organisation would return large dividends on whatever expenditure might be required for its establishment and working.

41. *Departmental Insect Pest and Plant Disease Committee.*—This departmental committee, which was established in 1938, has now held 36 meetings, six of which were held during the year under report. At these meetings, a large and varied number of subjects relating to insect and disease attack on cultivated crops were discussed and necessary action decided upon. Among important subjects considered by the Committee, mention may be made of (a) the scheme for the organisation and extension of preventive and control measures against insect pests and plant diseases of crops in various districts of the Province, (b) arrangements for the fumigation of imported plant material at Bombay, and (c) the Bombay Agricultural Pests and Diseases Act, 1941, and rules thereunder which it is proposed to apply against the cotton boll-worm (*Earias* spp.) in the Surat and Broach and Panch Mahals districts of Gujarat and the sugarcane grasshopper (*Hieroglyphus banian* var. *elongata*) in the Deccan Canal tracts.

A. Research Work.

42. *Against crop diseases.*—The Plant Pathologist to Government continued to carry on a large programme of

scientific investigation on the prevention and control of a wide and varied number of plant diseases affecting all types of cultivated crops in the Province. Some of the major items of such work are being done under schemes, financed or subsidized by the Imperial Council of Agricultural Research, the Indian Central Cotton Committee, etc. Other work is met by expenditure from his ordinary departmental grants. The Economic Botanist to Government is also engaged on similar work in connection with "striga" attack on *jowar* and "orobanche" attack on tobacco. Details of the progress made in such investigations can be found in the Summaries of Work done under these officers (Appendices J and K) and only brief notes on important items of work are given below.

43. *Plant Virus Disease Research Scheme*.—This scientific research scheme, which is designed to obtain fundamental information of plant virus diseases in India, is financed by the Imperial Council of Agricultural Research and has been in force for a period of three years. During the year under report, special investigations have been carried out in connection with the cotton white-fly as a vector of yellow vein mosaic virus in *bhendi* and, by a special technique, a study of the movement of the virus in the plant tissues after inoculation has been made. Interesting and valuable observations on the physiology of affected plants were completed. The virus of "Katte" disease of cardamum, which causes much damage in the spice gardens of the Kanara district, has not yet been found to be transmissible by sap inoculation but plants grown in sterile soil from surface sterilized rhizomes taken from diseased plants have shown symptoms typical of the disease.

44. *Wheat Rust Research Scheme*.—This research scheme, which is financed by the Imperial Council of Agricultural Research, was started in September, 1941. Its main object is to test the reactions of different strains of wheat to black rust and the work is part of a co-ordinated all-India scheme of investigation in rust disease attack on wheat. The work is done for part of the year at Mahableshwar and, for the remaining period, at Poona and is supervised by the Plant Pathologist to Government. Single spore cultures of seven physiologic races of black rust were obtained and maintained in the laboratories at Mahableshwar and wheat samples have been received from the Central Provinces and Berar and from

this Province for testing. Some of these samples have been found to be resistant to six races of rust, prevalent in India, in the seedling stage.

45. *Striga Research Scheme*.—This scheme, financed by the Imperial Council of Agricultural Research and conducted by the Economic Botanist to Government at Poona, has now completed its fourth year of working. The main line of work has been the selection of strains of *jowar* resistant to "striga" attack and, in addition to the resistant varieties "Bilichigan" and "Muddinandyal" mentioned in last year's report, three other varieties, viz., "Bcnganhila", "Yanzingyi Kalyapyang" and "Kyanktain Kalapyang", have been found to possess a high degree of resistance in field and pot tests. Further tests under controlled temperative conditions are in progress.

46. *Research work on Orobanche*.—Twenty-one species of *Nicotiana* and nineteen tobacco varieties were tested for resistance to "orobanche" attack and a few resistant plants were obtained. Experimental work on the control of "orobanche" by applications of fertilisers and weedicides were conducted and the effect of sulphuric acid and "Atlacide" in low concentrations was found to be promising. The work of this research scheme is financed by grants from the Sir Sassoon David Trust Fund and is now in its first year.

47. *Miscellaneous research work on plant diseases*.—(a) *Fusarium wilt on sann hemp*.—The wilt immune strain, D-IX, is being maintained and its seed multiplied. The mode of inheritance of wilt resistance in sann hemp is under study.

(b) *Wilt in Lathyrus sativus*.—Progenies of the Indore culture, T-2-1, were found to be completely free from wilt and this culture, which is homozygous for 100 per cent wilt resistance, will now be grown under village trials in the Broach and Panch Mahals district. Further testing of other strains showing a high degree of wilt resistance was continued in pot culture in the greenhouse.

(c) *Koleroga disease on arecanut palms*.—It is now confirmed that latent infection may be harboured on apparently normal trees and that such infection manifests itself as necrotic areas on leaf sheaths on the approach of the rainy season. Study of aëroscope slides indicates that the range of dissemination of the fungus is limited. Demonstrations of methods of control

of the disease by the destruction of dead or dying tops of arecanut palms, the removal and burning of affected leaf sheaths from palms harbouring latent infection and by spraying with Bordeaux mixture of infected trees only in order to localise the infection were carried out in a 25-acre garden area and proved most successful.

(d) "*Damping off*" in tobacco seed beds.—The disinfection of the soil with different fungicides was investigated and, in this connection, definite concentrations of Peronex J.29 and of Bordeaux mixture were found most effective.

(e) *Fusarium wilt* in tur and gram.—Some strains in gram which hold out promise of high resistance to wilt attack have been obtained in Dohad and Nagpur varieties. No resistant strain of tur has yet been isolated.

(f) *Miscellaneous*.—Further experimental work was continued on numerous other plant diseases including "soft rot" of ginger, chrysanthemum rust, "black spot" of mango, root rot of Lathyrus sativus and others.

48. *Against insect pests*.—Scientific investigations into the prevention and control of insect pest damage on the major crops of the Province is being carried out by the Professor of Entomology, Agricultural College, Poona and, with regard to sugarcane pests, at the Sugarcane Research Station, Padegaon.

At Poona, experimental work on the control of fruit flies with "clensel" traps and poison sprays resulted in a considerable reduction of affected fruits in the treated areas.

The serious insect pest of the mango, the mango hopper, was not so acute during the year under report but a study of the different species occurring in different localities was made. The species *I. clypealis* appears to be most susceptible to the effect of sulphur dusting as a control measure compared with other species which are more resistant to this treatment.

49. Two scientific research investigations into the control of insect pests are being financed by grants from the Sir Sassoon David Trust Fund. These schemes deal with the grape-vine beetle and the beetle-vine bug and are being conducted at Nasik and Bassein, respectively. Large scale field trials of spraying with different insecticides against the betel-vine

bug were carried out over an area of six acres at Bassein and the use of tobacco extract was found to be most effective and economical. Simple mechanical methods of controlling grape-vine beetle attack, e.g., by shaking the vines in the early morning and dislodging the beetles into trays for subsequent destruction, were found to be cheap and effective. Other methods of control are under investigation.

50. *Scheme for regional survey of borer pests on sugarcane.*— This scheme, which is part of an all-India investigation financed by the Imperial Council of Agricultural Research, was closed down at the end of November, 1941. It has been found that *Argyna stictiscraspis* Hmps. is the major borer pest on sugarcane in the Deccan Canal Tracts. The top shoot borer, i.e., *Scirpophaga* spp., appears to be on the increase in this area. A new scheme for the biological control of borers by *Trichogramma* colonization has now been sanctioned by the Imperial Council of Agricultural Research and commenced working at the Kalamb Sugar Factory estates in May, 1942.

B. Extension and Development Work.

51. As in previous years the Plant Pathologist to Government and the Professor of Entomology dealt with a large number of enquiries from the public covering a wide range of subjects relating to plant diseases and insect pests on crops. Demonstrations of practical methods of prevention and control against specific diseases and pests were organised and carried out in different parts of the Province. Special demonstrations of control measures against hairy caterpillar (*katra*) were carried out in the Kaira district of Gujarat but the unprecedented rains which fell in June prevented any serious outbreak of this insect pest. In all districts, the Plant Pathologist to Government, the Professor of Entomology and their staffs co-operated fully with the Revenue and rural development staff in various items of work connected with insect and pest prevention and control.

CHAPTER V.

SEED SUPPLY.

52. *Introduction.*—The organization of the multiplication and distribution of seed of improved varieties of crops is an essential and logical sequence to successful botanical research work in crop improvement. Consequently, such activities form a very important part of the duties of the Agricultural Department. In the Province, there are five organised schemes for the regular multiplication and extension of the seed of improved varieties of cotton, to which work large financial grants are made by the Indian Central Cotton Cotton. The multiplication and distribution of seed of improved varieties of other crops, e.g., cereals, pulses and oilseeds, offer rather more difficulty than in cotton as in most of these crops the seed is the main marketable or consumable item of produce and storage problems are more complicated and acute. The extension of improved varieties of these crops, however, is essential to the increased welfare of the cultivators and is one of the most popular and most appreciated form of departmental activities. During the year under report, a promising start has been made in several districts with "Model Seed Multiplication and Distribution Schemes" designed to place on an organised and progressive basis, the extension of the pure seed of improved varieties of crops, other than cotton. In many cases, these "Model Schemes" are being sponsored by District Rural Development Boards and the Revenue, Agricultural and Co-operative Departments are co-operating in their successful working. The assistance of non-official workers as "registered seed growers" in all seed multiplication schemes is essential to adequate development of such work and it is encouraging to find that such help is usually forthcoming to a sufficient extent in all districts where seed multiplication and distribution schemes are operating.

A. Cotton.

53. *Khandesh—Jarila Cotton Seed Multiplication and Distribution Scheme.*—The work under this Scheme, which assisted by a grant from the Indian Central Cotton Committee, has now completed its fifth year. The nucleus pure seed produced at Jalgaon and Bhadgaon Farms under strict departmental supervision, amounted to over 57,000 lbs. which were supplied to the Cotton Superintendent, Khandesh, for further multiplication on the lands of registered seed-growers in the

districts. The area organised by the Department for seed multiplication in the latter stages of the Scheme (III, IV and V) was 41,700 acres and 10,40,000 lbs. (8,000 bags) of seed were stocked by the Department for further distribution next season. In addition, stockists, working in co-operation with the Department, stocked 7,80,000 lbs. (6,000 bags). These amounts will suffice for a controlled area of about 90,000 acres in 1942-43.

A notable feature of the working of the scheme during the year under report was the most valuable co-operation and assistance rendered by co-operative organisations in the work of seed multiplication and distribution. The East Khandesh Central Co-operative Bank Limited, the branches of the Bombay Provincial Co-operative Bank, Limited, in Khandesh and Nasik, the Co-operative Cotton Sale Society, Yawal, the Co-operative Credit Society, Mhasavad, and the Taluka Co-operative Development Associations at many centres worked as "approved agents" and stocked over 33,000 bags of seed for distribution to cotton-growers. In addition to the controlled distribution mentioned above, it is estimated that about 4,000 bags of Jarila seed from the reserved area were specially stored and distributed by private individuals, i.e., gin-owners, landlords, merchants, etc.

In the next season, i.e., 1942-43, the area grown under controlled seed is estimated to be not less than 3,15,000 acres and it is confidently anticipated that Jarila cotton will have spread completely over the Khandesh cotton-growing tracts by 1944.

54. *Deccan Canals—Cotton Seed (Banilla) Multiplication and Distribution Scheme.*—The work of this Scheme, which is assisted by the Indian Central Cotton Committee, has now been in force for three years. Owing to the susceptibility of the Banilla variety to wilt attack, the seed now being distributed under this Scheme is that of Jarila which is well suited for cultivation in the irrigated areas. 550 acres of Banilla cotton were grown from seed supplied departmentally, the average yield of seed cotton being 800 lbs. per acre. The work of this Scheme is being held in abeyance owing to the urgent need to concentrate all efforts on food crop production, rather than cotton cultivation, in the Deccan Canal tracts.

55. *Gujarat—(a) 1027 A.L.F. Cotton Seed Multiplication and Distribution Scheme.*—During the year under report, the staff of the Agricultural Department engaged in the work of

this Scheme controlled 27,000 acres of pure 1027 A.L.F. for seed multiplication purposes and stocked and distributed 10,38,800 lbs. of seed of this improved stapled cotton. In addition, 14,38,500 lbs. of 1027 A.L.F. seed were sent to Rajpipla and Chhota Udepur States. The total area covered with 1027 A.L.F. cotton in British India was 70,000 acres during the year, a reduction of 30,000 acres on the previous year which was due to a reversion on the part of certain Cotton Sale Societies and growers to the high ginning but inferior quality cotton, viz., Surat I.A.

(b) *B.D. 8 Cotton Seed Multiplication and Distribution Scheme*.—This scheme is operating in the Broach and Panch Mahals district in which 1,07,600 lbs. of pure B.D. 8 cotton seed was stored and distributed during the year. The area covered with this improved variety was 13,200 acres, an increase of 3,000 acres over the previous year.

Both the above-noted schemes are assisted by financial subsidies given by the Indian Central Cotton Committee.

56. *Southern Maratha Country—Jayawant and Gadag No. 1 Cotton Seed Multiplication and Distribution Scheme*.—This scheme, which is financed jointly by the Indian Central Cotton Committee and Government, completed its sixth year of working as a revised and extended scheme. With regard to the improved variety of Kumpta cotton, viz., Jayawant, reserved seed growing areas amounting in all to 96,400 acres were organised and, for the greater part, “rogued” to ensure purity of seed. The area covered with the improved variety from departmentally controlled seed was 6,75,000 acres but a further area of about 1,34,000 acres resulted from natural spread. The multiplication and distribution work was largely done through “approved agents” working in co-operation with departmental staff. In all, 74,08,400 lbs. of Jayawant seed were stocked for distribution.

With regard to the improved Dharwar-American cotton, viz., Gadag No. 1, the work of seed multiplication and distribution was organised on similar lines. The reserved seed growing areas totalled 30,000 acres and the area covered with the improved variety exceeded 1,50,000 acres from departmental seed and 35,000 acres as a result of natural spread. 15,92,000 lbs. of Gadag No. 1 seed were stocked for distribution.

B. Rice.

57. In the Northern Division of the Province, Model Seed Multiplication and Distribution Schemes have been organised for the wider extension of improved rice varieties in the Thana, Kolaba and the Bombay Suburban districts. These schemes are just in their initial stages but are expected to give valuable results in the course of a few years. Similarly, in the Southern Division, a Model Scheme for improved rice seed multiplication and distribution has been commenced in the Belgaum district and is now in its second year. The departmental staff supplied 22,800 lbs. of seed of improved rice varieties to growers working under this scheme.

58. Various improved strains of Kolamba and Zinya rices were multiplied at the Rice Breeding Station, Karjat, and at its sub-station at Igatpuri. Altogether, 11,450 lbs. of pure rice seed were distributed from these centres for further multiplication in the districts. In addition, the Crop Botanist to Government purchased about 14,500 lbs. of pure rice seed from approved growers to supplement the supply available from Government Stations.

In the Konkan, 38,600 lbs. of pure seed of improved rice varieties were produced on the Kumta and Ratnagiri Farms and supplied to agencies in the districts for further multiplication on organised lines.

C. Millets (Jowar and Bajri).

59. In several districts, Model Seed Multiplication and Distribution Schemes for the extension of improved varieties of *jowar* and *bajri* have been adopted by District Rural Development Boards. Under such schemes, the improved *bajri* variety, No. 207, is being extended into general cultivation in the Ahmedabad and Kaira districts, 66,220 lbs. of seed sufficient for 9,460 acres being raised during the year. In the Broach and Panch Mahals district and in the Surat district, similar schemes are now in force for the multiplication and distribution of the improved varieties of *jowar*, viz., *rabi jowar* No. 8 and *Budh Perio jowar* No. 53. In the Southern Division, a model scheme for the expansion of the cultivation of the improved *jowar* strains, M. 35-1 and M. 47-3, evolved at Mohol Farm, is now in force in the Bijapur district. In the Central Division, schemes of the same type are in progress for improved varieties of *jowar* in the Poona Satara and Ahmednagar districts.

D. Wheat.

60. The multiplication of improved varieties of wheat, e.g., Jaya (Bansipalli-808), Vija (Niphad-81), Motiya (Bansi-168) and Gulab (Bansi-224), was undertaken at the Cereal Breeding Station, Niphad, and supplied to distributing agencies in the suitable wheat growing tracts for further multiplication which was done under similar "Model Schemes" in the Ahmedabad and Bijapur districts. Other "Model Schemes" for the extension of improved wheats are operating in the East and West Khandesh and Ahmednagar districts of the Central Division.

E. Other Crops.

61. (a) *Gram*.—Improved types of gram, e.g., Chafa, are being extended in the districts and pure seed for further multiplication is supplied annually from the Cereal Breeding Station, Niphad. At this centre, the area for such seed multiplication has recently been extended by eight acres to provide for meeting the increased demand for pure seed from the districts. A Model Seed Multiplication and Distribution Scheme for the improved variety of gram, No. 816, has been started in the Nasik district.

(b) *Potato*.—The Agricultural Department made arrangements for the import of over 6,000 bags of Numbri seed potatoes from Simla for cultivation in the Poona district in which the growers had formerly to rely on seed potatoes from Europe to meet their requirements. The crop sown from this seed was, in general, very successful and good yields were obtained. Potato cultivation was also extended under irrigation in the Deccan Canal tracts.

CHAPTER VI.

LIVESTOCK WORK.

62. *Introduction.*—The work of the Livestock Section of the Agricultural Department can be divided into two main categories, viz., (a) scientific research and (b) extension and development. The activities under the former head are mainly concentrated at the Government Cattle Farms at Bankapur and Tegur, at the Sheep Breeding Research Station, Poona, and the Government Central Poultry Farm, Kirkee. At the two latter institutions, the scientific work is subsidized by the Imperial Council of Agricultural Research. Extension and development work in connection with the improvement of cattle, sheep and poultry is being carried out in all parts of the Province and takes many forms. Within recent years, much progress has been made in this aspect of livestock work. The co-operation of numerous non-official agencies, especially in cattle improvement, has been secured. District Rural Development Boards are taking an ever-growing interest in livestock development in the areas under their control and considerable public interest and sympathy continues to be extended to departmental efforts to raise the standard of the livestock of the Province.

A. Livestock Research Work.

63. *Cattle.*—The development and improvement of the herd of Amrit Mahal cattle at the Bankapur Cattle Breeding Farm, especially with regard to early maturity, standardization of type and regularity of calving, was continued during the year in accordance with the breeding policy laid down for this herd. A small herd of Gir cattle, viz., 20 cows and 2 breeding bulls, has been added to the stock at this Farm as it was felt that this breed, useful both for milk production and draught purposes, deserved more attention in the Southern Division of the Province.

At the Tegur Cattle Breeding Farm, an effort is being made to evolve a type of cattle suitable for the Konkan tracts in which the existing livestock are in great need of improvement. At this centre, foundation stocks of the Dangi and Nimari breeds have been established and it is hoped to evolve a suitable dual purpose animal for the coastal tracts of the Province by scientific breeding within these two breeds.

The improvement of the valuable Gir breed of dairy cattle was continued by the authorities in charge of the Bombay

Gowrakshak Mandali and the Nathu Lalji Charity Trust Fund Gowshala, Mulund, working in co-operation with the Livestock Expert to Government. Similar co-operation towards the development of the Nimari breed of cattle by scientific breeding was continued at the cattle farms of Pimple and Gangapuri which have been organised, and are managed, by the Taluka Development Associations of Jalgaon and Jamner, respectively. The success of the Nimari cattle from the Pimple Farm at the 5th All-India Cattle Show, Delhi, reflected much credit on the management of that Farm.

64. *Sheep—Sheep Breeding Research Scheme, Bombay-Deccan, Bhamburda, Poona.*—The work of this scheme, which is subsidized by the Imperial Council of Agricultural Research, has now completed half its sanctioned period of ten years. The main object of the scientific work in progress is the improvement of the Deccani breed of sheep by (a) selection and (b) crossing with the Merino breed of sheep from South Africa. In addition, however, many and varied problems of sheep management and breeding and of wool production and improvement are being investigated at this Station.

The flock of Deccani sheep at the Station has been improved most considerably as a result of the breeding policy adopted and the defect of excessive hairiness in the fleeces is being rapidly eliminated. Further selective breeding is in progress and the work of cross-breeding with Merino rams to evolve a fine woolled sheep is making headway. It is interesting to note that blankets produced this year from the wool of the station flock gave a loss in manufacture of 5 per cent. only as compared with a normal loss of 35 per cent. in blankets made from the wool of local shepherds' flock. As the extent of loss is an indication of the hairiness of the fleece, the improvement obtained at the Station is very striking. Further problems investigated during the year dealt with the optimum time for lambing, prevention and control of pests and diseases of sheep, grazing management and shearing technique.

65. *Wool Analysis Laboratory Scheme.*—This scheme, which involves the establishment of a wool analysis laboratory at Poona, is, essentially, a complementary scheme to the Sheep Breeding Research Scheme mentioned above. The laboratory facilities provided enable analytical examinations of the individual fleeces to be made in successive generations of sheep and thus give most useful data as a guide to further selective breeding work. The laboratory is now well equipped

with modern apparatus for the study of wool fibres. During the year, a total number of 1,230 samples of wool were examined by the laboratory staff. A small scheme for research work into the dyeing of wool with locally produced vegetable dyes was commenced during the year.

66. *Poultry—Bombay Poultry Research Scheme, Kirkee.*—The Imperial Council of Agricultural Research is contributing towards the cost of this scheme for investigation into problems of poultry husbandry in Western India. The scheme, originally sanctioned for five years, has been extended from September, 1941, for a further period of four and a half years.

Very useful and interesting results have been obtained from trials of both Indian and imported breeds of fowls and their crosses with special reference to their adaptability to Deccan conditions and their egg-laying capacity. Additional work included the testing of feeding values of different poultry feeds, incubation trials and experiments on the design and construction of cheap poultry houses for village use. Special attention is being given to the economics of improved poultry husbandry, both at the Central Poultry Farm, Kirkee, and at the poultry sub-stations at Dharwar and Dhulia. Turkey breeding and rearing was continued most successfully and has resulted in a great demand from the public for birds and eggs.

67. *Goats.*—A small herd of Kamori goats obtained from Sind is maintained at the Government Central Poultry Farm, Kirkee, for experimental purposes. The performance of this breed with regard to milk production does not confirm the high claims which have been made for it in its place of origin. The highest milk yield per day was 7½ lbs. There is a fairly good demand for the services of the bucks from local goat keepers. A scheme for scientific research work on the improvement of local breeds of goats has been prepared and submitted to the Imperial Council of Agricultural Research but has been postponed until a later date.

B. Livestock Extension and Development Work.

68. *Premium Bulls.*—During the year under report, the number of Premium Bulls of different breeds supplied to selected agents in villages throughout the Province was 159. Of these, 86 were the progeny of Premium Bulls previously

placed out in villages, a fact which illustrates the progressive character of this aspect of live-stock improvement work. In July, 1942, there were 555 "Premium Bulls" at service in different districts of the Province, an increase of 48 on last year's figure. The effect of these "Premium Bulls" on the grading-up of village cattle is now most noticeable in many tracts of the Province. Under a similar "Premium Cow" scheme, 292 selected "Premium Cows" have now been issued to approved agents. This work is largely financed by funds provided by District Rural Development Boards. It is not possible to imagine any more effective and rapid method of wide-spread improvement of village cattle than the combination of the working of the "Premium Bull" and "Premium Cow" schemes in selected areas and the efforts of the Livestock Section are being concentrated on such work.

69. *His Excellency the Viceroy's Gift Bull Scheme.*—Since the commencement of this scheme in the Province, 404 "Gift Bulls" have been located in different villages and Rs. 67,149 have been expended out of a total contribution of Rs. 89,732. This work has proved a most valuable contribution to live-stock improvement in the districts. Steps have now been taken to utilize the balance of the Fund towards initiating "District Livestock Improvement Funds" to give loans at low rates of interest to approved cultivators for the purchase of reliable breeding stock. In this way, the intentions of His Excellency the Viceroy in originating his "Gift Bull" scheme will be fully carried out and placed upon a permanent basis.

70. *Scheme for Buffalo Breeding and Improvement.*—The distribution of young male buffalo stock obtained from high milking strains of buffaloes at the Agricultural College Dairy, Poona, to selected agents in the districts was continued. These agents undertake to maintain and rear the animals until fit for breeding purposes when they are issued as "Premium Bulls". Eight Surti male buffalo calves were given out during the year and there are at present 28 buffalo breeding bulls located as a result of this scheme in different villages.

71. *Application of Livestock Improvement Act, 1933.*—This Act, which provides for the compulsory castration of inferior male stock in villages on the initiative and at the instance of local bodies, has now been applied to 77 villages in the Province. During the year, 2,903 castrations of "Scrub"

bulls were carried out by Veterinary Assistant Surgeons. The application of the Act is an essential corollary to the location of "Premium Bulls" in villages if real improvement in village cattle is to be ensured.

72. *Co-operation with Gowshalas and Panjrapoles in cattle improvement work.*—In spite of continued propaganda work by the Livestock Expert and frequent discussions with the managements of numerous Gowshalas and Panjrapoles in the districts, there is not much progress to be reported in this direction. The need for legislation to control the working of these institutions in the interest of livestock development remains acute.

73. *Cattle Shows, Rallies and Demonstrations.*—The Province was again well represented at the 5th All-India Cattle Show held at Delhi in February, 1942, and also at the regional shows at Bhavnagar and Bangalore in December, 1941, and January, 1942. Seventy-five typical animals of the main breeds of the Province were exhibited at these shows and obtained numerous awards and prizes including the "Holkar" Challenge Cup for the best Nimari bull which went to the Pimple Cattle Farm, Jalgaon, East Khandesh. Under departmental management, 21 small district cattle shows and 10 cattle rallies were held during the year in different districts of the Province.

74. *Advisory and Propaganda Work towards Livestock Improvement.*—This work has now been centralised under the Livestock Expert to Government throughout the Province and, as a result, district activities in this connection have been considerably intensified and co-ordinated. Among recent developments, mention may be made of numerous schemes for livestock improvement carried out in co-operation with District Rural Development Boards in many districts, the initiation of measures for the development of the butter and ghee industry in Khandesh and a scheme for the improvement of Konkan cattle by the organisation of Dangi cattle breeders. At all Government Cattle Farms, "Farmers' Weeks" have been organised in order to acquaint the public with the work in progress at these institutions and to secure their cooperation in further developments in livestock improvement in the future.

75. *Formation of Milk Recording Societies.*—The Scheme for the regular recording of milk yields in selected herds of Indian cattle is being operated in this Province in connection with the Kankrej breed in Gujarat. This work, which is subsidised by the Imperial Council of Agricultural Research, is being done in nine villages of Sanand taluka, Ahmedabad district, and the milk yields of 143 cows were recorded and quality determined in a series of fortnightly tests. The scheme has recently been extended for a further period of one year and six months, i.e., till 31st March, 1943.

76. *Formation of Kankrej Breed Society.*—This Society, which has as its main object the promotion of the interests of the famous Kankrej cattle breed of North Gujarat, has now been established. Eighty members have joined the Society and 628 Kankrej cattle have been registered. A scheme to combine herd book registration with milk recording under the auspices of the Society has been submitted to the Imperial Council of Agricultural Research.

77. *Definition of Breed Characteristics.*—As part of the scheme initiated by the Imperial Council of Agricultural Research to systematise the definition of breed characteristics of the major breeds of Indian cattle, this work has been done by *ad hoc* expert committees consisting of livestock officers and cattle breeders for the Kankrej and Khillar breeds of cattle and the Surti breed of buffaloes in this Province. These definitions have now been published in the Miscellaneous Bulletins No. 27 of 1939 and No. 47 of 1941 of the Imperial Council of Agricultural Research. During the year, no further breed in this Province has been taken up for similar work.

78. *District Work on Sheep Improvement.*—A small sub-station for developmental research work on sheep improvement in the districts has been started at Javle in the Sangola Taluka of the Sholapur district. At this centre, the co-operation of local shepherds has been obtained in the improvement of their flocks by systematic breeding for white sheep and fine woolled fleeces through the introduction of selected rams obtained from the Sheep Breeding Research Station, Poona. In addition, the minor ailments of sheep are being treated, good drinking water provided for the use of local flocks and a scheme for the more profitable utilisation of wool commenced with funds provided by the District Rural Development Board, Sholapur. A similar sub-station has recently been sanctioned by Government and is being established in the Bagalkot taluka of the Bijapur district.

79. *District Work on Poultry Improvement.*—District work on poultry improvement is being continued along two main lines, firstly, the improvement of village poultry by the distribution of improved cockerels for breeding purposes in selected villages and, secondly, by the grant of premia to intelligent cultivators for the purchase of egg settings or fowls and for the construction of modern poultry houses. During the year under report, 320 cockerels, mostly of the White Leghorn and Rhode Island Red breeds, were located in approved villages for the “grading up” of village poultry stock. The effect of such work in the improvement of village poultry is becoming more and more noticeable and graded pullets, resulting from such work done in the past, are found to show an increase of 40 per cent in egg-laying capacity combined with the production of larger eggs than their dams. The full benefit of such work, however, will not be realised until more effective methods of preventing and controlling poultry diseases are available and more systematic methods of marketing village poultry products are introduced and extended. Fourteen premia were given to intelligent village poultry-owners to assist them in the scientific development of their stock. In addition, several district poultry centres have been established, mainly under the auspices of District Rural Development Boards, and are giving useful assistance and co-operation to the Agricultural Department in village poultry improvement. Twelve students received practical training in modern methods of poultry farming at the Government Central Poultry Farm during the year.

80. *Apiculture.*—A revised scheme for the extension of bee-keeping as a cottage industry on improved lines in the Kanara district was commenced during the year under report in co-operation with the local branch of the All-India Village Industries Association. By the close of the year, 177 bee-keepers in 35 villages had been organised, maintaining 496 bee colonies. 2,421 lbs. of honey worth about Rs. 1,200 were produced. A training class in improved apicultural methods was held in which 13 villagers received practical instruction in bee-keeping.

81. *Departmental Fodder and Livestock Committee.*—This Committee, with the Director of Agriculture as Chairman and including the Livestock Expert to Government and the Economic Botanist to Government as its members, met twice during the year under report. At these meetings, all schemes for research work in livestock and fodder problems

were discussed, progress reports examined and the future lines of work on these subjects laid down.

C. Agricultural College Dairy, Poona.

82. The Agricultural College Dairy, Poona, which is under the direct control of the Professor of Agriculture, Agricultural College, is run as a commercial dairy and, at the same time, is utilised to give practical instruction in animal husbandry and dairying to the students at the Agricultural College.

The Dairy includes two herds of milch cattle, one of Sindhi cows and the other of Surti buffaloes. During the year under report, the average milk yield per head of the Sindhi cows in milk was 2,357 lbs., the best milker being the cow Tucas which has now given 5,347 lbs. milk as an annual average over a period of nine calvings. The Surti buffalo herd provides the bulk of the Dairy's milk supply and the average milk yield per head was 3,084 lbs. Three buffaloes have now given an annual average milk yield of 4,838, 4,452 and 4,340 lbs. calculated on 7, 1 and 2 calvings, respectively.

The total quantity of milk produced at the Dairy was 3,42,596 lbs. of which 18,047 lbs. was fed to calves. The cost of production of 100 lbs. milk was Rs. 13·52 and the receipts from sale, etc., of the same quantity was Rs. 14·87.

The Dairy fodder area produced 44,84,440 lbs. of green fodder at an average cost of Re. 0-4-11 per 100 lbs.

CHAPTER VII.

HORTICULTURE.

83. *Introduction.*—As a result of the War, considerable impetus has been given to the increased cultivation of fruit and vegetables as an important part of the "Grow More Food" campaign in the Province. The present acreages under fruit tree and vegetable cultivation are 90,647 and 1,13,286 acres, respectively, and there is no doubt whatever that a very considerable increase under both these types of crops would be of the greatest benefit to producers and consumers alike. As there are no areas in the Province in which some varieties of fruit and vegetable crops cannot be successfully and profitably grown, the Horticultural Section of the Department has been concentrating its energies on extension work and, in this activity, the departmental staff have been ably and effectively supported in many districts by District Rural Development Boards. The main activities of the Horticultural Section can be classified as (a) research, (b) extension and (c) educational and a brief outline of the major items of work done during the year under each of these headings is given below.

84. *Departmental Fruit and Vegetable Committee.*—The departmental Fruit and Vegetable Committee held three meetings during the year under report and discussed numerous important matters relating to scientific research work on fruit and vegetable cultivation and the extension of horticultural activities in the districts. The Director of Agriculture is Chairman of this committee and the Horticulturist to Government is Secretary. Among the more important matters considered by the Committee were the establishment of district nurseries, tree planting schemes, increased vegetable production and intensified schemes for practical training of malis, etc.

A. Horticultural Research.

85. *Government Fruit Experimental Station, Ganeshkhind, Poona.*—Scientific work on the improvement of indigenous fruit production was continued at this Station and was mainly concentrated upon (a) selection work in various indigenous fruit crops, (b) manurial and irrigational experiments in orchard cultivation and (c) agronomic investigations on fruit tree culture. Grape fruit cultivation has proved most successful

and is being taken up on an ever-growing scale by local fruit growers. Improved varieties of guava, pomegranate, *bor* and grapes are now being issued from the Station. Manurial treatments for banana, grape and mango crops are still under experimentation. Similar work on citrus crops has resulted in much higher yields being obtained with the addition of 10 lbs. castor cake to a basal application of 80 lbs. farm-yard manure per tree. Irrigation and pruning experiments on grape vines are being continued. The total receipts of the Station during the year under report were Rs. 13,683 as against cultivation expenditure amounting to Rs. 11,979.

86. *Cold Storage Research Scheme, Ganeshkhind.*—This scheme of scientific research work into the technique and economics of cold storage of fruits and vegetables was financed by the Imperial Council of Agricultural Research and terminated in March, 1942. The results of the work done have been incorporated in a series of publications by the Council. Final trials of gas storage did not indicate any appreciable advantage in this method over ordinary cold storage with the types of fruits utilised.

87. *Investigations into citrus tree "die-back".*—In recent years, the phenomenon of the sudden "wilting" and subsequent mortality of mosambi trees in plantations in various parts of the Province has become very common and is causing considerable anxiety to citrus growers. The departmental investigations into the causative factors of this form of "die-back" have not yet been successful. The Agricultural Chemist to Government is testing the effect of different manurial treatments on the prevention and control of this phenomenon and this work is being done on three orchards in the canal areas. These investigations have not yet been conducted over a sufficiently long period to enable any definite conclusions to be reached. A special meeting of the departmental Fruit and Vegetable Committee has discussed this subject and future lines of research work have been laid down.

88. *Scheme of research into cytology of papaya.*—This scheme, which is supervised by the Economic Botanist to Government at Poona, is financed by the Imperial Council of Agricultural Research. It has now completed its second year of working. The year's investigations have shown that there is no outstanding difference in structure and chromosomes in the different sex types of papayas examined. Further experimental work is in progress.

B. Horticultural Extension and Development Work.

89. *Establishment of District Horticultural Nurseries.*—In order to stimulate and accelerate the increased cultivation of fruit trees and the production of fruit in all parts of the Province, an adequate and reliable supply of nursery stock is essential. A scheme for the establishment of "District Horticultural Nurseries" under expert supervision was prepared and Government has sanctioned the establishment of such nurseries in six districts of the Province as an initial step. This work is now in progress.

In order to meet the increased demand for shade trees resulting from departmental efforts to encourage tree-planting in all districts, the Horticulturist to Government has established shade tree nurseries in the Poona, Satara, Sholapur, Broach and Parbh Mahals and Ahmednagar districts. About eighteen such nurseries have already been laid down and over 1,50,000 young shade trees have been raised for distribution to cultivators and for planting on "Arbor Days" organised by District Rural Development Boards as part of their village uplift programmes.

90. *District Fruit Crop Surveys.*—During the year under report, the departmental Fruit and Vegetable Committee decided to inaugurate a series of "District Fruit Crop Surveys" throughout the Province. The main objects of these surveys are to ascertain the existing position of fruit tree cultivation in different parts of the Province, to delineate the exact edaphic, climatic and environmental conditions essential to the success of different types of fruit production and to suggest lines for future development in this important branch of agriculture. The survey of the Kanara district has been completed and will shortly be published. The survey of the Satara district is now in progress.

91. *District Propaganda and Advisory Work in connection with Horticulture.*—The demand for advice and assistance in horticultural matters is increasing rapidly and much of the time of the staff of the Horticultural Section is occupied in this type of work. Five horticultural and fruit preservation classes were organised in the districts and were invariably popular and well attended. In addition, a number of practical demonstrations of improved methods of horticulture were held and advice given to the public and to District Rural Development Boards in horticultural development. The

Horticultural Section took part in the "Grow More Food" campaign and schemes for the extension of vegetable cultivation are prepared and are under consideration.

C. Horticultural Education.

92. *Horticultural Training Class, Ganeshkhind Gardens.*—Forty students attended the special training course in horticulture at the Ganeshkhind Gardens, Poona. This course lasts for nine months and is held annually. The instruction given is essentially of a practical nature and the students have to perform all the field-work and horticultural operations with their own hands. Twenty-seven of the students received scholarships of Rs. 15 per month and District Rural Development Boards throughout the Province are taking advantage of this course to get their own workers trained in practical horticulture. Several hundred students have now completed this course since its inception in 1931 and many of these are now engaged on different aspects of horticultural extension and development in all parts of the Province.

CHAPTER VIII.

AGRICULTURAL ENGINEERING.

93. *Introduction.*—The Agricultural Engineer to Government is responsible for all research work on agricultural engineering problems and has a well-equipped workshop at Poona where such work is being carried on. In addition, however, his district staff is fully engaged on giving advice and assistance to cultivators in the erection and maintenance of power plants, in the construction and repairs to departmental buildings, etc., and in trials of improved implements and agricultural machinery under cultivators' conditions. The work of the Agricultural Engineering Section of the Agricultural Department has had many difficulties to face on account of conditions resulting from the War but, on the other hand, it has given valuable assistance through its expert staff in various activities connected with furthering the War effort.

94. *Research work on agricultural engineering.*—Research work on the improvement of existing agricultural implements and on the devising of cheap, new agricultural implements for specific agricultural operations was continued during the year, under the Agricultural Engineer to Government. This work is hampered by the difficulty of obtaining materials as a result of the War and has been mainly confined to the modification and improvement of existing implements.

The Grass Drying Machine, designed and built last year in co-operation with the Livestock Expert to Government was tested during the monsoon season but it was found that its capacity and thermal efficiency were low. A new model, built for the Imperial Council of Agricultural Research, has been modified in the light of this experience and has been found in preliminary trials to be much more efficient than the original design.

Work on ball bearing bullock cart-wheels was held up owing to the non-availability of essential parts and experimental work is now in progress with cast iron, tapered bushes with dust-proof and efficient lubrication devices. Wheels fitted with these bushes are now being subjected to heavy duty tests to determine their durability and to ascertain the economics of their maintenance.

Experimental work, including field trials, of the improved groundnut digger, mentioned in last year's report, is still in progress.

95: *Extension work, advice and assistance, to public, etc.*—The Agricultural Engineer to Government and his district staff were largely occupied with departmental constructional works during the year. These works included the erection of residential and office accommodation at Government Farms and sub-stations, construction of cattle byres, milk rooms and poultry houses and a tobacco curing barn and damping room.

Boring plants were leased out to six applicants and Rs. 5,550 were received as hire charges on this account. Similarly, Rs. 920 were credited as receipts on account of hire of pumping plants.

The Agricultural Engineering Section received and dealt with 400 enquiries from the public mainly in connection with pumping, boring and improved implements. Twenty-three power plants were erected and repairs were carried out to 86 plants on behalf of their owners. In addition, regular inspection work of agricultural machinery in the districts was completed as usual and 18 sites were surveyed, estimates being prepared for 11 plants.

A special oil engine class for cultivators' sons was held and attended by three students. No fees are charged for this training which lasts for three months. Instruction is given in both English and Marathi.

CHAPTER IX.

ANTI-EROSION WORK.

96. *Introduction.*—The importance of the wide extension of anti-erosion measures in the Province has been fully recognised and there is ample evidence that the cultivators, especially in the Central and Southern Divisions, are becoming more and more aware of the damage and destruction to their lands which invariably result from the uncontrolled run-off of rain water, with its consequent annual loss of thousands of tons of valuable surface soil from the cultivated lands. In the past, the Agricultural Department has conducted propaganda and demonstration work in many districts in order to induce cultivators to protect their fields by bunds, waste weirs, etc., constructed on scientific lines and under expert supervision. Taccavi grants have been liberally granted for such improvements and, in many areas, considerable progress has been made in local areas. Under the combined Bunding and Dry Farming Survey and Development Scheme, which commenced working in 1941, considerable impetus has been given to this most important branch of the activities of the Agricultural Department. A considerable staff of expert bunding officers under a Bunding Supervisor and two Survey Engineers has been appointed and survey parties established in many districts of the Province. More attention is being concentrated upon the planning and execution of "Anti-Erosion Projects" or "Village Developmental Projects" on a large scale and which include within their operations bunding "units," i.e., areas suitable for combined bunding schemes, e.g., water sheds, village lands, etc. The execution of such projects implies as a rule the co-operation of numbers of land-owners but little difficulty has been experienced in obtaining such co-operation in the areas in which such schemes have been proposed.

97. *Village Developmental Projects.*—At a meeting held under the chairmanship of the Director of Agriculture in December, 1941, a scheme for large scale anti-erosion measures by means of "Village Developmental Projects" was discussed and a preliminary list of fifty villages considered suitable for such work was drawn up. Preliminary surveys of some of these villages were carried out by the bunding staff in January and February, 1942, special attention being given to examination of the areas as suitable bunding "units" and to the degree of co-operation which would be forthcoming

from the local cultivators in carrying out the work under the "Project" and in its subsequent maintenance. At the same time, the newly appointed staff in the combined Bunding and Dry Farming Survey and Development Scheme, were given practical training in their duties and survey parties were formed and allotted to various districts. Each party consists of one Senior Surveyor, three Junior Surveyors and one or two sub-overseers.

On completion of the survey work which included 22 villages and embraced a total acreage of 26,000 acres, the preparation of working plans for suitable "Developmental Projects," i.e., plans and estimates, was commenced. Complete working plans for five "Village Developmental Projects" have now been drawn up, together with detailed estimates of cost, two of which have already been sanctioned by Government and the necessary funds allotted. It is an essential condition of all such "Village Developmental Projects" that the land-owners, who will ultimately benefit from the anti-erosion measures carried out under the Project, should themselves contribute part of the cost, generally in the form of labour, and should agree to the necessary arrangements for the maintenance and repair of the works on completion. The work of the Bunding Section in connection with "Village Developmental Projects" has thus made a good beginning and, as a result, demands and applications for such schemes against erosion are coming in from villages all over the Province. There is no doubt that an extension of such co-operative large scale bunding Projects, carried out under expert supervision and involving the co-operation of the land-owners concerned within suitable bunding "units," must prove to be the most rapid, economic and effective method of developing scientific anti-erosion measures in the Province.

98. *Taccavi applications for bunding works and land improvement.*—In addition to the major anti-erosion measures dealt with above under "Village Developmental Projects", the survey and technical examination of large numbers of individual applications to the Revenue Department for taccavi grants for field bunding and land improvement, have been undertaken by the Bunding Section of the Agricultural Department. During the year under report such taccavi applications examined, surveyed and reported upon covered an area of 19,000 acres, most of the individual applications being for small sums and dealing with small areas. The utility of such small individual bunding schemes is question-

able as, unless the areas concerned constitute suitable bunding "units," their adequate protection from run-off water coming from neighbouring unprotected lands is both difficult and expensive. The considerable increase in such applications, however, is evidence of the great growth of public interest in anti-erosion measures and a reflection of the ever-growing realization of the losses which uncontrolled run-off causes to the cultivator and his lands.

99. *Research work in anti-erosion measures.*—Scientific research work in anti-erosion measures is being carried on under the Professor of Agricultural Engineering, Physics and Mathematics, Agricultural College, Poona, and at the Dry Farming Research Stations at Sholapur and Bijapur. The work done at the Sholapur and Bijapur centres is described briefly in the paragraphs of this Report dealing with the Bombay Dry Farming Research Scheme. The Professor of Agricultural Engineering, Physics and Mathematics continued observations on "erosion" plots and on gully erosion in the vicinity of Poona and useful information has been collected both with regard to the extent and rapidity of erosion under differing environmental and rainfall conditions. Much of the advisory work formerly undertaken by the Professor of Agricultural Engineering, Physics and Mathematics and his staff in connection with erosion problems will now be done by the Bunding Section. The work of training fieldmen, etc., in practical bunding methods has already been handed over to the Bunding Supervisor and short term practical courses were organised and carried out in several districts during the year under report.

CHAPTER X.

.AGRICULTURAL PROPAGANDA.

100. *Introduction.*—As stated in last year's Report, a considerable amount of work in connection with agricultural propaganda in the districts is now being carried out by the rural development staff under Collectors and Chairmen of District Rural Development Boards. However, this arrangement does not appear to have made any appreciable reduction in the activities of the district staff of the Agricultural Department in agricultural propaganda and demonstration activities. During the year under report, such activities were, as a matter of fact, considerably intensified and expanded due largely to the work involved in Government's campaign for the increased cultivation of food crops to meet the requirements of consumers under War-time conditions.

This "Grow More Food Crops" campaign in its propaganda aspects was widespread and concentrated and all sections of the Agricultural Department staff were engaged in furthering its objects. The "Food Crop Production Week" organised in May, 1942, was a climax to the campaign and represented an intensive and organised propaganda effort in which both non-officials and officials co-operated to a very considerable degree. In addition, the departmental staff continued its district propaganda work in connection with Taluka Demonstration Centres, "Official" and "Farmers" Weeks at Government Farms and Research Stations and in all aspects of the co-ordinated policy for rural development which has been adopted by Government.

101. *"Grow More Food Crops" Campaign.*—During practically the whole of the year under report, the propaganda campaign to increase food crop production in the Province was in full swing and this work received full attention from all sections of the staff of the Agricultural Department. As Bombay Province is a deficit Province with regard to the balance between its requirements and its production of practically all major food crops, the urgent need for increasing the production of such crops in War-time in order to reduce imports and save transport, is obvious. The main objects of the drive to increase food crop production in the Province were (a) to substitute food crop production for the production of "unwanted" crops such as short staple cotton, (b) to increase the area under suitable food crops by more intensive cultivation and reduction in uncultivated areas and (c) to

increase the outturn per acre of the main food crops by manuring, extension of high yielding improved varieties, etc. The propaganda campaign was assisted by the preparation and distribution of a series of attractive posters advocating the increase of cereal crop production, by the wide issue of numbers of leaflets with the same purpose in view and stressing the economic gain to both producers and consumers which would result from more food crop production and by the holding of a large number of village meetings in every district of the Province at which the objects of the campaign were explained to the cultivators by experienced and qualified speakers both official and non-official. In addition, four senior officers of the Agricultural Department were placed on special duty in order to further the work of the campaign especially in the tracts in which there was excessive production of short or fair stapled cottons; use was made of local ballad singers, poets, etc., to bring the message of "Grow More Food Crops" to the cultivators in an impressive and popular manner; the cinema and magic lantern were utilized to show films and slides demonstrating the need for and advantages of more food crop production; and, finally, steps were taken by Government to give concessions to intending food crop growers, especially in the irrigated tracts, and to provide adequate seed supplies of such crops in all areas where there might be a danger of shortage of seed limiting increased cultivation of food crops.

In the Northern Division of the Province, 1,768 village meetings were held in pursuance of the objects of the "Grow More Food Crops" campaign and it is estimated that these meetings were attended by over 74,800 cultivators. In the Central Division, in which the largest areas of short stapled, "unwanted" cottons are cultivated, 830 village meetings attended by 1,05,000 agriculturists were likewise organised by the departmental staff supplemented by two specially appointed propaganda officers and, in the Southern Division, reports received show a total of 1,246 meetings with a total attendance of 133,800 cultivators.

The "Food Crop Production Week" organised and held in May, 1942, was a great success and, if its ambitious object of carrying the message of "Grow More Food Crops" to every villager by personal appeals at village meetings organised in all districts of the Province, was not completely attained, there is little doubt that the very intensive propaganda work done in the districts by non-official agencies and by the staffs

of the Revenue, Co-operative, Educational and Agricultural Departments went a very long way indeed towards realising the objective set forth. It is not possible to place too high a value on the assistance which was given during the whole campaign by large numbers of individual non-official gentlemen in the districts and by large numbers of co-operative organisations who responded with enthusiasm and energy to the appeal made by the Director of Agriculture for co-operation in the work of the campaign.

It is still too early to give any reliable estimate of the results, of the "Grow More Food Crops" campaign on crop production in the *kharif* season of 1942. The early and outstandingly satisfactory nature of the monsoon, the rise of cotton prices towards the sowing period and the general economic position of the cultivators are factors which will affect favourably or unfavourably the results aimed at to an extent which cannot yet be estimated. In general, however, it may be stated that all reports received from the districts indicate unmistakably that the campaign will prove to have been successful and that the propaganda work done has reached the cultivators and has been understood and appreciated by them in all districts.

102. *Taluka Demonstration Centres.*—These propaganda and demonstration "units" have been established in all the districts of the Province on the holdings of cultivators who have been induced to co-operate with the Agricultural Department in demonstrating the advantages and profits of improved methods and materials of agriculture on their own lands and with their own labour. A departmental fieldman is stationed at each Centre to guide and assist the owner in the work and to carry out propaganda and extension work in neighbouring villages. At suitable intervals during the year, demonstrations are held at each Taluka Demonstration Centre to which nearby agriculturists are brought to see the improved methods, etc., in actual practice on the fields of the owner.

There are now 71 such Taluka Demonstration centres established in the Province, of which 33 were added during the year under report or previously selected sites were changed for more suitable ones. These Centres are taking an important part in seed multiplication and distribution work and, at 52 Centres in the Northern and Central Divisions, 543 demonstrations were held during the year attended by over 12,000 cultivators from neighbouring villages. The depots for seeds, manures, insecticides, etc., established one at each Taluka Demonstration Centre are proving useful and popular.

103. *Model Project Schemes.*—A new and interesting system of agricultural propoganda and demonstration is to be found in the "Model Projects" two of which have been commenced during the year under report at Rayam in the Surat district and at Mirakhedi in the Broach and Panch Mahals district. These "Model Projects" which are financed jointly by the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and Government aim at introducing all possible agricultural improvements recommended by the Agricultural Department on an area of land of about 100-300 acres in a selected village and which comprises the cultivated areas of numerous cultivators all of whom have been induced to co-operate with the departmental staff in this work. A detailed study of the economics of such improvements is maintained and a definite programme of work laid down for each year.

At Rayam in the Surat district, the Model Project includes the lands of fifteen cultivators and the area of operation is 293 acres. The main improvements carried out during the year were field bunding and drainage, green manuring, groundnut cake manuring and improved tillage methods. It is interesting to note that the cultivators within the Project obtained an average yield of cotton per acre of 520 lbs. as compared with 380 lbs. by other cultivators in the same village. The average profit per acre on the lands under the Project was Rs. 17 which was very good in the season under report. The results obtained have induced other cultivators of Rayam village to join the Project scheme which, it is anticipated, will soon extend over the whole village area.

The Model Project at Mirakhedi covers an area of 216 acres in one of the most backward tracts of the Province inhabited mostly by Bhil cultivators. As work was only started in May 1942, it is too early to give any results obtained but a beginning has been made with the provision of improved implements and the distribution of seed of improved varieties of crops. Work on bunding and livestock improvement is also included in the programme of the Project for next year.

104. *"Officials" Demonstrations and "Farmers" Weeks on Government Farms.*—As usual, demonstrations for local "officials", i.e., staff of other Government Departments in the districts, and "Farmers' Weeks" were organised and held on practically all Government Farms and Research Stations in the districts. In general, these gatherings were well attended and much interest was shown by the visitors to the different items of work in progress which were fully explained to them by the departmental staff.

CHAPTER XI.

AGRICULTURAL EDUCATION.

105. *The College of Agriculture, Poona.*—The year under report was the thirty-fourth year since the establishment of the College of Agriculture at Poona. This institution continues to be the centre of agricultural education and of scientific research in specialised branches of agriculture in the Province.

The number of students attending the College were 87, 80 and 62 in the F.Sc. (Agric.), S.Sc. (Agric.) and B.Sc. (Agric.) classes, respectively, i.e., 209 in all. Seventy-two students appeared for the B.Sc. (Agric.) examination, of which fifty-two or 72·2 per cent. were successful. Fourteen students undertook post-graduate courses, viz., four in plant botany, six in agricultural economics, three in plant pathology and one in agricultural entomology. Special courses in crop production, animal husbandry and dairying, agricultural chemistry and fruit preservation were attended by eleven students.

The Special Forest Rangers' Course, instituted at the Agricultural College, completed its fourth year of working and the second batch of ten students completed the course during the year under report, seven of them qualifying for higher standard certificates and now working in their appointments as Rangers. A new batch of twelve students, seven Bombay Government nominees, four Indian States nominees and one private student, has commenced training in May, 1942.

A training class in agriculture and animal husbandry for Revenue Department officers was held in September-October, 1941, and was taken advantage of by seven Assistant and Deputy Collectors.

During the year, the re-equipment of the College laboratories was continued and the College Library was expanded from grants made available by Government for these purposes. The usual social and sporting activities of the College were carried on with undiminished enthusiasm during the year. The College platoon of the University Training Corps had a successful year and several members have received emergency King's Commissions in the Army and Air Force.

Air Raid Precautions have been fully installed at the College which is now a separate A. R. P. unit.

106. *District Agricultural Schools.*—The two district Agricultural Schools in the Province, i.e., the Marathi Agricultural School at Dhulia, West Khandesh, and the Kannada Agricultural School at Devi-hosur, Dharwar, had a successful year's working. The former school completed its 18th year of working while the latter has now been in progress for twenty-eight years.

At Dhulia, 113 applications were received for admission to the Marathi Agricultural School from the districts of East and West Khandesh and Nasik. Twenty-one students were admitted on the recommendation of the Local School Committee. The total strength of students during the year was 41, 20 of these being in the second year of training. The popularity of this centre of agricultural education is undiminished and the practical nature of the training given is in much demand by the public. Much credit is due to the Local School Committee for their untiring work in the supervision and development of the School.

At Devi-hosur, the total number of students receiving instruction was 29, of which eleven were in their second year. The total number of ex-students who have received certificates on the completion of their training at Devi-hosur is now 324. In addition, special agricultural instruction has been given to 39 primary school teachers, ten of whom are at present under training at the School.

The Agricultural Department has rendered all possible assistance and co-operation in the work of the privately managed agricultural schools at Rajapur, Ratnagiri district, and at Puntamba, Ahmednagar district, and in connection with the working of the newly established Agricultural High Schools and Agricultural Bias Classes under the control of the Educational Department.

107. *Rural Assistants' Training Centres.*—The scheme for the training of "rural assistants" in agriculture, cottage industries and co-operation was continued during the year under report at the training centres established at Manjri, Dhulia, Devi-hosur, Broach and Bordi. The assistants, who receive nine months' training of an essentially practical type, are destined for appointment as "village assistants," secretaries of village panchayats or in subordinate posts in connection with rural development work in various Government departments. In the Northern Division of the Province 45 rural assistants were trained at the Rural Assistants' Training Centres at Broach (17) and Bordi (28) and, all but

two of these students, have now been given posts in connection with rural development activities in the districts. In the Central Division, 60 rural assistants completed their course of training at Manjri (27) and at Dhulia (33) and fifty-three of these have now been found suitable employment. At Devi-hosur, Rural Assistants' Training Centre in the Southern Division, 23 rural assistants completed the training and have received appointments as "village assistants" or as kamgars, etc.

In the present year, a new course of training for rural assistants has been commenced at the centres mentioned above and is being attended by 62 students in the Northern Division, 72 students in the Central Division and 32 students in the Southern Division. A new Rural Assistants' Training Centre for the Konkan has been organised in co-operation with the management of the Agricultural School at Rajapur, Ratnagiri district, and is being attended by 10 students.

108. *Special Agricultural Training Classes.*—The special course of training in horticulture at the Government Experimental Fruit Station, Ganeshkhind, was attended by forty students. At the Government Poultry Farm, Kirkee, and its sub-stations at Dhulia and Dharwar, fifty-seven students attended special courses in poultry husbandry of which fifty-six successfully completed the training and were awarded certificates. A small class in oil engine upkeep and management was held by the Agricultural Engineer and attended by three students.

CHAPTER XII.

ADMINISTRATION AND FINANCE.

A. Administration.

109. *Introduction.*—During the year under report, the main developments in the organisation of the Agricultural Department have been (a) the organisation and establishment of a separate Bunding Section under the combined Bunding and Dry Farming Survey and Development Scheme and (b) the reconstitution of the Konkan Division as a separate agricultural charge under a Divisional Superintendent of Agriculture, Konkan. Both these developments have greatly strengthened the work of the Department and will undoubtedly prove to be most valuable extensions of departmental activities in the districts.

Another recent change in departmental organisation is the conversion of the post of Crop Botanist to Government into a post of Deputy Director of Agriculture, Crop Research. The holder of this new appointment will exercise technical supervision over all plant breeding work throughout the Province and he will have the plant breeding stations dealing with the improvement of rice, other cereals and tobacco under his direct administrative control also. It is anticipated that this arrangement will not only secure closer supervision over scientific work on crop improvement in the Province but will also relieve the territorial Deputy Directors of Agriculture of part of the ever-growing burden resulting from the expansion of botanical research work in the districts.

The scientific research work of the Agricultural Department, as will be seen from the information supplied in this Report and its Appendices, is increasing rapidly and is being facilitated considerably by the generous assistance and co-operation of such bodies as the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and the Sir Sassoon David Trust Fund. It may be mentioned in order to illustrate the extent of the valuable assistance rendered by these organisations in such work that, since their inception, the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and the Sir Sassoon David Trust Fund have subsidised departmental activities to the extent of approximately Rs. 16,06,817, Rs. 20,91,387 and Rs. 5,28,238, respectively.

As the World War continues, new duties and new problems arise in connection with agricultural development, food production, etc., which throw additional responsibilities and burdens upon the staff of the Agricultural Department. It is gratifying to be able to report that the staff of all grades have worked enthusiastically and in close co-operation in the execution of their ever-growing activities both in research and extension work and that, in such work, they have secured the sympathetic assistance and co-operation of many other agencies, both official and non-official, throughout the Province, whose valuable and willing help is fully acknowledged.

110. *Staff.*—Mr. W. J. Jenkins held charge of the post of Director of Agriculture throughout the year under report.

The undernoted major staff changes took place during the year :—

Mr. D. B. Kolhe, Assistant Livestock Expert to Government, was appointed to hold charge of post of Livestock Expert to Government in addition to his own duties.

Mr. M. S. V. Rama Rao was appointed as Bunding Supervisor and Messrs. M. K. Shirole and R. B. Mutalik Desai as Survey Engineers in the Bunding and Dry Farming Survey and Development Scheme.

Mr. V. S. Kulkarni, Agricultural Officer, Bijapur, was appointed to officiate as Divisional Superintendent of Agriculture, Konkan.

Dr. V. N. Gokhale, Assistant Investigator, Dry Farming Research Scheme, Sholapur, and Mr. R. B. Gode, Agricultural Officer, Dry Farming Research Scheme, Sholapur, were appointed to officiate as Chief Investigator and Assistant Investigator, respectively, in the same scheme.

Mr. S. G. Kelkar, Agricultural Officer, and Mr. S. J. Patel, Agricultural Officer, were appointed to officiate as Cotton Breeder, Southern Maratha Country, and Cotton Breeder, North Gujarat, respectively. Mr. G. S. Godbole, Lecturer in Dairying, was appointed to officiate as Assistant Professor of Dairying and Manager, Agricultural College Dairy, Kirkee.

Mr. V. P. Gokhale, Agricultural Officer was appointed to officiate as Assistant Plant Pathologist in the Bombay Wheat Rust Research Scheme.

The post of Crop Botanist to the Government of Bombay in Class II of the Bombay Agricultural Service was converted

into the post of Deputy Director of Agriculture, Crop Research, in Class I of that service and Dr. B. S. Kadam appointed to officiate in that post.

111. *Retirements.*—During the year under report, the undernoted officers were permitted to retire from service on superannuation :—

- (1) Mr. N. V. Kanitkar, Soil Physicist to Government and Chief Investigator, Dry Farming Research Scheme, Sholapur, entered the Agricultural Department in May, 1909, and after holding certain non-gazetted appointments, was appointed Assistant Professor of Chemistry at the Agricultural College, Poona. Mr. Kanitkar's capable and energetic work soon brought him promotion to the post of Soil Physicist to Government in which appointment he proved himself to be a research worker and administrative officer of considerable ability. When the Dry Farming Research Scheme, Sholapur, was started in October, 1933, Mr. Kanitkar was put in charge of it as Chief Investigator which position he held until the date of his retirement. The Dry Farming Research Scheme, Sholapur, owes much of its success to the energy, enthusiasm and ability of Mr. Kanitkar who guided the scientific investigations with skill and zeal. He retired from service on the 27th June, 1942.
- (2) Mr. M. M. Desai entered the Agricultural Department in June, 1912, and specialised in animal husbandry and dairying. He held the post of Manager, Northcote Cattle Farm, Chharodi, for 15 years and proved himself to be a capable, practical and energetic livestock officer. As a result of his intimate knowledge of animal husbandry and dairying in the Province, he was selected for the post of Assistant Marketing Officer, Livestock and Dairy Products, in April, 1935, and, later, became Assistant Livestock Expert to Government. In June, 1938, he was appointed as Assistant Professor of Dairying and Manager, Agricultural College Dairy, in which post his wide and practical experience and his energetic and capable administration proved of much value. He retired from service on 16th July, 1942.

112. *Obituary.*—During the year under report, the Agricultural Department in the Province suffered the grievous loss of four of its senior and experienced officers by death. Three

of these officers were still in service at the time of their untimely decease.

- (1) Mr. E. J. Bruen, O.B.E.—The death of this popular and capable officer, who for many years had guided with success and enthusiasm the work of the Livestock Section of the Agricultural Department, is recorded with the greatest regret. Mr. Bruen entered the Agricultural Department in 1914 and, in 1921, he was promoted to the Indian Agricultural Service. During all his long and faithful service, he held the post of Livestock Expert to Government and the Livestock Section of the Department has developed and expanded as a result of his personal energy and skill, his high standard of practical knowledge and ability and his sympathetic attitude towards the cultivators and cattle-breeders of the Province. In the words of the Government Resolution deploring his untimely death “throughout his service he displayed to a remarkable degree an unusual combination of talents, enthusiasm, patience and executive ability”. The sad and premature loss of this valuable officer is greatly regretted not only by his colleagues in the Agricultural Department but also by the multitude of persons in all walks of life in the Province who knew and appreciated his professional skill and his fine character.
- (2) Mr. V. V. Gadgil who retired from service in June, 1940, spent most of his working life in the Deccan Canal tracts of the Province and was a recognised authority on the problems of cane cultivation and irrigated farming in general. He was a most capable and enthusiastic officer who never spared himself in the execution of his duties and his sad death, so shortly after his retirement from active service, is much deplored.
- (3) Dr. V. G. Deshpande, who died in August, 1941, while on leave due to ill health, joined the Agricultural Department in 1913, and during his service, made a name for himself as a practical teacher and research worker in entomology. He was officiating as Professor of Entomology at the Agricultural College at the time of his death and, in this post, he was loved and respected by his colleagues and students. His untimely death deprives the Department of an industrious and energetic officer.
- (4) Mr. R. M. Hegdekatti held the appointment of Farm Superintendent, Kumpta Farm, Kanara, at the time of his sudden and much regretted death in October, 1941.

He was an officer with an intimate knowledge of the agricultural problems of the Konkan tract, from which he himself came, and his untimely decease has cut short a promising career. His loss is much regretted by his colleagues in the Department.

B. Finance.

113. *Introduction.*—The work of the Agricultural Department in the Bombay Province, as of Agricultural Departments in all parts of the World, is largely concerned with scientific research, propaganda and demonstration, education and services to the cultivating classes. The results of such work cannot be adequately presented in balance sheets or in profit and loss accounts and financial statements but, for many years past, these results have been contributing in no small degree to increasing the material prosperity of the agriculturists of the Province. The dividends which accrue from successful scientific research work, especially in agriculture, are immense. Mention has been made in another Section of this Report (paragraph 12) of the fact that the financial benefit to the cotton-growers of Khandesh as a result of the introduction and extension of the improved variety of cotton, Jarila, has, within a period of two seasons only, exceeded the total expenditure on the Agricultural Department during the past four years. Similar instances of direct financial benefit to cultivators as a result of the various activities of the Agricultural Department, though perhaps not so striking as the one quoted above, could be mentioned in many districts of the Province. The total expenditure on the Agricultural Department in the Province of Bombay during the thirty-six years of its existence is approximately 420 lakhs of rupees but there can be little doubt that this amount has been returned many times over in the form of increased profits to the agriculturists resulting from departmental activities during that period.

114. *Departmental Expenditure and Receipts.*—The expenditure of the Agricultural Department for the year under report amounted to Rs. 17,53,175 as against Rs. 9,54,929 in the previous year. The considerable increase in expenditure was mainly due to the de-amalgamation of the Rural Development Department whereby many of the staff and much of the activities formerly transferred to that Department were restored to the Agricultural Department. In addition, the considerable increase in special development activities referred to in this Report has added to departmental expenditure.

The receipts of the Agricultural Department from all sources were Rs. 2,12,968 as compared with Rs. 2,00,442.

115. *Subsidies and Grants.*—The Agricultural Department received considerable sums for research work and other activities from outside sources. In the year under report, such amounts were:—

	Rs.
(1) From the Imperial Council of Agricultural Research for various research schemes.	1,34,252
(2) From the Indian Central Cotton Committee for research schemes, seed multiplication and distribution schemes, etc., dealing with the cotton crop ..	1,16,714
(3) From the Sugar Excise Fund of the Government of India for work on the improvement of sugarcane cultivation..	28,870
(4) From the Trustees, Sir Sassoon David Trust Fund, for research schemes and schemes of agricultural development ..	15,757
(5) From grants made by the Central Government for poultry improvement work in villages	6,200

The numerous accounts of important activities of the Department, especially in connection with scientific research work, which are mentioned in this Report as having been financed, wholly or partly, from the financial assistance given from the sources mentioned above, testify to the outstanding value of such contributions which are gratefully acknowledged.

116. *Personal Ledger Accounts.*—The Personal Ledger Advance Account, placed by Government at the disposal of the Director of Agriculture mainly for financing cotton seed distribution work, was restored from Rs. 5,000 to Rs. 1,38,000 as a result of such work being returned to the Agricultural Department on the de-amalgamation of the Rural Development Department. A sum of Rs. 10,000 has been earmarked from this Account for making advances to approved cultivators for the purchase of "premium" bulls and cows under a scheme for livestock improvement.

In connection with the "Grow More Food Crops" campaign, Government has sanctioned an additional Personal Ledger Advance Account of Rs. 1,70,000 for financing the purchase and distribution of seed of food crops in areas where shortage of such seed might occur. This amount has been divided up and placed at the disposal of territorial Deputy Directors of Agriculture.

W. J. JENKINS,

Director of Agriculture,
Bombay Province.

APPENDIX A.

SUMMARY OF THE WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, NORTHERN DIVISION, FOR THE YEAR 1941-42.

I. STAFF AND ADMINISTRATION.

Rao Bahadur S. S. Salimath continued to hold charge of the post of the Deputy Director of Agriculture Northern Division, throughout the year. Mr. (now Rao Saheb) M. L. Patel was transferred to Dharwar and Mr. S. J. Patel was appointed to officiate as Cotton Breeder, Viramgam. The post of the Divisional Superintendent of Agriculture, Konkan Division, having been created with head-quarters at Ratnagiri, Alibag District, was transferred to the control of that Officer from 1st April 1942. There were no other substantial changes. The Northern Division, as it now stands, comprises all the four Districts of Gujarat and Thana and Bombay Suburban Districts.

II. SEASON.

The monsoon started late by the end of June. There were unprecedented heavy rains in Gujarat in the first week of July with records of 14.65 inches on 2nd and 11.63 inches on 3rd at Surat. The rainfall in the first fortnight of July was practically more than $\frac{3}{4}$ th of the total of the year. The crops sown under dry conditions before July rains had to be resown in many places. There was a long break after these heavy rains in most places and almost all the kharif crops suffered from want of moisture afterwards. There were fair rains in August in some places and the kharif crops fared there a little better. The September rains were very scanty throughout the Division and there were practically no rains in October with a result that the rabi crops suffered much from want of moisture and gave very low yields except in places where they could be irrigated. The agricultural season for 1941-42, therefore, was abnormal characterized by heavy rainfall to start with and very little afterwards resulting in low yields of both kharif and rabi crops. The yields of food crops were on the whole 50 per cent. normal whereas those of cotton which was improved by cold weather later ranged 50 to 75 per cent. normal. The prices of all farm produce were good but the outturns being poor, the economic position of the cultivators has not materially improved.

III. RESEARCH WORK.

(1) *Cotton Breeding at Surat.*—The comparative tests of four improved types, viz., 1027 A.L.F., Seg. 8-1, Selection 1-A.L.B. and S. 9-1-4 were conducted again during the year. The fibre length of Seg. 8-1 was observed to be as good as that of 1027 A.L.F. (0.92") and ginning percentage 3.3 more with no significant difference in the yield of seed-cotton. The average performance of 6 years' trials of these two

cottons on Surat Farm shows that Seg. 8-1 gives 7 per cent. more yield of seed-cotton and has 3 per cent. higher ginning resulting in 16 per cent. higher yield of lint and is nearly equal to 1027 A.L.F. in staple length. Seg. 8-1 was tried at five representative places in the Surat cotton area and the results were equally encouraging. Besides experimenting on Surat Farm and in cultivators' fields in Surat District, Seg. 8-1 was grown during the year on a fairly large scale (60 acres) at Sithan—a village in Olpad taluka of the Surat District. The produce of this area was sold at Rs. 117 on Broach (Rs. 173) against Rs. 120 on for 1027 A.L.F. Moreover Seg. 8-1 is wilt resistant under field conditions unlike 1027 A.L.F. which is wilt susceptible and is, therefore, much appreciated by the cultivators. The one defect of Seg. 8-1 is that it is not so silky in touch as 1027 A.L.F. Further work is directed towards improving this defect by synthesising types from crosses of Seg. 8-1 \times 1027 A.L.F. and back-cross 1-6 \times 1027 A.L.F.

Interspecific Hybridization in Cottons.—This work conducted on Surat Farm has been financed by the Indian Central Cotton Committee. The object is to explore the possibilities of combining the superior quality of American or Egyptian cottons with the hardiness, adaptability, ginning outturn, and disease resistance of Indian Cottons. The advance stage cultures of fertile back-crosses of American cottons show some desirable economic characters like staple length, ginning percentage and earliness developed to a fairly high degree in individual selections. Synthesising all the desirable characters in one type is being attempted. The utility of polyploid forms created by colchicine treatment is being studied. Cytological work has been helpful in determining chromosome numbers in various hybrids and colchicine treated material and in ascertaining how far chromosomal balance has taken place in different cultures.

(2) *Cotton Breeding at Broach.*—During the year under report, six segregates, viz., 76-1, 1-2, 1-6, 5-18, 7-29 and 3-1 along with checks B.D. 8 and Broach local were under trials on the Farm; while the two most promising segregates 1-2 and 1-6 along with checks were tried in 3 black soil and 1 gorat soil villages of the Broach District. On the Farm, all the 6 segregates were found to be statistically as good yielders as B.D. 8 but in comparison to Broach local they yielded significantly less seed cotton. They maintained their high ginning outturns and their lint yields per acre were significantly higher (27 to 37 per cent.) than that of B.D. 8 but 10 to 16 per cent. less than that of Broach local. In staple qualities, they were nearly as good as the quality strain B.D. 8. In village trials, the results were equally good. In mill tests, segregates 1-2 and 1-6 were found much superior to Broach local and equal to B.D. 8. These segregates and B.D. 8 spun 30's while local spun only 14's. The segregates fetched Rs. 259 and 256 against Rs. 251 for B.D. 8 and Rs. 148 for Broach local per candy of 784 Lbs. Segregates 1-2 and 1-6 were grown on 103 acres and 98 acres respectively in compact blocks during the year and the seed obtained from

the produce of these areas is sufficient to cover 3,760 acres and 3,360 acres respectively during the coming season. Possibilities of improving the quality of 1-2 and 1-6 still further by crossing them with quality cotton like 1027 A.L.F. and introducing earliness in the same are under investigation at Broach.

(3) *Cotton Breeding at Viramgam.*—As a result of detailed study of several cultures, 45 promising families have been obtained. Of these, 6 families are derived from local Wagad cottons while the remaining are evolved from crosses of Wagad with Surti-Broach, Iranian and early Russian herbaceums. Isolation of the most promising ones from these will be continued during the extended period of the Scheme for 5 years. Among the large scale variety trials, Segregates 4-1 which is a cross between Wagad 8 and 1027 A.L.F. back-crossed to Wagad 8 has been found to be the best. After careful study of its performance for 9 seasons on Viramgam Farm and 2 to 6 seasons in different talukas of Ahmedabad District it has been decided this year to organise its seed multiplication and spread in certain parts of the District. The average gross per acre money return for it on Viramgam Farm comes to Rs. 33-2-0 against Rs. 32-5-0 for local Wagad. Eight other promising types are on hand for large scale trials next season. To facilitate trials for such promising types under different environmental conditions prevailing in Wagad tract a new Sub-Station has been established at Dholka from 1st May 1942.

(4) *Cotton Breeding at Anand.*—The Indian Central Cotton Committee sanctioned a scheme in 1939 with the object of finding a superior type of cotton for replacing the inferior Rozi cotton grown in parts of Kaira District. This is sought to be achieved either by selection from Rozi or by introduction and trials of other perennial or annual cotton. This scheme is located on the estate of the Institute of Agriculture, Anand and came into operation in July 1941. From the Rozi seed samples collected from the representative villages and grown in 1941-42, 55 plants with ginning percentage of 20·7 to 37·2 and staple length of 17·1 to 23·4 mm. have been selected for further study. Several indigenous and exotic perennials as well as American annual types were tried, but none of them grew well. Segregates, 76-1, 1-2, 1-6, 5-18, 7-29 and 3-1 were tried at Anand along with checks B.D. 8 and Broach local. Though they yielded fairly well, they were late in growth and pickings continued till the end of May. They maintained their relative high ginning outturn and fibre length and feel. From 331 seed cotton samples of single plant collections of Rozi obtained from the farmers' fields during the survey, 61 plants with ginning percentage of 21·8 to 37·6 per cent. and staple length of 19·2 to 26·3 mm. have been retained as a foundation stock for this scheme.

(5) *Examination of Cotton Samples by the Technological Assistant.*—The Cotton Technological Assistant maintained from the funds of the Indian Central Cotton Committee continued to examine the samples of

cotton received from the Cotton Breeders, Surat, Broach, Viramgam and Jalgaon. During the year under report, 281 samples were received for laboratory tests—80 from Surat, 64 from Broach, 42 from Viramgam, 38 from Jalgaon and 57 from various Co-operative Societies in the Surat District. 268 samples were tested for fibre length, 154 for fibre weight and 84 for maturity. In addition to the above, 68 samples connected with research work were tested for fibre length, 68 for fibre weight and 48 for maturity. The Technological Assistant also helped the Cotton Breeders in examining the length and feel of 2,480 lint samples by hand stapling method.

(6) *Tobacco Breeding at Nadiad.*—The improved Keliu selections No. 49 and No. 24 gave respectively 19 per cent. and 22 per cent. higher yield than local under replicated trials. The performance of K-49 in the District continued to be satisfactory. A seed multiplication scheme for K-49 was suggested to the Rural Development Board of the Kaira District and has been adopted. Seed sufficient for about 7,200 acres has been raised under this scheme during the year under report. Saijpurii selections No. S-57 and S-98 gave respectively 14 per cent. and 9 per cent. higher yield than local under replicated trials though they matured seven days later. In quality they are equal to the local. Growing cigarette tobacco at Nadiad has not been a paying concern due to sodium salts in well water and the work conducted so far has not produced any practical results.

(7) *Bajri Breeding at Nadiad.*—One sub-selection from the original selection Bajri No. 207 has given 14 per cent. statistically significant higher yield of grain at the yield level of 2,243 lbs. per acre without irrigation. The average yield of Bajri No. 207 in 57 trials in all the 3 Districts of North Gujarat during the past 5 years is 20.1 per cent. more than that of the local. Schemes for the seed multiplication and distribution of this improved variety Bajri No. 207 have been adopted by the Rural Development Boards, Kaira and Ahmedabad Districts and 66,200 lbs. seed sufficient for an area of 9,457 acres has been raised under these two schemes.

(8) *Castor Breeding at Nadiad.*—The improved castor selections S-20 and S-5 gave respectively 124 and 155 per cent. statistically significant higher (more than double) yield than local under this year's conditions on account of their relative earliness. A seed multiplication scheme for S-20 Castor is under preparation for Ahmedabad District.

(9) *Maize Breeding at Dohad.*—In local Sameri maize 95 cultures have been selected for further work. As most of the selected lines looked uniform and promising, crossing of in-breds was started during the year and 50 combinations were made during the kharif season. Several in-breds were top-crossed with Farm Sameri maize plants and 64 combinations were made during the rabi season. In addition to these, 9 combinations were made with new African \times Farm Sameri maize. Mass selection in Sameri Maize was also continued.

(10) *Research work other than Cotton Breeding on Surat Farm.*—The various green manuring experiments described in the previous reports were continued. The season was abnormal during the year and results therefore, are not normal.

Seed Multiplication.—12,655 lbs. 1027 A.L.F. cotton seed and 7,640 lbs. Budh Perio No. 53 Jowar seed were produced on Surat Farm and were given out for further multiplication in the District. Similarly 909 lbs. Dhaincha seed was produced of which 280 lbs. was supplied for the Rayam Agricultural Project and the remaining to the seed growers in the District.

(11) *Research work other than Maize Breeding on Dohad Farm.*—Three varieties of dry wheats, viz., Pusa 4, Bansī 808 and Nipahd 81 were tried in a replicated experiment and Pusa 4 was found to be the highest yielder. Similarly, three varieties of irrigated wheats, viz., Pusa 4, Pusa 52 and Pusa 165 were tried and here too Pusa 4 was found to be the best. Two varieties of gram, viz., Dohad Yellow and Nipahd 816 were tried and there was no significant difference between the two.

(12) *Research work other than Cotton Breeding on Viramgam Farm.*—Jowar 10-2 obtained by selection in local jowar continued to produce satisfactory results. It was as early in maturity as the early Utavali variety and its fodder was found to be superior to that of Chhasati or Utavali. The results of 6 seasons on Viramgam Farm and those of the five trials conducted in Ahmedabad District during the year under report are encouraging and a scheme for seed multiplication of 10-2 jowar is under consideration.

(13) *Experiments on cultivators' fields.*—The Agricultural Officers continued to conduct experiments on cultivators' fields. Fourteen experiments on improved varieties of cotton, 13 on Bajri No. 207, 5 on Jowar 10-2, 5 on Castor S-20, 7 on K-29 tobacco, 11 on improved strains of paddy, 2 on wheat varieties and 6 on top-dressing groundnut cake on paddy crop were conducted during the year with a view to convince the cultivators of their merits.

IV. RURAL DEVELOPMENT WORK.

(1) *Multiplication and distribution of cotton seed.*—Two cotton seed multiplication and distribution schemes—one with 1027 A.L.F. in Surat and the other with B.D.8 in Broach area—were working during the year under review. The Department controlled 27,022 acres of pure 1027 A.L.F. and 5,617 acres of pure B.D.8 cotton for seed multiplication. The total quantities of pure seed stocked in and distributed from various depots were 10,38,837 lbs. 1027 A.L.F. and 1,07,582 lbs. B.D.8 cotton. Besides this quantity distributed in the British area, 14,38,497 lbs. 1027 A.L.F. seed was sent out to Rajpipla and Chhota Udepur States. The total area covered by 1027 A.L.F. cotton during the year in the

British area was 70,000 acres against 1,00,000 acres during the last year and that covered by B.D. 8 cotton was 13,178 acres against 8,978 acres. The British 1027 area was less due to some Cotton Sale Societies reverting to their own seed policy, viz., Selection 1-A. The Broach area was more due to higher premium realised for B.D.8 cotton than in the previous year.

(2) *Multiplication and distribution of improved seeds other than Cotton* Model Seed Multiplication and Distribution Schemes were prepared and have been adopted by the Rural Development Boards of all the Districts in the Northern Division. In Ahmedabad District these schemes are in connection with Bajri No. 207 and Wheats Bansi No. 224 and Pusa 52. The total quantities of seeds of these three crops raised during the year for further multiplication were Bajri No. 207—17,200 lbs., Wheat—Bansi No. 224, 9,600 lbs. and Pusa 52—9,600 lbs. In Kaira District these schemes are in connection with Bajri No. 207 and Tobacco K-49. The quantities of seeds raised during the year are Bajri No. 207—49,000 lbs. and Tobacco K-49—7,200 lbs. In Broach-Panchmahals District, the scheme is in connection with Rabi Jowar No. 8. The quantity of seed raised for further multiplication was 7,240 lbs. In Surat District, the scheme is in connection with Budh Perio Jowar No. 53. The Surat Farm Budh Perio No. 53 Jowar seed 291½ Mds. (11,660 lbs.) was distributed to 200 selected cultivators in 7 talukas. The produce of these 200 farmers will be further distributed to other cultivators by exchange system during the coming season. In Thana and Bombay Suburban Districts, the schemes are in connection with improved Paddy strains. The quantity of seed raised during the year was 74,160 lbs. sufficient for covering an area of 1,854 acres. All these schemes are hopeful and are expected to yield valuable results in the course of a few years.

(3) *Grading and Agmarking 1027 A.L.F. Cotton in Surat area.*—The Scheme for the marketing of pure 1027 A.L.F. cotton in Surat District was continued during the year. Fourteen Kamgars worked for inspection of fields and for separate ginning and pressing, certified seed-cotton in 10 different centres under the supervision of the Cotton Superintendent and his Graduate Assistants. The total area inspected was 31,543 acres of which the produce of 27,022 acres was certified for AGMARK having the purity of 97 per cent. and over. The total number of agmarked bales was 5,964 and the premium received for these varied from Rs. 5 to Rs. 27 against Rs. 5 to Rs. 26 last year.

(4) *Control of Selection 1-A Cotton in Surat Area.*—Ten check stations were established like last year to prevent the import of cotton from Olpad into Surat and Ankleshwar areas. Half-pressed bales were as usual allowed to be transported into Surat area for full pressing under licence. These bales were pressed under the supervision of the Agricultural Department and were marked as "OLPAD". The total number of full pressed bales thus marked was 14,344. Like last year 8 temporary Kamgars were appointed to make a survey and estimate of the spread

of Selection I-A in 138 villages of Surat and South Surat areas left unsurveyed last year. It was observed that the spread of I-A was general in all villages, the extent varying from 15 to 100 per cent. Navsari tract was found to be the worst affected.

(5) *Model Project Scheme, Surat District.*—A model agricultural project for introduction of all agricultural improvements in the cotton tract of Surat District at Rayam at a total cost of Rs. 10,610 to be spread over a period of three years was approved by the Indian Central Cotton Committee, the Imperial Council of Agricultural Research and the Bombay Government and its working was commenced from 2nd June 1941. A detailed study of the holdings of the 15 members who joined the Scheme was made and a technical programme of work was drawn. All the 15 members were induced to adopt the improvements laid down in the technical programme and day-to-day guidance was given to them. The area operated was 293 acres and 20 gunthas. The most important improvements adopted during the year were drains and bunds under Land Improvement, wider spacing of cotton (6 feet), Dhiancha green manuring in between cotton rows, groundnut cake top-dressing and timely interculturings. There were unusually heavy rains in the first week of July and practically little afterwards. The drains were useful for removing excess water and bunds for accumulating silt and preserving moisture. These combined with improved methods of tillage and manuring described above produced good yields especially of cotton ranging from 404 to 768 lbs. seed cotton per acre with an average of 520 lbs. for 15 members against 380 lbs. for other cultivators of the village outside the scheme. The total net profits ranged from Rs. 11 to 29 with an average of Rs. 17 per acre, which may be considered as very good for the season. These results have attracted others to join the scheme and it is hoped that most of the cultivators of Rayam village will join the scheme during the very next season.

(6) *Model Project Scheme, Dohad-Jhalod Talukas, Panch Mahals.*—A Model Agricultural Project similar to the one described above was approved by the Imperial Council of Agricultural Research and the Government of Bombay recently with effect from 1st April 1942. The area selected for the working of this "Model Agricultural Project" is one of the most backward tract of the Province and is inhabited by Bhils—a wild tribe—whose cultivation is of a very primitive type. A detailed study of the needs of all the 14 members and their economic position has been made. The scheme was actually started on 1st May 1942. The necessary implements were got prepared and seeds of various kharif crops were procured and distributed. The necessary staff has been appointed and day-to-day guidance is being given to the cultivators who have joined the scheme.

(7) *Taluka Demonstration Centres.*—There were 16 Taluka Demonstration Centres in the five Districts of Northern Division. 11 were added during the year under report, making a total of 27 in all. These were

a few changes in sites. These Demonstration Centres with improved crops and cultivation have attracted the attention of the cultivators and are producing good results in the neighbourhood. The Depôts established in these Centres were also very useful in distributing improved implements, seeds and manures. They were particularly useful during the year under report in stocking and distributing seeds of food crops. The Field Kamgars in these Centres did intensive propaganda for "Grow More Food Crops Campaign". The most important results achieved are the spread of Budh Perio Jowar and Green-manuring with Dhaincha between cotton rows in Surat District, the spread of Bajri No. 207 and Tobacco K-49 in Kaira District, Wheats Bansi No. 224 and Pusa 52 and Bajri No. 207 in Ahmedabad District, and improved strains of rice in Thana and Bombay Suburban Districts. The use of groundnut cake on cotton and rice has also extended. In all, 160 demonstrations were held on these Taluka Demonstration Centres and 3,248 cultivators attended the same.

(8) *Officers' Days and Farmers' Week on Government Farms.*—These were organised on Surat, Broach, Dohad, Nadiad and Viramgam Farms like last year and crop demonstrations accompanied by interesting and educative shows were held there.

(9) *Campaign for increased food crop production.*—In obedience to G. M., No. 7760-A/33, dated 5th March 1942, R. D., a propaganda was launched with a view to induce the cultivators to curtail the cultivation of non-food crops and to grow more food crops in their stead. A Special Officer was appointed for Gujerat in this connection and he started his work from 1st April 1942. Owing to war conditions the prices of short-stapled cotton began to fall and it was thought necessary to intensify the "Grow More Food Crops" Propaganda by asking every member of the Agricultural Department to move in villages and hold meetings for this purpose. "A meeting a day for each" was the rule. Suitable leaflets were prepared region by region showing the relative advantages of growing food crops against cotton and were distributed to literate cultivators at the time of these meetings. All the Agricultural Officers and their Assistants including Field Kamgars of Taluka Demonstration Centres moved in their respective charges and did intensive propaganda to reduce the area under unwanted short-stapled cotton and to grow food crops in its place. In Broach and Surat Districts, where cotton is grown 6 feet apart, the cultivators were advised not only to reduce their area under cotton but also to grow an early food crop in between cotton. Attractive coloured posters with proper captions were prepared and posted on railway stations, Village Chowras, Market places, Municipal Nakas and such other places commonly visited by the cultivators. To intensify the work still further, a "FOOD CROP PRODUCTION WEEK" initiated by the Director of Agriculture, Bombay Province, Poona, was organised from 24th to 30th May 1942. During this week all Official as well as non-Official agencies co-operated and held taluka and village meetings on an

extensive scale. The Officials of various Departments worked together in many places and the Officers of the Agricultural Department held more than one meeting a day. 400 meetings were held attended by 22,347 persons during this week. In fact, almost all important villages of Gujerat were visited by the Agricultural Officers and their Assistants and in all 1,786 meetings were organised attended by 74,827 persons according to the fortnightly progress reports received from them. These progress reports also indicated promises of the cultivators to reduce the area under cotton from 25 to 35 per cent with an average of 30 per cent all over Gujerat. The cultivators' expressions in inferior Mathio tract indicated a greater reduction than 60 per cent. From June onwards the food crop propaganda was concentrated on purchasing, stocking and distributing various seeds of food crops specially those which were not locally available such as early varieties of paddy and jowar. An amount of Rs. 50,000 was made available to the Personal Ledger Account of the Deputy Director of Agriculture and he was authorised to purchase and distribute the seed at a concession rate of $\frac{2}{3}$ rd the cost price. Distribution of seeds of kharif crops is in progress mainly through the agencies of Taluka Development Associations and Taluka Demonstration Centres and that of the seed of rabi crops like wheat is under contemplation. The work of seed distribution added on to the propaganda has been very much appreciated by the cultivators and it is hoped, that the fall in the area under cotton will not in any way be less than the above stated estimates.

V. AGRICULTURAL EDUCATION.

(1) *Rural Assistants' Training Centres, Broach and Bordi.*—Two training Centres—(1) non-Official conducted by the Gokhale Education Society at Bordi and (2) the Official at Broach, were established in May and July 1941 respectively for the instruction of the Rural Assistants in practical agriculture, co-operation and Village Industries. 28 candidates were trained at Bordi and 17 at Broach. 26 out of 28 candidates at Bordi and all the 17 at Broach have been appointed to work as Rural Assistants after their training in Agricultural, Co-operative and Rural Development Departments. Only one candidate has been taken by the Industry Department.

(2) *Primary and Secondary Schools with Agricultural Bias Classes.*—There are in all 14 primary schools with agricultural bias classes in the Northern Division. The local Agricultural Officers continued to maintain touch with the working of these classes and conducted examinations of the same. The agricultural classes attached to Godhra High School were examined by the Agricultural Officer, Nadiad Farm.

VI. MISCELLANEOUS WORK.

The Deputy Director of Agriculture, Northern Division, besides, controlling all the work of the Division attended the meetings of Anand Institute and colosely guided its work in various Sections. He attended the meetings of Rural Development Boards and worked for the

continuance of various seed multiplication schemes adopted by them in the previous year. He also attended meetings of the Indian Central Cotton Committee to which he submitted progress reports and proposals for extension of various schemes. He attended also the meeting of the Locust Committee at Delhi. He prepared schemes for development of agricultural lands at Chembur and Khardi.

S. S. SALIMATH,

Deputy Director of Agriculture,
Northern Division, Surat.

Surat, 27th July 1942.

**Programme of work to be done under the Deputy Director of Agriculture,
Northern Division, Surat, for the year 1942-43.**

Research Work.

(1) Cotton Breeding work at Surat, Broach and Viramgam will be continued on the lines of last year with special reference to the points referred to in the body of the report.

(2) Tobacco Breeding work at Nadiad will be shifted to Anand whereas Bajri, Tur and Castor Breeding work will be continued on Nadiad Farm.

(3) Maize Breeding work at Dohad will be concentrated on various crosses of in-bred strains.

(4) Research work other than breeding on Surat, Dohad and Viramgam Farms will be continued.

(5) District trials in cultivators' fields will be conducted in new places where they have not been conducted in previous years.

Rural Development Work.

(6) Seed multiplication schemes on cotton and other crops will be carried out to their requirements.

(7) Grading and Marking of 1027 A.L.F. Cotton will be continued, if sanctioned.

(8) The import of 1-A cotton from Olpad into Surat area will be controlled by establishing Check Stations.

(9) The existing 27 Taluka Demonstration Centres will be guided and ten new ones will be organised.

(10) Officers' Days and Farmers' Weeks on Government Farms will be continued.

(11) The Agricultural Project at Rayam will be conducted on an extended scale and that at Mirakhedi just started will continue to work.

(12) Intensive propaganda on "Grow More Food Crops" campaign will be continued.

S. S. SALIMATH,

Deputy Director of Agriculture,
Northern Division, Surat.

Surat, July 27th 1942.

APPENDIX B.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, CENTRAL DIVISION, POONA, FOR THE YEAR 1941-42.

A. SEASON.

The Kharif season from the agricultural stand-point was less satisfactory than the preceding year, in most parts of the Deccan districts, the two out-standing features being late advent of monsoon rains and prolonged breaks in the rains during the crop growing period. There was no frost during the cold season, but there were hail-storms in certain parts of Khandesh. The irregular season adversely affected the crops in most parts of the Deccan. In Ahmednagar District, the cotton suffered considerably due to prolonged drought, and in the light soils the crop had to be grubbed up and kept ready for the rabi season. In the eastern parts of Poona District, the Bajri and rabi jowar crop was a partial failure. In East Khandesh, though the rainy season was favourable for the cotton crop due to light and intermittent showers interspersed with dry spells, the wheat crop was much affected for want of moisture in the soil. In West Khandesh, the yield of wheat was below normal.

B. RESEARCH AND EXPERIMENT.

I. COTTON.

(Scheme subsidised by the Indian Central Cotton Committee.)

This is the fifth year of the Scheme which has been extended for a further period of five years (1942-47).

Selections—(Dokras Cotton).—Of the cultures tested, five were found promising and the study of these shall be continued.

Crosses.—Cross No. 1: [(Jarila × N.R. 5) × N.M.D.] F3.

Family 176, which seemed to be promising in respect of wilt resistance and ginning and is as good as Jarila in other characters, will be further studied. The remaining families will be rejected.

Cross No. 2: (Jarila × N.R. 5) F4.—Families 197, 268, 403, 670, and 757 will be further studied as these are all superior to Jarila in ginning and are as good as the latter in staple and yield. These families also show a high degree of resistance to wilt.

Cross No. 3.—[(Jarila × N.M.D.) × Jarila] F2.

This cross is still in an early stage, and 22 plants have been selected for further study.

Cross No. 4.—(Jarila × N.R. 5) × Jarila.

Jarila has been back-crossed to N.R. 5 during the last season, and will be back-crossed to Jarila in the next season. The object of the

back-cross is to combine the staple of Jarila with the high ginning and high yielding characters of N.R. 5.

(1) JALGAON FARM.

(1) *Spacing Experiments*.—During the year, plants with shorter distances in a row, viz., 3 inches gave higher yields than plants spaced at wider distance, viz., 6 and 9 inches. This is the second year of the experiment.

(2) *Manurial trials*.—The effect of Farm Yard Manure was very much pronounced, 20, cart-loads of F.Y.M. giving the highest yield. The experiment is continued.

(3) *Sann Green Manuring to Cotton*. (i) *(First set of experiment)*.—Cotton was grown on all the previously treated plots. There was no significant difference in cotton yields obtained from these plots. It was, however, observed that cotton yield in treatments (a) i.e., sann buried and wheat, and (b) i.e., sann buried in between tur lines, was 6.4 and 2.1 per cent. more respectively over the control treatment. This is the second year of the experiment.

(ii) *Second set of experiment*.—Cotton was grown on all the previously treated plots. Cotton yield obtained in treatments A and B, i.e., sann buried and wheat, and sann composted and wheat respectively, was significantly superior over the treatment C, i.e., wheat without sann (control). Last year wheat yields in treatments A and C were significantly superior over treatment B. This is the second year of the experiment.

(4) *Rotational Experiment*.—This is the second year of the experiment and one cycle of two years relation has been completed with the following results. Cotton after groundnut gave 65.6 per cent. more yield than that obtained after Jowar. Similarly, Jowar after Groundnut gave 39.7 per cent. more yield than that obtained after Cotton. Groundnut yield either after Jowar or Cotton did not show any appreciable difference.

(5) *Tillage Experiment*.—The experiment did not show any significant difference between the two treatments like last year. The experiment will, however, be repeated for one more year.

(2) KOPERGAON FARM.

Varietal Trials.—The experiment of periodic planting of cotton varieties was conducted with a view to ascertain the most promising and suitable varieties in irrigated tracts and also the optimum time of sowing these in the tract. The total number of varieties tried was 27. There was no statistical lay out. The experiment is continued.

II. JOWAR.

In the cotton manuring experiment Jowar follows cotton in cotton-jowar-groundnut rotation. In order to see the residual effects of different manurial doses given to cotton on the succeeding jowar crops, the experiment was undertaken, but did not show any significant difference between any of the treatments.

III. SUGARCANE.

Kopargaon Farm.

(a) *Water-cum-Manure Experiments.*—Replicated water-cum-manurial series with three levels of water (95", 115" and 130"), three levels of Nitrogenous top-dressings (225 lbs., 300 lbs. and 375 lbs. N) were taken up during the year, and were tried with CO. 419 and P.O.J. 2878. The results have shown 115" superior to 95". The Nitrogen quantities of 225, 300 and 375 Lbs. per acre gave progressively higher yields and the increase of 375 lbs. over 225 lbs. was significant. The outstanding merit of the variety CO. 419 is again proved significantly superior to P.O.J. 2878.

(b) *Manurial trials.*—Sulphate of ammonia and groundnut cake were applied as top-dressings in the ratio of 1: 1, 1: 2, and 2: 1, with and without compost as basal manure. The experiment was relaid during the year. Ratio 1: 2 proved its superiority over ratio 2: 1 in both the treatments of compost and without compost.

(c) *Varietal Trials.*—Replicated experiments on combined plantings July, October and January, were tried with three promising varieties C.O. 419 was found to be the best, C.O. 426 being second in performance. The July planting was significantly better than October planting, which in turn was superior to January planting.

(d) *Rotational Series.*—The following rotational crops were grown to study their effects on Sugarcane:—

(1) Jarila cotton, (2) Bajri, (3) Groundnut, (4) Sann, (5) Patada-Shevra, and (6) fallow. This is the first year of the trial.

In the Irrigated tract of Ahmednagar District, the improved varieties of sugarcane, viz; C.O. 426, C.O. 428 and C.O. 443 were tried along with C.O. 419 and P.O.J. 2878 at 8 centres on two guntha plots, each variety being in four replicates. The final yield results are not yet to hand.

IV. WHEAT.

Wheat strains Niphad 81, and Niphad 31 were tried on Jalgaon Farm along with Bansi 224 and 168, on a guntha plot replicated eight times. Strain Nos. 224 and 31 gave significantly superior yield over Niphad 81 and strain No. 168. In the districts of Nasik and Ahmednagar, trials of Niphad 81 were made with the local in duplicate plots at three centres and the results were in favour of Niphad 81.

V. GRAM.

Niphad No. 816 was compared with the local on Jalgaon Farm on half a guntha plot in ten replications. No significant difference was found between the varieties. In Nasik and Nagar Districts, there were six and eight village trials of this improved variety with the local and No. 816 was found to give superior yield in the majority of these trials.

VI. OTHER EXPERIMENTS.

(1) *Varietal trial of Sesamum.*—Sesamum strains, N-722 and N-717 from Niphad were compared for yield with the local strain on a guntha plot in 10 replications on Jalgaon Farm. The new strains gave significantly superior yield over the local. This is the first year of the experiment.

(2) *Varietal trial of Tur.*—Tur strain No. 81 from Niphad was compared for yield purpose with the local strain on Jalgaon Farms. The lay out of the experiment was students' ABBA method with ten replications. The net area of each plot was 1.05 gunthas. N-81 gave significantly superior yield over the local. This is the first year of the trial.

C. COTTON SEED SCHEMES.

1. *Jarila cotton seed multiplication and distribution scheme, Khandesh.*—This is the fifth year of the Scheme, which is now extended for a further period of five years. The area organised for multiplication during the year was 41,682 acres under stages III, IV and V. Out of this, an area of 16,320 acres was rogued out and an arrangement for stocking and distribution of about 10,40,000 lbs. (8,000 bags) of Jarila cotton seed was made departmentally, and 7,80,000 (6,000 bags) by stockists for organising an area of at least 90,000 acres for multiplication under stages III, IV and V during the season of 1942-43.

An important feature of this year's work was to secure seed from stages IV partly, and Stage V in the year 1941-42, and to get it stocked by the East Khandesh District Central Co-operative Bank, Ltd., Jalgaon, Bombay Provincial Co-operative Bank's branches at Dhulia, and Malegaon, the Co-operative Cotton Sale Society, Yawal, the Co-operative Credit Society, Mhasavad, and Taluka Development Associations, Jalgaon, Chopda, and Pachora, known as approved agents, for supplying partly for multiplication and for the general cultivation for the season of 1942-43. Thus there were eight principal approved agents who undertook to stock and distribute the seeds on subsidy basis at annas six per bag of 130 lbs. The total quantity of seed, including 6,000 bags mentioned above, stocked by these agents, amounts to 42,90,000 lbs. The total area under controlled seed supply in the year 1942-43 is estimated at 3,15,000 acres approximately.

Another noteworthy feature of the year is that arrangements were made to seal and mark the bags of Jarila cotton seed for preventing admixture with other impure cotton seeds in transit and in the godowns.

To accelerate the seed multiplication work, additional staff has been sanctioned as per G.M., R.D., No. 7760-A/33, dated 25th May 1942. Government is also pleased to sanction the necessary staff for the organisation of Co-operative Cotton Sale Societies for the marketing of pure Jarila cotton in East Khandesh, and for its "Agmarking".

2. *Banilla (Jarilla) Cotton seed multiplication and distribution scheme in the Deccan Canals.*—A quantity of 13,435 lbs. of Banilla was grown in and around Sansar of Baramati tract on 550 acres. The average yield of seed cotton was 800 lbs. per acre. The cotton fetched a premium of 1½ to 2 rupees per maund of Kapas over local. Though Banilla was in great demand, as compared to the local, its susceptibility to wilt became a serious menace to its extension in the Deccan Canal tract, and a proposal to replace it by Jarila was submitted and was approved by the Indian Central Cotton Committee at its meeting held on 23rd January 1942.

D. GRASSHOPPER CONTROL SCHEME.

The operations of this scheme are extended for a further period of three years and the scheme is to terminate in March 1944.

For want of anti-monsoon and adequate rains, the emergence and growth of the pest was not severe during the year. The total affected area was 2,100 acres and the pest could be kept under effective check by the adoption of control and preventive measures.

E. MODEL SEED SCHEMES.

The undernoted statement shows the progress of the Seed Schemes started during the year:—

Name of crop.	Variety or strain.	District.	Taluka and seed multiplication centres.	Quantity of seed produced for stage III.	Arrangements for further multiplication.	Remarks.
1	2	3	4	5	6	7
				Lbs.		
Wheat (Dry)	No. 224	East Khandesh.	Jalgaon and 2 centres.	3,000	5 talukas are to be taken during 1942-43.	A
Do.	No. 168	West Khandesh.	5 talukas and 9 centres.	16,320	Collector of West Khandesh requested to purchase the seed from P. L. Account.	

Name of crop.	Variety or strain.	District.	Taluka and seed multiplication centres.	Quantity of seed produced for stage III.	Arrangements for further multiplication.	Remarks.
1	2	3	4	5	6	7
				Lbs.		
Gram	No. 816	Nasik	5 talukas and 30 centres.	16,800	Collector of Nasik has approached the Commissioner for the necessary funds, viz., Rs. 1,142 for the purchase of seed. Storage arrangements are made at five centres.	
Jowar	M. 35'1	Poona	Shirur Peta, 25 villages and 3 centres.	1,700	The stocking of the seed has been made by the Rural Development Inspector, with the Multi-purpose Society.	
Do.	Do.	Safara	2 Talukas and 2 centres.	1,200	Further multiplication is arranged through the Mamlatdars.	
Do.	Do.	Ahmednagar.	10 talukas and 15 centres.	73,000	Further multiplication is arranged through the Rural Development Inspector.	
Wheat (Irrigated).	Pusa 4 and III.	Do.	7 talukas and 14 centres.	10,000	Do.	

A.—Seed purchased from the advance kept at the disposal of the Collector.

F. GROW MORE FOOD CROPS CAMPAIGN.

A wide spread and intensive propaganda campaign was initiated in all the districts of the Central Division, in order to induce cultivators to increase the production of food crops and, in particular, to reduce the cultivation of cotton and other non-food crops, in favour of increased food crop production. Two Propaganda Officers, one for Khandesh with head-quarters at Dhulia, and another for Barsi-Nagar tract with head-quarters at Ahmednagar, were appointed early in April 1942 for a period of one year. To bring to the direct notice of all the agriculturists the reasons and objects for which the food production "drive" was initiated, 830 cultivators' meetings attended by 1,05,000 cultivators had been organised by the Special Propaganda Officers and District Agricultural Officers in various parts of this division till the end of June 1942, assisted by Ballad Singers and by influential persons, both officials and non-officials. The work was concentrated mostly in

these areas where short and fair stapled cotton was being extensively grown and was supplemented by the widespread distribution of propaganda posters, leaflets, handbills, cinema films, etc. As a more concentrated effort in this direction, the "Food Crop Production Week" was organised throughout the districts of the division, and 639 village meetings attended by 87,000 cultivators were held during the period 24th to 30th May 1942. Arrangements to secure seed of improved variety of Bajri, viz. Akola Bajri were made and 1,310 bags were distributed at a total cost of Rs. 23,580 from Personal Ledger Account kept at the disposal of the Deputy Director of Agriculture, to poor cultivators through the various Taluka Development Associations at concession rates, both in the cost of the seed and in transport charges. This helped greatly to augment the area under food crops. Similar concessions are to be granted for the improved varieties of Jowar and Wheat.

As a practical measure to encourage food and fodder crops in the Deccan Canal areas, Government have taken the necessary steps to reduce the irrigation rate for wheat crop from Rs. 5 to Rs. 3 per acre, to refuse pre-seasonal waterings to cotton, to give water at a nominal rate of Rupee one per acre for food and fodder crops during the rains, to charge nominal rate of one rupee per acre to early sown rabi crops till the 15th October, and to allow "Pazar" water free of charge to the growing of food and fodder crops.

G. TALUKA DEMONSTRATION CENTRES.

Fifteen new demonstration centres were opened during the year, thus bringing the total number of taluka demonstration centres to 35 in the Central Division, distributed as under:—

Name of District.	Number of Taluka Demonstration Centres.	Number of demonstrations held.	Attendance of cultivators.
East Khandesh	6	76	1,120
West Khandesh	7	119	3,200
Nasik	6	96	630
Ahmednagar	5	47	750
Poona	6	18	2,830
Satara	5	27	520
Total ..	35	383	9,050

Propaganda within the radius of five miles from the Centres for the popularisation of the various improvements was carried on by the

Field-Kangars stationed at the Centres which are now becoming the nuclei for the spread of improved seed and improved agricultural methods. The holding of adult agriculturists' class at Mhasavad Centre (Taluka Jalgaon) for a week in September 1941, was a new innovation and was greatly appreciated.

In addition to the above demonstrations, one District Agricultural Show was organised at Jalgaon on 1st and 2nd November 1941 on the occasion of the celebration of the Co-operators' Day, presided over by Mr. H. F. Knight, C.S.I., C.I.E., I.C.S., Adviser (Finance), and was a marked success.

H. OFFICIAL DAYS AND FARMERS' WEEKS.

The sub-joined table shows the details:—

Name of the Farm or Institution.	Number of		Dates on which held.	Attendance.	Remarks.
	Official days.	Farmer's weeks.			
1. Jalgaon Farm ..	1	..	29th September 1941.	20	
Do. ..	..	1	6th to 11th October 1941.	125	
2. Kopergaon Farm ..	1	..	5th December 1941..	80	The Collector presided over the meeting held.
Do. ..	..	1	15th to 19th December 1941.	246	
3. Agricultural School, Dhulia.	1	..	6th October 1941 ..	10	
Do. ..	..	1	7th to 14th October 1941.	280	

A special feature of the farmers' week at Dhulia school was that on the last day, viz. 14th October 1941, a demonstration and lecture had been arranged by the Taluka Development Association, Dhulia, at which the Collector presided and about 200 cultivators were present.

The farmers' week greatly impressed the cultivators.

I. AGRICULTURAL EDUCATION.

1. *Marathi Agricultural School, Dhulia.*—The School has now completed its 18th year. One hundred and thirteen applications for admission were received from the districts of East Khandesh, West Khandesh, and Nasik, during the year, and 21 students were admitted for the first year. Twenty students passed out from the school and 20 were promoted to the second year. The Local School Committee collected Rs. 2,000 during the year whereas its expenditure amounted to Rs. 2,220, the excess being spent from the reserve fund which was Rs. 4,043 at the close of the year.

2. *Rural Assistants' Training Centres.*—Thirty-three candidates from Dhulia centre and twenty-seven from Manjri centre completed their nine months' general training. At the end of this period, they were interviewed by an *ad hoc* committee to find which particular branch of work each of the trainees was suited for. According to their recommendations further specialised training was given at suitable centres. Four candidates from the western half of Poona, who were receiving general training at Dhulia were sent to Manjri centre for receiving specialised training. Two trainees from Dhulia centre and five from Manjri centre were weeded out by the *ad hoc* committee as being unsuitable. At the end of the specialised training, the rural assistants were absorbed into existing posts or new posts in the various departments connected with Rural Development, Co-operation, Village Panchayats, Industries, and Agriculture. The under-noted list indicates the departments in which the rural assistants have been absorbed :—

Department.		Dhulia Centre.	Manjri Centre.
Rural Development (Revenue)	..	3	8
Village Panchayats	..	9	3
Industries	..	2	..
Co-operative	..	10	8
Agricultural	..	7	3
		—	—
Total	..	31	22

A fresh batch of 30 and 42 has been taken up at Dhulia and Manjri centres respectively from the 1st May 1942.

J. GUN-CLUBS.

(a) *East Khandesh.*—Six new clubs were started during the year thus bringing the total gun-clubs to fifteen. The grant from Rural Development Board was Rs. 1,500. The number of pigs and blue-bulls killed during the year was 696.

(b) *Satara.*—There were seventeen gun-clubs in the district. The contribution from the Rural Development Board was Rs. 200. The total number of pigs killed was 321. The work is proposed to be concentrated in Wai taluka where the pig trouble is found to be serious.

The Shikar work was transferred to the control of the Revenue Department from the 1st March 1942.

K. SERVICES TO THE PUBLIC.

One expert "Gulva" was sent to Bulsar from Kopargaon Farm to demonstrate improved furnace and good quality gul. Sugarcane of the farmers adjoining Kopargaon Farm was crushed at the farm crushing plant and hire recovered on account of the crushing and gul-making amounted to Rs. 249-12-0.

The Power Chaff Cutter of the Jalgaon Farm was given on hire to Jalgaon and Chopda Taluka cultivators and about 19,000 bundles of Jowar Karbi were chaffed.

Information regarding export of food grains, stocks awaiting transport, number of wagons required, stocks with the dealers and prices of agricultural commodities is being collected and supplied every week by the District Agricultural Officers and Divisional Superintendent of Agriculture, Deccan Canals, Ahmednagar.

Necessary help was given by the Agricultural Officers for the inspection of Agricultural Bias Classes, for the scrutiny of better farming societies' registration and for grant of subsidy and for long-term loan applications to Land Mortgage Banks.

Two hundred and twenty bags of Akola Bajri and 25 lbs. of Karla (Bitter Gourd) seed were despatched to the Director of Agriculture, Peradeniya, Ceylon.

Schemes for the installation of a power cane crusher at the effluent area, Manjri, and for the investigations into the economics of clean picking of cotton in East Khandesh were prepared and submitted.

S. H. PRAYAG,

Deputy Director of Agriculture,

Camp Dhulia, 20th July 1942.

Central Division, Poona.

**Programme of work under the Deputy Director of Agriculture,
Central Division, Poona, 1942-43.**

- (1) Isolation of desirable types in Dokras Cotton, and in the Hybrids,
- (2) Maintenance of nucleus of pure seed of Jarila,
- (3) Agronomical experiments on Cotton,
- (4) Comparative yield trials of improved crops, both on the farms and in the district,
- (5) Varietal, manurial, and rotational trials of Sugarcane,
- (6) Continuation of model seed schemes,
- (7) Opening of new Taluka Demonstration Centres,
- (8) Training of students at the Marathi Agricultural School, Dhulia, and at the Rural Assistants' Training Centres at Dhulia, and Manjri,
- (9) Propaganda regarding increased food crop production;
- (10) Sugarcane-Grasshopper Control Scheme.

S. H. PRAYAG,

Deputy Director of Agriculture,

Camp Dhulia, 20th July 1942.

Central Division, Poona.

APPENDIX C.

SUMMARY OF THE WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN DIVISION, FOR THE YEAR 1941-42.

A. STAFF AND ADMINISTRATION.

Mr. H. G. Baluch continued to hold charge of the Deputy Director of Agriculture, Southern Division, Dharwar, throughout the year. He, however, was on leave for one month when Rao Saheb M. L. Patel, Cotton Breeder, Southern Maratha Country, Dharwar, was in charge. The post of the Cotton Breeder, Southern Maratha Country, Dharwar, which was vacated by Rao Saheb S. H. Prayag was filled in by the appointment of Rao Saheb M. L. Patel who took charge of the post on 19th July 1941. He proceeded on leave preparatory to retirement on 1st May 1942 and Mr. S. G. Kelkar is now holding the post. Mr. V. C. Pavate was in charge of the post of the Cotton Superintendent, Southern Maratha Country, Dharwar, throughout the year.

A post of Divisional Superintendent of Agriculture, Konkan Division, Ratnagiri, was created and two Districts from this Division were transferred to his control in April last, leaving only four Districts, viz. Sholapur, Bijapur, Dharwar and Belgaum in this Division.

B. SEASON.

(a) *Climate and rainfall.*—The total rainfall, in the Southern Division this year, was both sub-normal in quantity and very irregular in distribution. Except in the western part of Karnatak, the anti-monsoon showers received, were very feeble and sporadic. However, in the "transition tract", rains in May helped the preparatory tillage for *kharif* crops to a certain extent. The advent of regular monsoons was in time and substantial in the Mallad tract, rather late and feeble in the transition tract and very late, scattered and scanty in the eastern part of this Division. There was a brisk and timely sowing of paddy which germinated well. Sowing of *kharif* crops was a bit late in the transition tract and very much delayed in the eastern tract. In some places in Bijapur and Sholapur Districts, *kharif* sowing could not be done at all. Except in the scanty rainfall tract of Karnatak, rains received, in August and September supplied sufficient moisture for the sowing and germination of the cotton crop. In the eastern tract, due to frugal rainfall, cotton crop did not germinate well; in fact in many a field it had to be resown. Good showers got in September and October were quite opportune for the sowing of rabi crops which germinated well. But total absence of rain after middle of October, retarded their growth.

(b) *Condition of crops.*—In short, none of the crops, except *Kharif* Jowar in the transition tract had a favourable season. Paddy was sown in time, germinated well, tillered profusely, but due to absence of

effective rainfall after August and standing water at flowering time yielded less. On the whole, the cotton crop was in good condition, up to the middle of November, subsequently, however, the drought conditions and unfavourable winds, at its critical stages of blooming and bolling, forced it up to premature ripening, resulting in sub-normal yields. Condition of rabi crops in Bijapur and Sholapur Districts was still worse. There, in many a field, Jowar failed to produce earheads; and those which emerged produced only chaff or undeveloped grains. Damage due to crop pests and diseases was negligible.

C. RESEARCH WORK.

I. COTTON.

(i) Cotton Breeder's Section.

(a) *Kumta Cotton.* (1) *Trial of selected strains against local Kumta.*—This was the fourth year of this trial. Jayawant, New-Jayawant and K.F.T. 12-2-5 were tested for yield with local Kumta. All the selected types yielded higher than local Kumta.

(2) *Study of crosses.*—1: All the segregates from 1A-14-3 x 1-0-1 F₈ and (Jayawant x N-14) x 1A-14-3 were found to be highly susceptible to wilt hence they were discontinued. 2: Selection for resistance to wilt in combination with other economic characters was continued in the following crosses:—

1. (K.F.T. 12-2-5 x 1A-14-3) F₄
2. (K.F.T. 12-2-5 x New Jayawant) F₅
3. (New-Jayawant x B.D. 8 BC F6-1-6) F₂.

Promising material from these crosses has been selected for further study.

3: To secure 100 per cent resistance to wilt, under field conditions, by infusing double blood of resistant types, two back-crosses and two composite ones were made and their F₁s tested in wilt-sick soil. This work will be continued with the best selected material.

(3) *Testing for wilt-resistance.*—Promising material from all the crosses, back-crosses and composite crosses, mentioned above, was tested for wilt re-action, in a highly wilt-infected plot. Segregates with desired qualities would be studied further.

(b) *American Cottons.*—(1) Trial of promising segregates from (G1 x CO2) F₁₀:—1: The segregates 4-4-1-1-2 and 9-7-6-6-6 were tried against G1 for yield at Gadag. Contrary to the last three years' result G1 has yielded more than the rest. 2: Selected segregates from 9-family were tested for yield against G1. All of them showed superior performance to G1. There is a definite variability in the segregate from 9-7-6 and 4-4-1 families, with regard to staple length and ginning percentage which will lend itself to further improvement.

(2) *Back-Crosses and inter-Specific Crosses.*—1 : F₂ of [(9-7-6-6-6 x G. Peruvianum) F₁ x 9-7-6-6-6] was grown at Gadag and its genetic variability indicates desired results.

2 : Promising cultures from inter-specific crosses were grown at Gadag. Majority of them do not show blends of economic characters. However, a few of them deserve further study.

(c) *Seed Multiplication.*—260 lbs. of selfed seed of Jayawant and 597 lbs. of Gadag No. 1 was produced and given out for further multiplication.

(d) *Spinning tests of 1940-41.*—Jayawant kept up its 41 counts; New-Jayawant and K.F.T. 12-2-5 spun 40's. Of the G. Hirsutum, G1 and 4-4-1-1 gave 30's and 9-7-6—34's respectively.

(vi) *Dharwar Farm.*

(1) *Manurial Trials.*—F.Y.M. series on "Cotton and Jowar" and San-Green-Manure to "Cotton and Wheat" was continued. Better response of cotton to direct manuring is indicated. The trials will be repeated.

(2) *Cultural Trials.*—The economics of ploughing the lands every year, once in two and three years against only harrowing, with "Cotton and Jowar" rotation are under study. This is the first year of this trial and so results cannot be interpreted.

(3) Two and three feet spacings between rows of cotton was tried against 18" spacing. The results favour wider spacing.

(vii) *Arbhavi Farm.*

(1) *Varietal Trial.*—CO3 and CO4 cottons were tested for yield with CO2 as check, under irrigation, for the first time. The trial will be continued.

II. PADDY.

(i) *Mugad Rice Breeding Station.* (1) *Dodagya strains (old lot).*—This trial was in its seventh year and D. 6-2-2 gave again the best yields. Hence further trial is to be discontinued in favour of D. 6-2-2.

(2) Strain D. 6-2-2 was tested for yield in the districts, where it has retained its superiority in yield.

(ii) *Selection in local fine rices.* (1) *Yield trial of fine rice, early strains.*—Waner-1 and 26-2 were tested for yield with M-161 and local, early variety as checks. The trial was vitiated due to failure of rains at flowering time.

(2) *Yield trial of mid-late, late and very-late, fine rice strains.*—Three mid-late strains, four late strains and six very-late ones were tested for

yield. Strain 52-2 from mid-lates, 44-1 and 47-5 from lates, and Yelikhirsal-4 from very-lates have given the highest yields. The trials will be once more repeated and then the most promising types will be tested for yield in the Districts next year.

(iii) *Antersal late*.—(1) Strains A-267 and A-176 were tried for yield against A-200 as check. All the strains are equal in yield. As A-200 is better in quality, this trial has been dropped in favour of A-200.

(iv) *Testing new material*.—(1) Four early strains and two very late types from Mysore were tested for yield against the Mugad Farm standard types. Excepting the two very late types, the rest of the material will be discarded as inferior to our types.

(v) *Hybridization*.—(1) To evolve early, mid-late and very-late strains of intense purple colour of stem and leaf, in combination with other economic characters, to facilitate eradication of Gonag, several crosses are under observation. The study will be continued. (2) Crosses to combine high yield, fineness and scent, T24 x P.R. 90 and Luchai x P.R. 90 were grown in F₃. Promising segregates from both these crosses would be studied next year. Culture No. 280 from the second cross is a promising one. (3) The third set of crosses was made for combining yield with earliness and drought resistance. The study will be continued.

(vi) *Paddy seed multiplication*.—(1) 16,104 lbs. of pure, pedigree seed of the seven improved types was produced and given out to the Rural Development Department for further multiplication.

III. SUGARCANE.

(i) *Arbhavi Farm*. (1) *Varietal trial*.—Five, promising Coimbatore sugarcane varieties were tested for yield with J213 as check. CO419 has given the highest yield of Gul.

(2) *Better rotting of San*.—The experiment, the details of which have been given last year, was repeated. No conclusion can be drawn as the cycle is not yet complete.

(3) *Top-dressing*.—Top-dressing at two levels, viz. 100 lbs. and 75 lbs. Nitrogen per acre was tried on CO-419 cane. The results favour the lower dose. It will be repeated.

(4) *Spacing experiment*.—Three and a half feet spacing between two rows of CO419 sugarcane was compared with 3' spacing. The results are not conclusive.

(5) *Rotation series*.—With the object to improve "Karl" soils by green manuring of San, the rotational trial, the details of which have been given in last year's report, was laid out. No inference can be drawn at this stage.

IV. TOBACCO.

(i) *Nipani Farm.* (1) *Selection in local tobacco.*—The most promising cultures from Surti, Bagalani, and Bhopli were under study, for purity and botanical characters in "leaf" and "seed" sections. Best of the material has been retained for further testing.

(2) *Cigarette tobacco.*—Six, cigarette tobacco varieties were studied for their quality and yield performance under Nipani conditions. In the absence of the curing barn, no flue curing could be undertaken.

V. GROUNDNUT.

(i) *Cotton Breeder, Dharwar.*—Seed of Spanish-5, Spanish Improved and Pondicherry-8 was maintained pure and multiplied.

(ii) *Dharwar Farm.*—The area was cut to half under seed multiplication and the Coimbatore strains were discontinued being inferior to our strains.

VI. JOWAR (KHARIF AND RABI)

(i) *Dharwar Farm.*—The seed of six improved types of Kharif Jowar was maintained pure and multiplied for distribution.

(ii) *Mohol Farm.*—Three selections from Maladandi and two from Dagadi varieties of Rabi Jowar were tested for yield. M-35-1 gave the highest yield even under abnormal rainfall conditions. The trials will be repeated.

VII. GRAM.

(i) *Cotton Breeder, Dharwar.*—(1) Strains 18-12, Dohad, Niphad 816 and Nagpur were tested for yield and wilt resistance in wilt-sick soil. Strain 18-12 is both high yielder and resistant.

(ii) *Dharwar Farm.*—Strains 18-12 and Niphad 816 were tested for yield in ordinary soil. Both of them yield equally well. Niphad 816 is not resistant to wilt.

VIII. WHEAT.

(i) *Dharwar Farm.* (1) *Varietal trial.*—Wheat 808, Niphad 81 and 4 were replicated for yield with local, red wheat variety, as check. Yields of strain 808 and local were nearly equal but superior to Niphad 81 and 4 under Dharwar Farm conditions.

IX. MAIZE.

(i) *Arbhavi Farm.*—The work of Botanical improvement of maize was continued. Sixteen promising cultures have been selected for further study. Further exploration of the local material is continued. Sahara and Peruvian varieties have been dropped from study as unprofitable, under local conditions, due to their extreme lateness.

X. OTHER EXPERIMENTS.

(i) *Trial of Napier grass, as a rainfed crop*—(1) on the *Dharwar* and (2) *Mugad Farms*.—The crop was in its third year and yielded 6,685 lbs. and 17,440 lbs. respectively. It is worth noting here that due to timely anti-monsoon showers, an early cutting was obtained on the Mugad Farm. This experiment has been discontinued as it is uneconomic to grow it under seasonal rainfed conditions.

D. RURAL DEVELOPMENT.

(a) *Cotton*.—The work under the extended and revised multiplication and distribution scheme of Jayawant and Gadag No. 1 cotton seed was continued through Co-operative Societies and approved agents. Work done, at all the centres was satisfactory. The rogued, reserved area, under Jayawant in seven centres, was 9,449 acres, and that, under Gadag No. 1 29,912 acres. Roguing done was well supervised. The cost of roguing, this year, per acre came to 4·2 pies, in the case of both the varieties. 7,408,372 lbs. of Jayawant seed and 1,592,000 lbs. of Gadag No. 1 seed were stocked; out of these stocks 6,403,180 lbs. and 1,564,900 lbs. of seed of Jayawant and Gadag No. 1 respectively were actually distributed, thereby covering 674,415 acres and 151,753 acres with Jayawant and Gadag No. 1 Departmentally. In addition to these areas, 133,949 acres and 35,000 acres were brought under Jayawant and Gadag No. 1 respectively, due to natural spread. The new arrangements for Hubli Centre through the amalgamation of the Co-operative Society and the Approved Agent seem to promise success in the progress of our scheme.

(b) *Grading and Auction Sales*.—As usual the produce of improved cotton varieties was pooled, through various agencies in different markets, graded by the Cotton Staff, and sold by auction. During the year under report, 69 auction sales were held, in the case of Jayawant cotton and 25 in that of Gadag No. 1. In these sales, out of 98,648 Jayawant docras and 26,858 Gadag No. 1 docras received, 46,858 and 15,434 docras of Jayawant and Gadag No. 1 respectively were sold, after grading the same. The extra price realised at these sales was about Rs. 15 and Rs. 22 per Nag of 1,344 lbs. of seed cotton of Jayawant and Gadag No. 1 varieties respectively. Thus, on the whole, Rs. 85,08,000 in the case of Jayawant and Rs. 3,72,000 in that of Gadag No. 1 were realised, as extra profit by the growers of improved cottons. In order to cover the stipulated area, under New and Combined Seed Scheme, so far, 61,578 bags of Jayawant seed and 19,371 bags of Gadag No. 1 seed have been secured and stocked from the reserved areas under these two types.

(c) *Working of Cotton Transport Act*.—Twenty temporary Check Stations were opened in the cotton season to supplement the six permanent ones, to prevent illicit import of cotton in the specifically protected areas. Licenses were issued, as usual, at Gadag and Bagalkot

throughout the year, and, at Nargund, for four months only, for importing cotton from one protected area into another, as well as, from prohibited area, for trade and mill consumption. During the year, 1993 road-licences and 492 Rail-licences were issued. In spite of above, 12 cases of illicit imports were detected. In order to prohibit mal-practices including admixture, the issue of licences was stopped, both at Gadag and Bagalkot; but it was resumed for this season, on a clear understanding, that inferior cotton should not be imported under cover of these licences. The Cotton Transport Act continued to work well in the interest of consumers and growers of cotton. To stop infiltration of inferior varieties, 24 additional check stations are proposed to be opened.

(d) *Working of Cotton Market Act.*—The regulated cotton markets at Bailhongal and Bijapur continued to work satisfactorily. In accordance with the Agricultural Produce Market Act, 1939, new constitutions were framed for both these markets. In the Bailhongal market, 72,059 docras of Kapas and 3,689 of lint were sold by open auction sales. In the Bijapur Market, 38,132 Kapas docras and 21,995 lint docras were received; of which only 35,410 Kapas docras and 13,745 lint docras were sold by auction.

(e) *Ginning and Pressing Factories Act.*—Inspection of Ginning and Pressing Factories with a view to stop watering and admixture there, was done, as far as possible, by the Cotton Staff.

(f) *Advisory and Development Work.*—Applications for loans, referred to by the various Land Mortgage Banks were inquired into and necessary advice given. Proposals for registering Better Farming Societies were scrutinised and recommended.

(g) *Village trials of crops in the Districts.*—The District Agricultural Officers had arranged trial and demonstration plots with improved types of various crops, manurial experiments with groundnut cake, on typical holdings of representative villages.

(h) *Services to the Public.*—Technical advice in putting bunds, free distribution of shade trees and supply of grafts and budded plants of various fruit trees of known quality were some of the services rendered to the Public.

(i) *Taluka Demonstration Centres.*—In addition to the existant thirteen Demonstration Centres, seven new Centres were opened, thus bringing the total number to twenty. The idea of these centres was to select a progressive farmer, with a fairly representative holding and help him to put in his estate all possible resources for land improvements, better tillage, improved crops, etc., to demonstrate to the farmer and the farming public around, the benefits of improved farming. The work done, at these Centres, has caught the imagination of the farming world to such an extent, that a spontaneous demand from the Public, for the establishment of still more such Centres has arisen. To satisfy this demand, opening of nine additional Centres is in progress.

(j) *Demonstrations for Officials and Farmer's Weeks.*—Demonstrations for Officials and Farmer's weeks were held, as usual, on all the farms. There was a very good around attendance. Keen interest was evinced by both officials and farmers in the agricultural improvements demonstrated. In addition to these, stalls were arranged in shows set up by private and semi-private bodies. All possible help was rendered to the Rural Development Department, by sending charts and samples for demonstration in the shows arranged by that sister Department.

(k) *Distribution of pure pedigree seeds of improved crops produced on Government Farms.*—Definite quantities of seeds were allotted to District Agricultural Officers, for village trials and multiplication, and to Rural Development Inspectors for further multiplication and distribution according to items of improvement suggested for each District.

E. PROGRESS WITH MODEL SEED MULTIPLICATION AND DISTRIBUTION SCHEMES.

(i) *Belgaum District.*—(1) A Scheme for Muga Paddy Strains Nos. M. 141, M. 81, M. 161 and A. 200, A. 90 and A. 67 is in its second year. 22,821 lbs. of Paddy seed in all was given by the Department for the Scheme.

(ii) *Bijapur District.*—(1) A Scheme for Mohol Jowar Strains M-35-1 and M-47-3 is in its second year. 5,686 lbs. of seed in all was supplied by the Department for the Scheme.

(2) A scheme for Wheat Jaya (808) is in its second year. 2,850 lbs. of seed was supplied by the Department for the Scheme.

(iii) Other Districts in Southern Division have not yet formulated regular Model Scheme on lines suggested by the Department.

F. CAMPAIGN FOR INCREASED FOOD CROP PRODUCTION.

In order to meet the needs for food supply for local self sufficiency and at moderate rates due to the present situation and shortage of transport facilities, the campaign was started in March last. A Special Propaganda Officer was appointed to attend to reduction in Cotton area (including short and unwanted cottons specially) in particular and growing of more crops instead of other non-food crops in general. A ballad singer was also appointed on 19th May last for disseminating the spirit of the Campaign through special ballads composed and sung by him. The special feature of the Campaign was the inauguration of the "Grow More Food Crop Week" observed during the last week of May in which all the officers and staff visited 1,246 villages, organised Village Committees and explained to the people the necessity and advantages of growing food crops over any other non-food crops. In all 1,246 meetings were held and the attendance was about 1,33,828. The

total estimated increase in food crops, as gathered from the Campaign, would be about 4,17,000 acres. Posters, leaflets and other printed material with regard to the Campaign have been distributed in all the villages. There is a very favourable response and the campaign has every chance of success.

G. AGRICULTURAL EDUCATION.

(i) *Agricultural Schools—Kannad Agricultural School, Devihosur.*—The School had a successful year. Eighteen fresh students were admitted, thereby, bringing the total strength to 29. So far 324 students have been trained or received certificates from this School. In addition, 39 Primary School Teachers have received agricultural training here.

(ii) *Rural Assistants Training Centre, Devihosur.*—Twenty-three trained Rural Assistants were selected by different Departments for employment. They are in service now, after receiving specialised training. A fresh batch of 32 students has been taken up.

(iii) *Agricultural High School, Bijapur and Agricultural Bias Classes.*—All guidance and advisory assistance was given and an annual inspection was held and report communicated to the Educational authorities for their guidance.

H. PUBLICATIONS.

(1) Short notes and articles were supplied for publication in Indian Farming, Bombay Information and local news-papers.

I. MISCELLANEOUS WORK.

(1) The Deputy Director of Agriculture and his District and Farm Staff attended a number of Rural Development Board meetings and former also attended the "Fodder and Grazing Committees" and the co-ordination of Officers meetings.

(Signed) H. G. BALUCH,
Deputy Director of Agriculture,
Southern Division, Dharwar.

Dharwar, 20th July 1942.

**Programme of work under the Deputy Director of Agriculture,
Southern Division, Dharwar, 1942-43.**

I. COTTON BREEDER'S SECTION, DHARWAR FARM.

A. COTTON.

(a) *Kumta Cotton.*

- (1) Trial of selected strains against Kumta.
- (2) Study of old and new crosses.

(b) *American Cotton.*

- (3) Trial of the promising segregates against G1.
- (4) Further purification of 9-7-6-6 and 4-4-1-1.
- (5) Study of back crosses and inter-specific crosses.

B. GROUNDNUT.

- (6) Maintaining the promising strains pure.

C. JOWAR.

- (7) Maintaining the selections pure.

D. GRAM.

- (8) Maintaining strain 18-12 pure.
- (9) Pot tests of the material given by the Pulse Breeder, Dharwar.

II. DHARWAR FARM.

- (1) Cultural and manurial experiments.
- (2) Seed multiplication of Jowar varieties, Jayawant cotton, Wheat, Groundnut and Vegetable seed.
- (3) Trial of African varieties of Jowar.

III. ARBHAVI FARM.

- (1) Varietal trial of sugarcanes.
- (2) Rotational and manurial experiments.
- (3) Trial of Cambodia Cotton.
- (4) Trials of Maldandi Jowar strains.
- (5) Maize selection work.

IV. MUGAD RICE BREEDING STATION.

- (1) Yield trials of fresh Dodagya selections.
- (2) Yield trial of early, mid-late, late and very late fine rice selections.
- (3) *Hybridization.*— The study of several crosses on hand will be continued.
- (4) Seed multiplication.

V. MOHOL FARM.

- (1) New selection work of Maldandi type.
- (2) Trial of Jowar varieties from other countries for crossing work.
- (3) Multiplication of pure seed of the strains No. 35-1 and 47-3.

VI. TOBACCO BREEDING STATION, NIPANI.

- (1) Selection and Breeding in local tobacco.
- (2) Trial of Cigarette Tobacco varieties.
- (3) Manurial experiments.
- (4) Rotational Experiments for dry and irrigated crops.
- (5) Curing of Cigarette Tobacco.

VII. DISTRICT AGRICULTURAL OFFICERS AND THEIR STAFF.

- (1) *Research Extension*.—Village trials of suitable and promising strains of crops.
- (2) Multiplication of improved seeds.
- (3) Supervision and guidance of Taluka Demonstration Centre work and establishment of new ones.
- (4) Organising Shows and Demonstrations, etc.
- (5) Inspection of Cotton Check Stations.
- (6) Campaign for increased food crop production.

VIII. SPECIAL AGRICULTURAL PROPAGANDA OFFICER.

- (1) Campaign for increased Food Crop Production and reduction in Cotton area.

IX. COTTON SUPERINTENDENT, SOUTHERN MARATHA COUNTRY;
DHARWAR.

- (1) Seed Scheme Work.
- (2) Work in connection with the introduction of Agmarking of Jayawant and Gadag No. 1 cottons.
- (3) Administration of the Cotton Transport Act and other Acts.
- (4) Campaign for increased food crop production.

(Signed) H. G. BALUCH,

Deputy Director of Agriculture,
Southern Division, Dharwar.

Dharwar, 20th July 1942.

APPENDIX D.

SUMMARY OF WORK DONE UNDER THE DIVISIONAL SUPERINTENDENT
OF AGRICULTURE, KONKAN DIVISION, RATNAGIRI, FOR THE YEAR
1941-42.*A. Staff and Administration.*

A separate Division comprising the districts of Kolaba, Ratnagiri and North Kanara under the control of a Divisional Superintendent of Agriculture, was constituted from 1st April, 1942. Mr. V. S. Kulkarni took charge of the post of the Divisional Superintendent of Agriculture, Konkan Division, with head-quarters at Ratnagiri, on 25th April 1942. The work summarised below is practically what was effected under the control of the Deputy Director of Agriculture, Southern Division in Ratnagiri and North Kanara Districts and under the Deputy Director of Agriculture, Northern Division in the Kolaba District, during the year. The Division has Research Stations at Kumta and Ratnagiri with a sub-station at Hatkhamba near Ratnagiri, where research work is conducted. Besides it has a special scheme in progress for development of Bee Keeping as a cottage industry in the Kanara District, a Rural Assistants Training Centre at Rajapur and 12 Taluka Demonstration Centres.

B. Season.

The total rainfall during the year was only 40 to 60 per cent. normal average of the tract. Its distribution, particularly in the Kolaba and Ratnagiri Districts, was not satisfactory. There were no anti-monsoon showers. Regular monsoon broke out with heavy showers early in June. After a dry spell in the second fortnight in June there were weak and insufficient showers in July and in the succeeding months till the monsoon finally closed in the first week in October. July got only 40 per cent. normal average rainfall and transplanting paddy was thus checked and the rains in August having been equally low, the paddy crop in the Kolaba and Ratnagiri Districts had a check in growth and suffered in yield. Early varieties yielded about 25 per cent. normal yield and mid-late and late ones yielded about 40 to 50 per cent. normal yields in these districts. The narrow strip along the Sahyadri range in the northern districts as also the Kanara District in general fared better as although the rainfall was much below the normal average it was better distributed in these tracts and almost normal yields of paddy were obtained. The insufficiency of Kharif rains and the absence of rabi rains severely curtailed the area under rabi crops over the whole Division and rabi crops un-aided by irrigation withered away before attaining maturity and harvest at most places. Scarcity of drinking water was acutely felt in the northern districts during the summer months.

C. *Research and Experimental Work.*

(1) PADDY.

(A) *Kumta Farm.*—The work on the Kumta Farm on this crop continued on the same lines as during the previous year as follows :—

(a) *Mugin-bildu strains.*—None of the seven strains selected from local Mugin-bildu and tested in six replications in comparison with the local gave significantly higher yields than the local, which was unlike the results obtained in previous years. Only four of these viz. 125, 159, 169 and 230 will be tested again next year.

(b) *Selections in Coastal White Halga and Chintamani.*—Further study was made of the 430 individual panicle selections in Coastal White Halga and 207 in Chintamani and 43 in the former and 23 in the latter were retained for further testing in the next year.

(c) *Selections in varieties of Ankola-Karwar Zone.*—The 162 selections made last year in the four varieties viz., Bile-Akka, Sanna Pandya, Sanna Malliga and Dodda Pandya—were further tested and 53 high-yielding strains were retained for further testing in the ensuing year.

(d) *Hybridization.*—Out of the crosses secured by hybridizing Kumta Farm's improved strains—Red Halga 244 and J-1061 with Mugad strains—M-161 and A-90, five promising selections were further studied and yield characters etc. were recorded. The preliminary study is to continue for one year more before any of these can be tested on plot scale.

(B) *Ratnagiri Farm.*—The work on the Ratnagiri Farm on paddy was confined to maintaining purity of the strains already evolved on the Farm and raising pure seed of the same for distribution in the district for further multiplication. The village trials of Late Varangal No. 487 and Fine Vaksal No. 1 strains continued during the year at several places and both yielded 9 to 15 per cent. higher yields than the local (check) and repeated the results obtained in the preceding two years.

(2) NAGLI.

The three improved strains.—B 11, A 16, and E 31 evolved on the Hatkhamba Sub-Station (Ratnagiri) were grown for maintaining purity of the strains and for multiplication of seed for distribution. In all 2244 lbs. of seed was thus raised and distributed.

(3) SUGARCANE.

The three varieties.—CO 402, CO 413 and CO 419 were tried in six replications on Kumta Farm in comparison with H. M. 320. CO 419 gave significantly higher yields than the others. This is the second year of the experiment and it is to be repeated in the ensuing year.

(4) BETELNUT.

The manurial experiments on betelnut started in 1939-40 continued at the two selected gardens in the Kanara Up-Ghat tract. The results obtained during the year were not statistically significant. The experiment will continue in the next year.

(5) PULSES AS SECOND CROPS.

The local varieties of pulses viz., Udid, Mug, Kulthi, Chavali, Runner Bean and Wal were tried in six replications on the Kumta Farm, as second crops after paddy. The yields and other observations were recorded. This is the first year of the experiment.

(6) PINE-APPLE.

(a) *Fertiliser experiments.*—Experiments as laid down in 1936-37 were continued on Kumta Farm in four replications. The fertilisers failed to show statistically significant higher yields over the check (Farm Yard Manure alone). The experiment is to be repeated in the next year.

(b) *Varying doses of Farm Yard Manure.*—Experiment with varying doses of Farm Yard Manure viz. 10 to 35 cartloads per acre, did not give, on the Kumta Farm, significant results in favour of the higher doses. The experiment will be repeated in the ensuing year.

(c) *Varietal trial.*—Of the six varieties tried on the Kumta Farm, the Kew again recorded the highest yield consistent with good quality of the fruit.

(d) *Pine Apple as an unirrigated crop.*—On the Kumta Farm the trial to grow the Kew variety as an unirrigated crop again proved disappointing. Only 69 lbs. of fruit were obtained from 6 gunthas. The experiment will be dropped.

(e) *Spacing Experiment.*—To determine the optimum distance between rows and plants, an experiment was undertaken on Ratnagiri Farm in four replications. This is the first year of the experiment. Yields etc. were recorded.

(7) TOPIOCA.

On Kumta Farm of the six varieties imported from Travancore in 1939-40 Kovile Vella and Sunder Vella gave the highest yields and were earlier than the rest and local varieties. A demand for cuttings of these two varieties has been created in the Kanara District.

(8) TUNG OIL TREE ON KUMTA FARM.

79 out of 80 planted in 1938 have survived and have put in 3 feet growth. Of the 80 plants planted in 1940 only 66 have survived. The plants are putting up very slow growth.

(9) CASHEWNUT ON KUMTA FARM.

The 96 plants planted in 1938 and 210 planted in 1940 in Bena land are growing well and a few from the early plantation may flower next year.

(10) MANGO EXPERIMENTS ON RATNAGIRI FARM.

To find out if grafts from a local Alfonso tree (graft) known to be an annual and early bearer turn out true to type, an experiment has been undertaken during the year on Ratnagiri Farm. The tree is generally known to flower in October and have fruits ready for harvest in March every year. To see if this advantageous character can be availed of to have fruits in early summer on a large scale, grafts have been obtained and planted during the year on the Ratnagiri Farm. Observations will be recorded till and after these grafts begin to bear fruits.

(11) FRUIT CULTIVATION ON HIGH-LYING VARKAS LAND.

To find out if an economic use can be made of the Varkas lands in the Ratnagiri district which ordinarily are under very indifferent growth of grass, mango grafts and Cashewnut have been planted 15 and 4 years back respectively on a typical piece of slopy Varkas land on the Hatkhamba sub-station (Ratnagiri). The plants have put in fairly good growth but they have not given any fruits so far. The economics of the plantation are being recorded.

D. Seed Supply for Seed Multiplication and Extension of Improved Strains, etc.

The following statement gives the quantity or number of pure pedigree seed and good grafts, etc., supplied by the farms during the year:—

Serial Number.	Name of seed, etc.	Kumta Farm.	Ratnagiri Farm.
1	Paddy of Improved Strains ..	9,302 lbs.	29,271 lbs.
2	Nagli of Improved Strains ..	..	2,244 ..
3	Mango Grafts ..	767 (Number).	623 (Number).
4	Other Fruit Plants ..	725 ..	121 ..
5	Pine Apple Suckers ..	5,352 ..	7,632 ..
6	Tapioca Cuttings ..	527 ..	..
7	Napier Grass Seed ..	9½ lbs.	..
8	Napier Grass Tussocks ..	200 (Number).	..

E. New Schemes.

Bee-keeping Scheme in the Kanara district.—The Scheme for development of Bee-keeping as a cottage industry in the North Kanara district mentioned in the last year's report, started working in three talukas from November 1941. By the end of May 1942, 177 bee-keepers in

35 villages maintained 496 bee-colonies and obtained 2,421 lbs. of honey valued at about Rs. 1,210. Honavar taluka is showing better progress than the other two, viz., Sirsi and Siddapur. A Training Class to train farmers in Bee-keeping was held and 13 persons were given detailed training. The work is directly controlled by an Honorary Superintendent (Mr. S. K. Kallapur) assisted by a few trained staff paid from funds sanctioned by Government for the Scheme.

The species domesticated and kept for collection of honey is the Indian bee (*Apis indica*). As the work started a bit late in the year, only one season's honey flow was secured. The people have been taking to the industry with keen interest especially in the Honavar taluka. Its progress in the next year may be watched.

F. Taluka Demonstration Centres.

To the five Taluka Demonstration Centres already working in the Division, seven more were added during the year making the total in the Division to be 12 in all. They are located as follows :—

Kolaba district	..	..	..	3
Ratnagiri district	..	..	..	4
North Kanara district	..	..	..	5

Each Centre is equipped with improved implements and appliances and the Kamgar in charge demonstrates the various items of improvements by having them practised by a farmer on his own holding (Demonstration farm) and farmers from neighbouring places are invited to small shows and demonstrations when the benefits from the improvements are demonstrated to them. The Taluka Demonstration Centres have been useful in distributing seed of improved strains and for intensive agricultural propaganda.

G. Education.

A new Centre for training Rural Assistants was started in June 1942 under sanction from Government at Rajapur in the Ratnagiri district, as a branch of the already existing Agricultural School conducted by a private Board of Management and ten students from those educated for two years at the Agricultural School were selected for training as Rural Assistants. They will complete their training in April 1943.

H. General.

In connection with the Grow More Food Campaign launched by Government, the Staff in this Division held in all 63 meetings during the Week at an equal number of places and addressed on the subject to a total audience of about 2,744 persons.

V. S. KULKARNI,

Divisional Superintendent of Agriculture,
Konkan Division, Ratnagiri.

Ratnagiri, 20th July 1942.

Programme of work to be done under the Divisional Superintendent of Agriculture, Konkan Division, Ratnagiri, during 1942-43.

I. RESEARCH AND EXPERIMENTAL WORK.

(1) *Kumta Farm*—

(A) *Paddy*—

- (a) Yield trials of Mugin-bildu strains.
- (b) Study of selections in Varieties of Ankola-Karwar Zone and in Coastal White Halga and Chintamani Varieties.
- (c) Study of results of hybridization between Mugad and Kumta strains.
- (d) Trial of oil-cakes for manuring paddy.
- (e) Maintenance of pure nucleus seed of improved strains.

(B) *Other crops*—

- (a) *Sugarcane*.—Yield trials of Coimbatore Varieties.
- (b) *Betelnut*.—Manurial Experiments.
- (c) *Pulses*.—Trial of different pulse crops after paddy.
- (d) *Cashewnut and Tung Oil Plantation*.—Study of growth and economics.
- (e) *Tapioca*.—Trial of Varieties.

(2) *Ratnagiri Farm*—

- (a) *Mango*.—Trial of early and annual bearing grafts.
- (b) *Varkas land*.—Observations on growing Mangoes and Cashewnut on high-lying Varkas land on Hatkhamba Sub-station.
- (c) *Paddy*.—Trial of oil-cake manures.
- (d) *Pine-apple*.—Spacing Experiments.
- (e) Maintenance of pure nucleus seed of improved strains of Paddy and Nagli.

II. SEED MULTIPLICATION.

- (a) Multiplication of seed of improved strains of paddy and Nagli on the Ratnagiri Farm and of paddy strains on Kumta Farm.
- (b) *Nursery*.—Multiplying suckers of pine apple and cuttings of tapioca and preparing grafts and buddings, etc., of fruit trees, for distribution on as large a scale as possible.
- (c) Raising seed of Vegetables on Kumta Farm for distribution in the tract.

III. BEE-KEEPING.

To increase the number of bee-keepers and bee colonies and extend the bee-keeping to additional centres and to hold training classes for Villagers. To organise the sale of honey.

IV. TALUKA DEMONSTRATION CENTRES.

To conduct intensive propaganda roundabout the existing centres for popularising agricultural improvements and to supply seed of improved strains and grafts, etc., to farmers. To hold seasonal demonstrations of standing crops and method for controlling plant pests and diseases. To open six more Taluka Demonstration Centres during the year.

V. EDUCATION.

(a) To guide the working of the Rural Assistants' Training Centre at Rajapur, (b) to hold the annual examination of the Agricultural School at Rajapur, (c) to hold meetings and small demonstrations of standing crops and other agricultural improvements during the Farmers' Week on each Farm, (d) to hold training classes for farmers and nursery-men in grafting and budding.

VI. GENERAL.

(1) To give co-operation in the Grow More Food Drive, particularly in the supply of seed of improved strains, etc., to increase food supply in the Districts. (2) To attend meetings of Co-ordination of Officers and of the District Rural Development Boards. (3) To supply technical information on agricultural matters to all those that seek for it.

V. S. KULKARNI,

Divisional Superintendent of Agriculture,
Konkan Division, Ratnagiri.

Ratnagiri, 20th July 1942.

APPENDIX E.

SUMMARY OF WORK DONE UNDER THE LIVESTOCK EXPERT TO THE
GOVERNMENT OF BOMBAY FOR THE YEAR 1941-42.

Personnel.—Mr. E. J. Bruen, O.B.E., I.A.S., the late Livestock Expert to Government of Bombay, held charge of the Livestock Section until his sudden and untimely death on the 7th of December 1941. Mr. Bruen's death has been a severe blow to the Department of Agriculture.

2. Since 9th December 1941, I held charge of the post of the Livestock Expert to Government in addition to my own duties as Assistant Livestock Expert to Government.

The work done under the Livestock Section during the year 1941-42 is summarized under the following headings:—

A—Improvement of cattle and allied matters.

B—Improvement of milch buffaloes.

C—Improvement of poultry.

D—Improvement of sheep and wool.

E—Improvement of milch goats.

A—IMPROVEMENT OF CATTLE AND ALLIED MATTERS.

(a) *Work on Cattle Breeding Farms:—*

(1) *Government Cattle Breeding Farm, Bankapur, district Dharwar.*

The breeding and improvement of the famous "Amrit Mahal" breed of cattle is being carried out on this Farm since the year 1919, particularly with the objects of securing (i) early maturity, (ii) regularity of calving, and (iii) desired type. Three new heifers calved at the age of 2 years 10 months, 3 years 2 months and 3 years 8 months respectively. The calves were normal in growth. There were 30 calves—15 male and 15 female—born during the year. The interval between two calvings varied from 10 to 15 months. The farm supplied 8 premium bulls for the improvement of cattle in the district.

A small nucleus herd of 20 Gir cows and 2 Gir breeding bulls was established on the farm for dairy purposes. The Gir cattle are doing well. Ten cows were in milk during the year. One good cow has given 3,400 lbs. of milk in ten months. It is too early to give the average milking capacity of the Gir cows. This will be reported next year.

The total area cropped was 50 acres—30 acres under Kharif and 20 acres under Rabi crops—and produced about 7 lakh lbs. of green fodder. About 40,000 lbs. of good hay was made on the farm from an area of 12 acres at a cost of Rs. 125. 4½ lakh lbs. of green fodder was ensilaged during the year.

(2) *Government Cattle Breeding Farm, Tegur, district Dharwar.*

The main object of the farm is the production of suitable dual purpose cattle of (1) Dangi and (2) Nimar breeds, particularly for the Konkan division. There are 40 animals of each of the breeds, including bulls and young stock. 14 Dangi calves—9 male and 5 female—while 15 Nimar calves—2 male and 7 female—were born on the farm. The cows are milked from two teats and two teats are allowed for suckling of the calves. One good Dangi cow has yielded 1,142 lbs. during a period of 8 months, while one good Nimar cow has produced 1,283 lbs. during a lactation period of 10 months. This is the 2nd year of the trial of these animals on the farm. Animals of both breeds are thriving very well on the farm.

Cultivation of fodder crops was done on about 25 acres of land. About 58,000 lbs. of green maize fodder was ensilaged in the month of September, which provided good silage in the hot months to maintain the condition of cattle. Hay to the extent of 71,000 lbs. was made during the year. The farm will be in a position to put out few breeding bulls in the district next year.

(3) *Northcote Cattle Breeding Farm, Chharodi, district Ahmedabad.*

The famous Kankrej breed of cattle is bred on this farm since the year 1917. The farm has been transferred to the Institute of Agriculture, Anand, since 1st April 1940. The Institute has agreed to supply 20 breeding bulls per year for cattle improvement in villages.

(4) *Bombay Gowrakshak Mandali's Cattle Farms at Kandivlee and Betegaon.*

The Bombay Gowrakshak Mandali is doing excellent work in the breeding and improvement of Gir cattle at Kandivlee and Betegaon farms since the year 1924 in co-operation with the Livestock Section. An outstanding herd of Gir cattle has been developed. The Institute maintained about 325 heads of Gir cattle. On an average 1,300 lbs. of milk was produced daily out of which 2/3rd of the production was supplied to the hospitals, maternity homes, infant welfare centres and schools in Bombay at concession rates. The annual average milk yield of the Gir herd works out 2,300 lbs. per cow excluding the suckling by the calves. During the year, the Mandali supplied 12 breeding bulls.

and 45 breeding cows to Government institutions such as Rural Assistants' Training Centres. The dipping of cattle is regularly done on the Farm. During the year 1,200 animals at Kandivlee and 4,900 animals at Betegaon were dipped.

(5) *The Nathu Lalji Charity Trust Fund Gowshala at Mulund, district Thana.*

This Institute is also co-operating with the Livestock Section in the breeding and improvement of Gir cattle since the year 1939. The year began with 225 heads of cattle and ended with 183, the decrease being due to disposal of cattle. The Institute supplied 6 breeding bulls during the year for improvement of cattle in the district.

(6) *The Pimple Cattle Breeding Farm, Jalgaon, East Khandesh.*

This farm is being conducted by the Taluka Development Association, Jalgaon, for the breeding and improvement of Nimar cattle in co-operation with the Livestock Section since the year 1932. The farm maintained about 140 heads of Nimar cattle. There were 37 calves—19 male and 18 female—born during the year. The Nimar cows were milked from two teats, two teats being kept for suckling of the calves. 40 cows were milked producing 25,000 lbs. of milk. The milk was sold at Jalgaon town fetching Rs. 1,853. 16 Premium bulls and 12 Premium cows were supplied during the year for improvement of cattle in the districts. Silage and hay making were carried out as usual from 400 acres of grazing lands supplied by Government.

In order to enable the Farm to carry on the breeding of Nimar cattle, Government has increased the annual subsidy from Rs. 1,000 to Rs. 3,000.

At the 5th All-India Cattle Show held at Delhi, the Nimar cattle from this farm gained all the prizes in the Nimar class.

(7) *The Gangapuri Cattle Breeding Farm, Jamner, East Khandesh.*

This farm is run by the Taluka Development Association, Jamner, for the breeding and improvement of Nimar cattle in co-operation with the Livestock Section since the year 1933. The farm maintained about 75 heads of Nimar cattle. There were 20 calves—12 male and 8 female—born during the year. The cows of this farm are also being milked from two teats. 18 cows were milked producing 2,400 lbs. of milk. 8 Premium bulls and 7 Premium cows were supplied during the year. The farm exhibited Nimar cattle at the 5th All-India Cattle Show held at Delhi in February 1942. Silage and hay making were done as usual from 150 acres of grazing lands provided by Government.

(b) *District Cattle Improvement and related work.*—This is being accomplished by means of the following agencies :—

(1) *Working of the Premium Bull Scheme.*—The number of Premium bulls working in different divisions is shown below :—

Name of Division.	Number of Premium bulls working on		Remarks.
	1st July 1941.	1st July 1942.	
(1) Agricultural Officer, In Charge Cattle Breeding, Anand.	41	37	
(2) Agricultural Officer, In Charge Cattle Breeding, Palghar.	51	43	
(3) Agricultural Officer, In Charge Cattle Breeding, Jalgaon.	96	92	
(4) Agricultural Officer, In Charge Cattle Breeding, Poona.	....	40	New division.
(5) Agricultural Officer, In Charge Cattle Breeding, Pandharpur.	194	219	
(6) Agricultural Officer, In Charge Cattle Breeding, Belgaum.	....	11	New division.
(7) Agricultural Officer, In Charge Cattle Breeding, Dharwar.	125	113	
	507	555	

Besides, there were 135 Premium bulls working part-time whose periods expired before 1st July 1942. During the year 159 new bulls were supplied, out of these 86 bulls were the progeny of the Premium bulls. The demand for more bulls is increasing.

(2) *Working of His Excellency the Viceroy's Gift Bull Scheme.*—The number of Gift bulls whose periods expired during the year were 52. At present there are 188 Gift bulls working in the whole of Province. The formation of "District Livestock Improvement Fund" out of the balance of money from the Gift Bull Scheme is under consideration of Government.

(3) *Working of the Premium Cow Scheme.*—The Premium Cow Scheme is appealing more and more to the cultivators. Under this Scheme cows of the appropriate breed are supplied either free or half cost or $\frac{1}{3}$ rd cost to the recipients. The various Rural Development Boards contribute the remaining balance of money. During the year 113 cows were supplied. The total number of Premium cows working in the Province is 292.

(4) *Working of the Bombay Livestock Improvement Act of 1933.*—The Act is made applicable to 77 villages in the Province. No difficulties are experienced in the working of the Act. People are appreciating the advantages of good stock. During the year under report 2,903 castrations of scrub bulls were done. Seventeen more villages are surveyed for the application of the Act.

(5) *Registration of cattle.*—The number of pure-bred stock registered during the year was 3,381. The progressive total of cattle registered is 10,288.

(6) *Cattle Shows, Rallies and Demonstrations.*—These are very useful in spreading knowledge of Livestock Improvement work and in creating a healthy spirit of competition. Eleven cheap cattle shows and 23 cattle rallies were held during the year. An outstanding feature during the year was the organization of "Pola" day celebrations in 120 villages of East Khandesh and 12 villages of West Khandesh for the purpose of educating the cultivators in the care of working bullocks.

This Province, also, exhibited 21 Nimar cattle at the 5th All India Cattle Show at Delhi in February 1942, where all the prizes in Nimar class were won by the cattle from Pimple Farm, Jalgaon (East Khandesh). Fifty-four exhibits were also sent at the Regional Cattle Shows at Bhavnagar and Bangalore.

(7) *Definition of Breed Characteristics.*—No breed of cattle from Bombay Province was defined during the year. The definitions of breed characteristics of the Khillar breed of cattle and of the Surti breed of buffaloes have been published by the Imperial Council of Agricultural Research.

(8) *Cooperation with Cowshalas and Panjarapoles.*—Almost all the Gowshalas and Panjarapoles in the Province were revisited for inducing them to cooperate in the improvement of cattle, but so far no Institute is willing to cooperate. Further attempt would be made.

(9) *Milk Recording Scheme.*—The object of the Scheme is to start village milk recording in respect of those breeds of Indian cattle in regard to which action has already been initiated by the Imperial Council of Agricultural Research for the establishment of Herd Books. The milk recording was done in respect of the Kankrej cattle in nine villages of Sanand Mahal. The milk of 143 cows was recorded and tested fortnightly. Full report of the scheme is being submitted to the Imperial Council of Agricultural Research.

(10) *The Kankrej Breed Society.*—An unregistered society for promoting the interest of the Kankrej breed of cattle with headquarters at Sanand, has been formed. The membership of the society is 80 and a sum of Rs. 160 is collected as the membership of the society. A trained secretary belonging to the cattle breeders community is provided at Government cost at Rs. 30 per mensem.

A model scheme of 5 years' duration has been approved by the Imperial Council of Agricultural Research with some modifications.

(11) *Cattle Developmental Schemes*.—A scheme of breeding and improvement of Dangi cattle in cooperation with Dangi cattle breeders and also a small scheme of introduction of Dangi cattle in Ratnagiri district was sanctioned during the year. A Scheme for encouraging the breeding of better kinds of draft cattle to meet the transport difficulty, has been submitted to Government for consideration.

(12) *Fodder Storage Propaganda*.—An outstanding example during the year was that one Premium bull agent in Konantambi village in Karajgi taluka of Dharwar district, with the help of the Rural Development Board fund, constructed a small silo pit and made very good silage from jowar under the supervision of the Agricultural Officer, In Charge Cattle Breeding, Dharwar. Two more pits one at Karajgi and one at Hosriti have been constructed. Silage making in 12 villages of Thana district was also done.

(13) *Scheme for Drying of Green Grass*.—The object of the Scheme is to dry young green grass which is plentiful in the monsoons for the purpose of utilising the high protein and carotein content of the grass. 2,000 lbs. of green grass was dried. The dried grass contained 4.5 per cent. protein, i.e. almost $2\frac{1}{2}$ times the quantity contained in ordinary grass.

(14) *Mixed Farming Scheme along with Khillar Cattle Breeding at Yedhalli in Bilgi Peta of Bijapur district*.—A mixed farming scheme at Yedhalli was prepared for four cultivators to whom Government lands have been given for the purpose of better Khillar cattle breeding.

(15) *Rural Development work*.—The district Livestock staff fully cooperated in furthering the Rural Development activities as far as Livestock Section was concerned. The Director of Information was helped in taking a cattle film and commentary on "Better Cattle". Useful help was also rendered in the "Grow More Food" campaign.

B—IMPROVEMENT OF MILCH BUFFALOES.

Eight pedigree buffalo bull calves of the Surti breed from the Agricultural College Dairy, Kirkee, were supplied free to suitable agents in Mehmedabad taluka of Kaira district for the purpose of rearing and subsequent issue of premium bulls. So far 28 males have been distributed in Kaira district out of which 18 are surviving.

Besides the above number, there were 28 buffalo bulls working during the year. Demand for buffalo breeding bulls, especially of the Pandharpuri breed is increasing. To meet the demand for buffalo breeding bulls, a scheme for the improvement of the milch buffaloes in the Province has been submitted to the Director of Agriculture for consideration.

C—IMPROVEMENT OF POULTRY.

(1) *Government Central Poultry Farm, Kirkee—*

(i) The egg laying capacity of 15 White Leghorn, 5 White Wyandotte, 5 Rhode Island Red and 5 Australorp hens for one complete year from 1st December 1940 to 30th November 1941 in the "Testing Pens" was 171, 161, 171 and 139 eggs respectively.

(ii) During the year 785 chickens were hatched.

(iii) *Supply of breeding stock and eggs.*—Four-hundred and thirty-seven pedigree birds and 1,051 setting eggs were supplied for improvement.

(iv) *Turkey breeding.*—During the year 470 turkey chickens were hatched. They did exceedingly well on the free range. Thirty-nine toms, 68 pullets, 72 chickens and 154 setting eggs were supplied to cultivators for breeding purposes. One-hundred and seventy-four table turkeys weighing 1,188 lbs. were sold for Rs. 1,715. There is a good demand for turkey meat. This small experiment has proved self-supporting.

(v) *Poultry training.*—Twenty-nine students took practical training in poultry.

(2) *Government Poultry Farm, Dhulia.*—The annual egg laying capacity of 10 White Leghorn and 8 Rhode Island Red hens was 162 and 133 eggs respectively for one complete year. During the year 355 chickens were hatched. Two-hundred and eighty-three birds and 2,078 setting eggs were supplied during the year for poultry improvement. The farm gave practical training to 12 students during the year. Seven demonstrations were arranged during the year of report for the benefit of farmers in the district.

(3) *Government Poultry Farm, Dharwar.*—This farm hatched 200 chickens supplied 164 birds and 52 setting eggs during the year for poultry improvement in the district. Sixteen students were given training in practical poultry farming.

(4) *Bombay Poultry Research Scheme financed by the Imperial Council of Agricultural Research.*—A separate report is already submitted to the Imperial Council of Agricultural Research. The salient results obtained during the year are as under:—

(i) The scientific study and purification of indigenous breeds of poultry, viz. (1) the Chittagong and (2) the country selection, was continued. The average egg production per hen per month was 4.2 and 11 eggs respectively. It is intended to replenish the Chittagong blood.

(ii) The average laying capacity of (1) Chitt-Rhode and (2) Chitt-Sussex cross pullets was 17.8 and 14.4 eggs per month respectively over a period of 5 months.

(iii) Maintaining pedigree records of the White Leghorn and the Rhode Island Reds was continued during the year.

(iv) Cheap housing experiments were continued.

(v) Two feeding experiments to test the values of (i) groundnut cake v. linseed meal and (ii) groundnut cake v. crushed gram were done. The results indicate that there was no appreciable difference in sustaining body weight and the production of eggs in the case of groundnut cake and linseed meal experiment. In the second experiment it was found that the body weights almost equally increased but the gram lot produced 24 eggs more.

(5) *Poultry Improvement Schemes*.—These have been extended upto March 1945 :—

(i) *Improvement of Poultry in villages*.—During the year under report 320 pedigree cocks were introduced in villages in replacement of scrub cocks in 16 districts of the Province.

(ii) *Encouragement for pedigree keeping in villages by grant of premia to suitable poultry farmers*.—Six housing premia at Rs. 100 each and 8 egg and fowl premia at Rs. 75 each were given to selected poultry farmers in the Province during the year of report.

D—IMPROVEMENT OF SHEEP AND WOOL.

(a) *Bombay Sheep Breeding Scheme, Poona*.—This is a ten year scheme financed by the Imperial Council of Agricultural Research. The results obtained are :—

(i) *Improvement of Deccan Sheep by Selection*.—A definite type of Deccan sheep carrying white wool is now established for further selective breeding. There are now 104 white fleeced Deccani ewes and two rams. These are selected after testing the fleeces for the hairiness. Further studies will be carried out to segregate Deccan sheep carrying all wool.

(ii) *Adaptability of the Merino to the Deccan environment*.—The conditions essential in breeding these sheep satisfactorily are now fully studied. If an opportunity is given for a trial of this breed in a place where favourable conditions are available, it is hoped that in the near future this breed will play a major part in the sheep improvement work of this Province. There are 17 imported ewes and 10 farm-bred sheep on the farm.

(iii) *Crossing of the Deccan sheep by the Merino*.—The results of the F₁ generation showed that the majority of the progeny are born with fine white wool. There is a great divergence in wool quality from fleece to fleece. Each individual is studied to select for further breeding of F₂ generation.

(b) *Wool Utilization Section*.—The trials of manufacturing woollen goods suited to village industries are in progress. It is reported that about 35 per cent. of the "wool" is lost in the milling process when the average Deccan wool is used for manufacture of blankets, while the blankets prepared from the classed wools at the Poona Farm showed a maximum loss of 5 per cent.

(c) *Wool Analysis Laboratory*.—The extent of hairiness in Deccan sheep was estimated in all its details. 1,230 samples were tested and it was found that 23 per cent. of these conform to the standard of pure-wool. A system of appraising quality of fleeces of stud rams is evolved. Four workers in sheep improvement from Farms established by the Imperial Council of Agricultural Research were deputed to study the methods of wool analysis carried out at this Laboratory.

(d) *Sheep Breeding Sub-Station, Jawle*.—The object of this Sub-Station is to develop white flocks and to study the problem of sheep and wool improvement under the shepherds conditions. During this year four white flocks were located with the shepherds and a flock of 100 white sheep is established on the farm. Each of these flocks are headed by a selected ram. Besides these, 12 more rams are placed with the shepherds who have promised to breed white sheep. A small equipment of utilising wool is attached to the farm to demonstrate to the local spinners and weavers the method of manufacture of woollen goods.

(e) A scheme for improvement of the sheep at Bagalkot, District Bijapur, has been sanctioned by the Bombay Government. The work of selection of land, etc., is being undertaken.

(f) Work on wool dyeing with vegetable products is sanctioned during the year.

E—IMPROVEMENT OF THE MILCH GOATS.

The results of investigations into the milk-yielding capacity of a small herd of Kamori goats of Sind, maintained at the Central Poultry Farm, Kirkee, since the last 2½ years, indicate that the goats do not attain the same standard of milk as is claimed for it in Sind. A farm-bred doe yielded 574 lbs. of milk in 143 days. The maximum yield of milk per day was 5¼ lbs.

Publications.

The following were published during the year :—

(1) Leaflet No. 4 of 1941 (New Series) on "Grading up" Bombay Province's Village Cattle. Importance of Premium Bull Scheme.

(2) Special pamphlet No. 4 of 1941 (New Series) "Groundnut cake as a cheap and useful cattle feed".

Advisory Work.

The demand for advice in respect of all matters connected with the improvement and development of livestock work had considerably increased during the year of report.

(Signed) D. B. KOLHE,

Poona, 27th July 1942.

Livestock Expert to Government,
Bombay Province, Poona.

APPENDIX.

ANIMAL INDUSTRY.

(General precis of the position required as per Government Resolution, Revenue Department, No. 3520/39 of 4th December 1940.)

The position remained almost the same as reported during the last year.

On account of the war situation, there is a growing demand for more livestock. The transport by bullock carts is steadily increasing. The figures of slaughter of cattle were not available in time and hence could not be incorporated. The Chief Marketing Officer, Bombay, has informed that he had no further information as regards the trade in livestock.

(Signed) D. B. KOLHE,
Livestock Expert to Government,
Bombay Province, Poona.

**Programme of work under the Livestock Expert to Government,
Bombay Province, Poona, for the year 1942-43.**

(1) Breeding and Improvement of Livestock on Government Farms, on farms subsidized by the Imperial Council of Agricultural Research and on non-official farms co-operating with the Livestock Section of the Agricultural Department ;

(2) Rural Development work pertaining to the Livestock Section ;

(3) District Livestock Improvement work and Propaganda ;

and

(4) Advisory work.

APPENDIX F.

SUMMARY OF WORK DONE AT THE POONA COLLEGE OF AGRICULTURE,
FOR THE YEAR 1941-42.

This is the thirty-fourth year of the College.

STAFF.

I was in charge of the College as Principal excepting the leave period from 11th December 1941 to 1st February 1942 when Dr. G. S. Cheema held the charge in addition to his own duties and Professor K. S. Kulkarny acted as Professor of Agriculture in addition to his own duties.

Professor V. M. Chavan, Assistant Professor of Botany, was on leave for one month from 25th July to 24th August 1941 and Mr. S. R. Godbole acted in his place.

Professor P. V. Wagale, Professor of Entomology, was on leave for one month from 27th October to 26th November 1941 and I held his charge in addition to my duties.

The College sustained a great loss during the year by the untimely death of Dr. V. G. Deshpande, Professor of Entomology, on 22nd August 1941. Dr. Deshpande was a good teacher and popular amongst the students and the staff.

Mr. M. M. Desai, Manager, Agricultural College Dairy and Assistant Professor of Dairying went on leave preparatory to retirement during the year after a long and efficient service for 30 years. Mr. G. S. Godbole, Lecturer in Dairying has been appointed to officiate in his place.

EQUIPMENT.

Library.—During the year under report the Library received the fifth and the last instalment of Rs. 5,000 of the special grant and 215 new books and 3 new journals were added. Thus the Library gets 96 journals and has got 10,949 books and 3,860 bound volumes of periodicals.

Laboratories.—The Government were also pleased to give the fifth and final instalment of Rs. 1,400 for equipping the various college laboratories during the year under report. These amounts were utilised to equip the laboratories of the Horticultural and Agricultural Engineering sections but the amount of some Rs. 1,100 given for the Plant Pathology section could not be utilised as the microscopes were not available in Bombay.

STUDENTSHP.

The number of students that attended during the year was 87, 80 and 62 in the F.Sc. (Agri.), S.Sc. (Agri.), and B.Sc. (Agri.) classes respectively.

EXAMINATION RESULTS.

The number of students that appeared for the examination was 84 for the F.Sc. (Agri.), 84 for the S.Sc. (Agri.) and 72 for the B.Sc. (Agri.) and the number passed was 47, 71 and 52 respectively.

POST-GRADUATE COURSES.

In all, 14 post-graduate students were working in this college, viz. : 4 in Botany, 1 in Entomology, 6 in Agricultural Economics and 3 in Plant Pathology sections. Of these, 4 were studying for Ph.D. degree and the remaining 10 for M.Sc. (Agri.) degree.

Out of these, 1 got the Ph.D. degree in Botany.

SPECIAL COURSES.

Special courses were taken advantage of by 11 students:—Crop Production 1, Animal Husbandry, Dairying and Fodder Production 8, Analysis of Soils and Manures 1 and Fruit Preservation 1.

AGRICULTURAL GRADUATES' EMPLOYMENT BOARD.

There were 64 registered members on the roll of the Board, 18 being new members. The 20 enquiries received from employing agencies were promptly circulated to the registered members.

ADMISSION FOR 1942-43 FOR THE B.Sc. (AGRI.) DEGREE COURSE.

In all, 100 duly qualified candidates (99 from the Bombay Province and 1 from outside) applied for admission to the First Year class. But only 77 candidates (76 from the Bombay Province and 1 from outside) were admitted against the total number of 68 in the last year.

SCHOLARSHIPS.

The number of scholarships continued the same as in the previous year.

THE STUDENTS' HOSTEL.

There were 121 students in the Hostel during the 1st term and 132 in the 2nd. Seven messes were working. Government were pleased to sanction a special hostel equipment grant of Rs. 4,500 during the year and this was fully utilised in replacing the old hostel furniture.

SPORTS AND SOCIAL ACTIVITIES.

The College Gymkhana.—This continued its activities of indoor and outdoor sports and athletics, the Students' Reading Room and the

Debating Society. In the Inter-group University competition one of our students (Mr. N. B. Hiremath) won the first prize in high jump.

The Annual Social Gathering.—This was held in September 1941 and Mr. R. P. Masani, the Vice Chancellor, Bombay University, presided and addressed the students and Mrs. Masani distributed the prizes.

STUDENTS' LITERARY ACTIVITIES.

The Poona Agricultural College Magazine.—Dr. J. A. Daji continued to work as Editor during the year. There were in all 401 subscribers. Out of the 22 articles published, 3 were from the students, 11 from the College and Departmental staff and 8 from outsiders. The financial position of the Magazine continued to be sound there being an addition of Rs. 156 to its reserve fund.

THE UNIVERSITY TRAINING CORPS.

The usual activities of the platoon commenced from the last week of June 1941. The platoon consisted of one officer, one sergeant, two corporals, four lance-corporals and 31 cadets. 2/Lt. B. G. Oka was in charge of the platoon throughout the year and Lt. Chavan, V. M., acted as second-in-command of "B" company. 2/Lt. Oka was attached to a regular military unit for two months for training during the year. In the annual firing course the platoon stood second in the "B" company.

It is a matter of pride to learn that Cpl. S. V. Bapat of our platoon has now been promoted as Captain Bapat and Sgt. Chitnis, J. R., and L./cpl. Dewal, M. G., have been given the emergency King's Commission in the army; so also Cadet Joshi, M. G., has been taken up in the Indian Air Force.

AIR RAID PRECAUTIONS.

Government were pleased to sanction a grant of some Rs. 16,000 for the Air Raid Precautions and the constructional and other protective works were being pushed on vigorously during the year under report. The college has been formed into a separate A.R.P. unit.

AID AND ASSISTANCE TO THE PUBLIC.

Veterinary Hospital.—The number of out-patients, in-patients of cases supplied with medicine and of the animals castrated was 4,952, 381, 58 and 166 respectively.

REVENUE OFFICERS' TRAINING CLASS.

This was held from 22nd September to 3rd October 1941 and 7 Assistant and Deputy Collectors attended.

FOREST RANGERS' COURSE.

The second batch consisting of 10 Ranger students (6 Bombay Government Nominees, 2 State Nominees and 2 private students) completed its course (1940-42) in April 1942 and seven out of them—6 Bombay Government and one State Nominee have qualified for Higher Standard Certificates during the year and have already joined their appointments as Rangers. The third batch consisting of 12—seven Bombay Government Nominees, four State Nominees and one Private Student—has commenced its course (1942-44) from 1st May 1942.

RESEARCH AND ADVICE.

This Institution, in addition to teaching also, conducts research into various problems concerning agriculture and allied sciences which makes teaching at the College more realistic. Summaries of research work done by each section are embodied in the Annual Report of the Department.

B. S. PATEL,
Principal.

College of Agriculture,
Poona, 1st July 1942.

Programme of work for the year 1942-43.

1. Administration and control over the teaching activities and welfare of the students of the College.
2. The readjustment and revision of the Post-Graduate courses to make them more useful.

B. S. PATEL,
Principal.

College of Agriculture,
Poona, July 1st, 1942.

APPENDIX G.

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURE,
AGRICULTURAL COLLEGE, POONA, FOR THE YEAR 1941-42.

Staff.—Mr. B. S. Patel held the post of the Professor of Agriculture during the year except between 11th December 1941 to 1st February 1942 when he was on leave. During this period Mr. K. S. Kulkarny, Assistant Professor of Agriculture, officiated as Professor of Agriculture, in addition to his own duties. Mr. M. M. Desai, Assistant Professor of Dairying and Animal Husbandry, proceeded on leave preparatory to retirement from 1st May 1942. Mr. G. S. Godbole, Lecturer in Dairying, has been appointed to officiate in Mr. Desai's place.

Teaching.—The teaching in Agriculture and Dairying was carried on as usual. The results of the University Examination were quite satisfactory. Three students joined the Special Crop Production Course of whom two left early in the year. One finished this course satisfactorily. One student has been taken up for M.Sc. in Agriculture in April 1942. The Special Course in Dairying and Animal Husbandry was attended by eight students of which six finished the full course.

THE AGRICULTURAL COLLEGE FARM.

Season.—The summer of 1941 was very hot and dry. There were no ante-monsoon showers. The rainfall of 2.28 inches in early June helped the preparation of land. The real useful rain of 1.86" was received at the end of June. The rain continued up to 19th of July bringing the month's total to 11.33 inches. August gave only 1 inch rain in drizzles. Last week of September gave good rains, the monthly rain being 3.79 inches in 14 days. October gave only 1.24 inches. Thus the total rainfall was 22.64 inches from June to May which was below normal and badly distributed and thus most of the crops had to be irrigated, and the growth of crops, *kharif* and *rabi* was below normal.

Research.

(a) An experiment to economise the quantity of water for sugarcane did not give any encouraging results.

(b) An experiment to study the effective rotting of *Sann hemp* green manure showed no significant differences in yield in tobacco or garlic.

(c) An experiment to study the effect of bulky manures like Farm yard manure and compost as against top dressing ginger with 40 lb. N. in the form of groundnut cake did not show any differences in yield.

(d) *Five varieties of tomato, viz.*—Marglobe, Special large, Pride of Market, Poona Market and Bonny Best were tried for comparative yields in the *kharif* and hot weather. In both the seasons, Bonny Best gave the highest yield, *kharif* yield being 13,533 lbs. and *rabi* yield being

6,811 lbs. of saleable yield which was the highest and the increase was significant over those of others. The saleable yield in Bonny Best was 53 per cent. of the gross yield whilst in others the percentage varied from 33 per cent. to 47 per cent.

(e) *Napier grass* grown on the *mal* land as a dry crop gave only 4,470 lbs. of green fodder per acre.

(f) White beans were grown for finding out the cost per lb. of seed for canning purposes. The maximum yield was 1,004 lbs. per acre when irrigated and manured with 15 cart-loads of Farm yard manure per acre. Due to a bad season the dry crop yield was very poor. The cost of production of beans for the irrigated crop came to Rs. 87-4-0 per acre working at anna one and six pies per lb.

THE AGRICULTURAL COLLEGE DAIRY.

(g) *Development of higher milk yield along with early maturity and regular calving in Sindhi cows and Surti buffaloes—*

(a) *Sindhi cows.*

The average number of milking cows in the year under report was 27·5 out of a total of 41·4. The annual average milk yield per head comes to 2,357 lbs. as actually drawn and 2,128 lbs. after feeding the calves. Cows Tucas and Homtul again topped the herd record as first and second best milkers with 5,347 lbs. as annual average for a period of nine calvings and 4,438 lbs. as annual average for a period of five calvings respectively. Cows Hameline, Reduke, and Ujam showed good performance with annual average of 4,106 lbs. over 13 calvings, 3,982 lbs. over 13 calvings and 3,143 lbs. over 12 calvings respectively.

(b) *Surti Buffaloes.*

The average number of milking buffaloes was 60·3 out of a total of 79·4. The annual average milk yield per head was 3,084 lbs. actually drawn and 2,986 lbs. after feeding the calves. Unlike cows there was decrease in the total output of buffalo milk owing to the fact, that there were more than 60 per cent. of buffaloes in the herd which were either in their first and second lactations or which had already completed eight lactations and above.

Buffaloes Bhagtter, Sabdipride and Sujecter gave 4,838 lbs., 4,452 lbs. and 4,340 lbs. in 365 days (or per year) calculated on an average of 7, 1 and 2 calvings respectively.

Buffaloes Sajani II, Sabar, Patashi, Bhoot, Hondi, Gangabai and Ghosran were among the best animals in the herd which yielded from 3,454 lbs. to 4,427 lbs. of milk each, per year calculated on the total period from first to the latest calving.

Nine young and promising bull calves were issued to cultivators for improvement of Surti buffalo breed through the Live-stock Expert to Government.

(h) *Commercial working of the College Dairy.*—This was an exceptional year for the Dairy when the total receipts have gone to the maximum so far. Quantity of milk produced on the farm was 342,596½ lbs. out of which 18,047 lbs. was fed to calves while remaining 324,549½ lbs. was available for disposal.

The cost of producing 100 lbs. of milk was Rs. 13·25 and the money realised was Rs. 14·87 for the same.

(i) *Fodder production.*—The total green fodder produced at Manjri and Kirkee together was 4,484,440 lbs. and the cost of producing the same came to Rs. 0·4–11 pies for 100 lbs. of green fodder.

(j) There was no case of corruption during the year in my section.

B. S. PATEL,
Professor of Agriculture.

Programme of Work for the year 1942-43.

1. *Teaching.*—This would be continued as required by the new courses.

2. *Research.*—The following items will be in hand during the year :—

(A) *On the Agricultural College Farm.*

- (i) Position of legumes and an oil seed in rotation with a cereal.
- (ii) Improvement of soil fertility by leguminous green manure crops.
- (iii) Modified method of planting sugarcane.
- (iv) Spacing varieties and number of seedlings of chillies.
- (v) Spacing varieties and number of plants in cotton.

(B) *On the Agricultural College Dairy, Kirkee.*

(vi) Development of higher milk yield in cows and buffaloes along with early maturity and regular calving.

B. S. PATEL,
Professor of Agriculture.

APPENDIX H.

ANNUAL REPORT OF THE HORTICULTURIST TO GOVERNMENT, BOMBAY
PROVINCE, POONA, FOR THE YEAR 1941-42.

The work done during the year under report is summarised as far as possible as follows :—

I. RESEARCH.

*(a) Work done at the Ganeshkhind Fruit Experiment Station, Kirkee.
Improvement in the quality of indigenous fruits.*

A good deal of work is being done under research by definitely establishing the superior points in the quality of our selections of guava, pomegranate, bor and grape seedlings.

Lucknow 49 selection in guava gives attractive big sized fruits and the pulp seed ratio is very satisfactory. A tree on an average of plantation scale has given 732 fruits with a gross income of Rs. 4-5-0, the net income being Rs. 3-2-0. Per acre of 108 trees the net income would be Rs. 337-8-0. This income is considered to be very satisfactory, and therefore the selection can be said to have proved its merit. The plants of Lucknow 49 are being distributed for cultivation.

G. B. No. 1 pomegranate has got very soft seed, slightly pinkish pulp and gives medium sized fruits. It is undoubtedly superior in quality.

Stoneless bor, remains shy bearer. It is now put under regular cultivation in order to see the effect of manuring on setting of fruits.

The Pandhari Sahebi grape seedling No. 94 has given a successful crop. The bunches are compact, and the yield is heavy. Field trial, however, remains to be given.

Improvement work of brinjal and chilli is now closed down. Selection No. C-2 and C-9 of chilli and selections of Gote 28-21 and Dorli 27-32-6 of brinjal have proved very successful in our field trials. Apart from the superior quality the yield is high. Large quantities of seeds are already distributed in the district. It is anticipated that at least 500 acres under improved chillies will be grown this year in the Deccan. The acreage under improved gote and dorli brinjals also is likely to be large this year. It is anticipated that these selections will soon replace the existing acreage under inferior chillies and brinjals in the Deccan.

INTRODUCTION OF FOREIGN FRUITS.

Grape-fruit cultivation and the income derived out of it has very much attracted the fruit growers of the Deccan. It is a matter of great satisfaction that large plantations are being raised in the districts. It is likely to be a very popular fruit under cultivation during the next few years.

Italian lemon has given in the Konkan districts sufficient promise. The fruit also does well in the Deccan but its ability to resist die-back disease is doubtful.

Avocado and different varieties of mango from Ceylon and United Provinces are included in future trials. Red rock papaya is in no way superior to the Washington papaya which is already under cultivation for a number of years in the Province of Bombay.

MANURIAL EXPERIMENTS.

Banana.—No special advantage has been observed by giving higher doses of Farm Yard Manure over 40 lbs. per plant. The application of 2 lbs. of ammonium sulphate with 2 lbs. of sulphate of potash along with 80 lbs. of Farm Yard Manure has given 9 per cent. increased yield over the control of 80 lbs. Farm Yard Manure. The results of new series of experiments where 4 lbs. N. is given per stool, are not available at present. It is, however, observed that frost injury was comparatively seen more where artificial manures were applied.

Grapes.—In the case of grape-vines sulphate of ammonia and sulphate of potash along with 80 lbs. of Farm Yard Manure has given 4 per cent. more fruiting spurs than the control "80 lbs. Farm Yard Manure only." The general outlook of the vines where artificial manures were applied shows a distinct weakening of the vines. This experiment is temporarily stopped to revive the vines.

Mango.—Manurial trials show that Farm Yard Manure and Niciphos have produced 10 per cent. increase in average height of the plants; 3 per cent. increase in the average circumference and 25 per cent. in average number of vegetative shoots, as compared with the control, "80 lbs. Farm Yard Manure".

Mosambi.—Mosambi manurial trials show 80 lbs. of Farm Yard Manure with 10 lbs. of Castor Cake has yielded on an average 65 per cent. more fruits than the control, "Farm Yard Manure only". The manurial trials will be carried on till conclusive results are available.

Irrigation experiments.—In the case of grape vines the furrow system of irrigation consumed 40 per cent. more water and yielded 2 per cent. less than the ring system. Vines under the furrow system have shown considerable attack of scab. The berries cracked to a very great extent.

Pruning experiments in grape vines.—Long cane pruning (6 buds spur) in October has increased the yield by 27 per cent. per vine in the case of Kandhari variety and 40 per cent. in the case of Phakdi variety as compared to short spur pruning (3 buds spur). This observation will be continued.

Miscellaneous experiments.—Large number of field observations such as (1) Planting of single versus double suckers of banana; (2) Restricting

the number of side suckers in the case of Velchi banana to get better bunches ; (3) Alternate bearing in double grafts of mangoes ; (4) Effect of deblossoming on alternate bearing of mangoes and (5) Investigation into the balanced nutrition of mosambi are on hand.

The Ganeshkhind Fruit Experiment Station, Kirkee, credited Rs. 13,683-4-0 under receipts as against Rs. 11,979 spent under cultivation grant. The total grant was Rs. 15,002. 36 students out of 40 completed the training for nine months. A special whole time teacher is appointed for teaching these students.

(b) *Cold (Gas) Storage Work.*

Gas Storage Scheme was closed down on 31st March 1942. The result of gas storage work is not promising. No added advantage of gas storage is observed both in the case of mosambi and santra.

(c) *Work done at Modibag.*

The Modibag garden is now being very largely used for teaching work. A provision is made at this garden for giving field practicals to the students by opening new plots under pomegranates, guava, mosambi and other crops.

Large quantities of brinjal and chilli seed of improved strains are multiplied and distributed from this garden. The garden has credited Rs. 4,015 receipts as against Rs. 4,540 contingent charges.

Banana bunches bagging experiments are in progress. All improved crops are being planted for nursery purposes. One of the district shade tree nurseries is located here from which shade trees are given to the cultivators. Nearly 10,000 plants have been raised for distribution.

II. DISTRICT WORK.

(a) *Horticultural service and propaganda in Rural areas.*—The Assistant Horticulturist to Government, and his three divisional malis have covered a very vast field in regard to the advisory work for the extension and improvement of fruit crops. The Assistant Horticulturist spent 163 days in the district and has visited nearly 101 localities and has inspected 34 sites for plantations. 15 nurseries for planting trees in treeless tracts of the Province have been successfully established. Five horticultural and fruit preservation classes have been held. Six demonstrations were given and he has attended 10 meetings of the Rural Development Boards. Very large number of new proposals regarding the extension of district work have been prepared and discussed. A good deal of time has been spent in preparing schemes for the new horticultural nurseries which are to be opened shortly. Divisional malis services were made available for district work.

(b) Fruit Survey Work.

The fruit survey work has been progressing very satisfactorily. A report of Kanara district has been already submitted. The immediate and outstanding results have been that the Rural Development Board, Kanara, has taken up one of the indicated areas of 60 acres for wholesale planting of mangoes and have further decided to open a fruit nursery in Haliyal.

(c) 'Grow more vegetables' campaign.

This campaign is now engaging the major attention of departmental farms. A good deal of responsibility is to be borne by both the gardens under the supervision of the Horticulturist to Government. Advisory work in regard to the supply of seeds and cultivation of vegetables has entailed a great deal of additional work on horticultural establishment.

(d) Fruit and Vegetable Committee.

The Fruit and Vegetable Committee held three meetings and dealt with many subjects.

PROGRAMME OF WORK FOR 1942-43.

It is intended to continue all the development work relating to manurial, irrigation and pruning experiments. A good deal of attention will be devoted to 'grow more vegetables' campaign which entails a lot of field and propaganda work. Development of horticultural shade tree nurseries is likely to occupy much time. Survey of fruit areas will be continued. Root stock experiments relating to mosambi and Chiku crops will be undertaken.

G. S. CHEEMA,

Horticulturist to Government,
Bombay Province, Poona.

APPENDIX I.

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL ENGINEER
TO THE GOVERNMENT OF BOMBAY, FOR THE YEAR 1941-42.*Staff and Administration.*

Mr. P. J. Patel, was in charge of the Agricultural Engineering Section during the year under report. Eight members of the Mechanical staff were transferred to the Forest Department in the month of May, 1942 for special war work.

Research on Implements.

Hay Drying Machine.—The machine built in the year 1940-41 was worked in monsoon this year. It was found that its shape required modification to ensure more efficient working. Accordingly, its length was doubled and the height halved. Further test trials showed that its capacity has been nearly doubled and the thermal efficiency increased. The feeding arrangement has also been made more convenient and easy. It will be worked during the next season and the results given in the next year's report.

Cart Wheels.—Due to the non-availability of the ball bearings in these present abnormal times, it was suggested that plain bearings of some special material and shape should be tried to reduce the draft, with attachments for efficient lubrication and dust proof arrangements to decrease maintenance cost. Accordingly, cast iron taper bushes were prepared and fixed in the wheels with a special lubricating and dust proof device. The results of the trial showed that there was no appreciable reduction in draft, but that this arrangement will reduce the lubricating cost and increase the life of the bearings and axle. The wheels have been put on a heavy duty test and results will be given in the next year's report.

Advisory and Development work.

Mechanical Help.—The total number of enquiries on various engineering problems received and dealt with, were about 293. Mechanical help was given to the cultivators and the departmental institutions by the district, as well as the head quarter staff. Details are as under :—

Item of work.	Mechanical Assistant.			Head-quarter staff.	Total.
	Poona.	Dharwar.	Surat.		
Sites surveyed ..	6	6	6	..	18
Estimates supplied ..	4	6	1	..	11
Erections made ..	5	4	6	8	23
Advice given and repairs carried out.	10	12	37	27	86
Plants inspected ..	18	13	73	..	104
Miscellaneous works ..	..	16	5	4	25

Hire and Sale of Machinery.—Boring machines, pumping plants and agricultural machinery were given on hire and the hire amount realised was Rs. 6,805-3-4. Rs. 25 were received for rendering mechanical help

to the public and labour and stores were supplied to departmental institutions upto an extent of Rs. 158-3-1. The amount realised by the sale of boring machines, steam engine and other articles comes to Rs. 6,409-15-8.

Agricultural Education.

The special oil engine class was conducted as usual and three cultivators' sons were given training in running the engines and pumps. No fees are charged and the training is given in Marathi and English.

Miscellaneous Works.

General.—During the year under report a number of departmental constructional works were entrusted to this Section and the Drawing Branch was kept busy preparing drawings and estimates and also supervising constructional works. In all 114 drawings, 74 tracings, 55 estimates and 25 sketches were made.

The workshop staff was busy in constructing the new Hay Drying Machine for the Livestock Expert to Government. Boring machines were overhauled and kept in working order for giving out on hire. Three bores were successfully carried out departmentally at Bankapur, Devihosur and Chas, for these respective farms. Tractor ploughing was carried out at Kopergaon farm in the scheme for raising more food crops.

Special Works.—A great number of building constructional works were prepared and executed for various departmental institutions by this Section.

P. J. PATEL,

Agricultural Engineer to Government,
Bombay Province, Poona.

Programme of work under the Agricultural Engineer to the Government for the year, 1942-43.

(1) *Research on Implements, their modifications and test.*—Modification and tests of wheat drill, groundnut digger, cart wheels, clod crusher, milk can insertions and the hay drying machine and other implements, etc.

(2) *General Work.*—(a) Inspection of pumping site; (b) Purchase, sale, hire, maintenance and inspection of departmental machinery; (c) Advice to departmental institutions and public on engineering matters and (d) Training of cultivator students in operating engines and pumps.

(3) *Constructional work.*—(a) Construction of a hostel, lecture hall, dining room and two poultry runs at the Dhulia Poultry Farm; (b) Construction of buildings for the Marl Land Improvement Scheme at Korti; (c) Laboratory extension at Padegaon; (d) Construction of buildings at Devihosur and (e) Construction of the Hostel for Forestry students at Poona.

P. J. PATEL,

Agricultural Engineer to Government,
Bombay Province, Poona.

APPENDIX J.

SUMMARY OF THE WORK DONE UNDER THE PLANT PATHOLOGIST TO THE GOVERNMENT OF BOMBAY FOR THE YEAR 1941-42.

Staff and Administration.

Dr. B. N. Uppal held charge of the section throughout the year.

Mr. V. P. Gokhale was appointed to the temporary post of Assistant Plant Pathologist under the Bombay Wheat Rust Research Scheme.

Research Work.

1. *Fusarium wilt in sann-hemp*.—About 3 lb. of nucleus seed of the wilt-immune strain of sann-hemp was obtained from the crop grown in the wire cage at Poona. A cross has been made of the immune strain, D-IX, with susceptible individuals of sann-hemp with a view to studying the inheritance of wilt resistance in this crop.

2. *Wilt in Lathyrus sativus*.—Progenies of 62 plants comprising four Indore varieties and one local selection of *Lathyrus sativus*, which showed high degree of wilt resistance in glasshouse tests in the previous season, were again tested in pot culture in the glasshouse, soil temperature in pots ranging from 23 to 30° C. during the period of the test. Progenies of culture Indore T-2-1 alone remained completely free from wilt, whilst others segregated and suffered varying mortality from wilt. Promising plants from amongst the survivals in each culture have been selected for further work.

As culture Indore T-2-1 has remained free from wilt over a period of four years, both in wilt sick soil in the field and in pot culture tests made in the glasshouse, it is proposed to multiply the seed of this culture with a view to conducting village trials in Broach district.

Preliminary tests have shown that *Lang* wilt *Fusarium*, when grown in Richards's solution, produces substances which proved lethal to *lang* seedlings. The nature of these toxic substances is being investigated.

3. *Koleroga of areca-nut*.—Observations made during the season have confirmed that apparently healthy areca-nut trees may harbour latent infection in their crowns. At the approach of the rainy season this infection manifests itself as minute specks on leaf-sheaths, surrounded by water-soaked areas. These infection spots on leaf-sheaths continue to grow for some time and support active growth of the fungus, which is carried down in rain water to the branches of young developing nuts.

Further tests have confirmed that the soil at the foot of heavily infected trees harbours the organism of *koleroga* disease. The infected soil does not seem to play any part in initiating primary infection since

at the beginning of the rainy season when bunches that had been blown to the ground by strong winds show heavy infection on contact with diseased soil, there is no trace of infection on nuts on the trees.

The study of aeroscope slides has not revealed that the fungus is disseminated by wind over long distances.

Demonstrations of methods of control of *koleroga* of areca-nut were carried out in a 25-acre garden area. These methods consisted in the destruction of dead or dying tops of areca-nut trees, removal and destruction of affected leaf-sheaths from trees harbouring latent infection, and spraying of infected trees only with a virow to localising infection. The disease was most effectively controlled in the entire area.

4. *Damping off in tobacco seed beds.*—Experiments on control of damping off in tobacco seed-beds at Nadiad were continued. Each bed was uniformly inoculated with the growth of *Pythium* on carrot medium, and after a month was sown with tobacco seed of variety K. 49 at the rate of 4 gm. per bed. Perenox J 29 and Bordeaux mixture were used for disinfection of soil in beds, while in one case Semesan was used as seed dressing only. The first spray application was made a day after the beds were sown, and in all six sprayings were given at weekly intervals. The lay-out of the experiment was a Latin Square of six replications of six treatments, as follows: Perenox J 29 $1\frac{1}{2}$ lb. in 50 gallon water, Perenox J 29 $2\frac{1}{2}$ lb. in 50 gallon water, Bordeaux mixture 2-2-50 and 3-3-40, Semesan as seed dressing, and control. The size of each bed was 4 feet \times 4 feet. In determining efficacy of the treatments records were made for each bed of the number of seedlings damped off, the area damped off, and the number of seedlings fit for transplanting. The results, which are statistically significant, show that Perenox J 29 of the strength of $2\frac{1}{2}$ lb. in 50 gallon water and Bordeaux mixture 2-2-50 were the two most effective treatments.

5. *Soft rot of ginger.*—Experiments on control of soft rot by growing ginger on raised beds were continued at Bassein and at Kachholi near Amalsad. Due to failure of rains the results were inconclusive.

6. *Chrysanthemum rust.*—Spraying trials with Bordeaux mixture 2-2-50 and 3-3-50 were continued at Walhe and Kumbharvalan near Saswad, for control of chrysanthemum rust. Casein was added to the spray mixtures as an adhesive. The first application was made a fortnight after the crop had reached the bud stage, followed by a second application a month later. Due to failures of rains rust did not appear on the crops.

7. *Black spot of mango.*—The study of the physiological relations of *Actinodochium* sp. has now been completed. In controlled experiments it was found that the fungus is a wound parasite, and inoculated *Alphonso* and *Piarie* mango fruit suffer the maximum damage when incubated for 2 to 3 days at temperatures ranging from 26 to 35° C. At the lower temperatures infection spreads slowly but ultimately involves the whole fruit. In nature the fungus seems to enter the fruit through injuries caused by insects and other agencies.

8. *Wilts in tur and gram.*—Work on the development of wilt-resistant varieties of *Cajanus cajan* was continued at Arbhavi in collaboration with the Economic Botanist to Government. None of the selections has yet attained high degree of field resistance. Wilt inoculum was prepared for adding to the infected plot at Arbhavi, with a view to intensifying soil infection.

Work on breeding wilt-resistant gram being done in collaboration with the Cotton Breeder, Dharwar, has progressed satisfactorily. Besides strain 18-12, some promising material has also been found in Dohad and Nagpur varieties of gram. Wilt inoculum was prepared for the plots at Dharwar and Poona. It is proposed to link up this work with the Pulse Breeding Scheme.

9. *Root rot in Lathyrus sativus.*—*Macrophomina phaseoli* has been isolated from *lang* plants affected by root rot. A detailed study of the physiology and morphology of the fungus has been made.

10. *Cotton Wilt Breeding Scheme.*—The following is a brief summary of the work done during the year:—

(I) Poona Wilt Breeding Scheme.

(a) Selfed seed of single plants of the most promising segregates of Broach cross and back-crosses, viz., 76-1, 1-2, 1-6, 7-29 and 3-1 was received last year from the Cotton Breeder, Broach, and tested in pot culture for isolation of 100 per cent. wilt-resistant strains. With the exception of 76-1, all other segregates have shown high degree of wilt resistance.

(b) Two cultures of Jarila have shown high degree of resistance in pot culture tests.

(c) Seed of 10 strains of Gaorani cotton was tested in pot culture, and strain II-39-5315 proved to be very highly resistant.

(d) Progenies of two families of the cross (K.F. \times 1027 A.L.F.) were grown in F_3 in soil temperature tanks. Results show that of the resistant F_2 plants in each family, one-third have bred true, and two-thirds have segregated in F_2 ratio, thus confirming the original hypothesis of monohybrid segregation for wilt resistance in *Gossypium herbaceum*. This hypothesis finds further confirmation in the results of the back-cross, in which a 1 : 1 ratio of resistant to fully susceptible individuals was obtained.

(II) Cotton Wilt Breeding Scheme for Surat Area.

(a) Crosses of 8-1 with 1027 A.L.F. and Broach back-cross segregate 1-6 and of 1027 A.L.F. and Broach back-cross segregate 1-6 have given promising results in respect of wilt resistance and other agricultural characters. The cross (8-1 \times 1027 A.L.F.) has reached the stage when some of its promising segregates will be tested in replicated trials.

(b) Segregate 8-1 has shown high degree of field resistance in tests carried out in wilt sick soil. It is now being tested in pot culture at Poona.

11. *Plant Virus Research Scheme.*—The following is a brief summary of the work done during the year :—

(a) *Yellow vein-mosaic of Hibiscus esculentus.*—The white-fly, *Bemisia gossypiperda*, attains its maximum efficiency as a vector of yellow vein-mosaic virus if made to fast for four hours before or after feeding on a source of infection. The white-flies could secure the virus from top leaves of an infected plant several days before the appearance of symptoms of yellow vein-mosaic. Bheni plants are susceptible to infection by the virus at all stages of growth so long as the vector is able to feed upon young leaves. Female white-flies are only slightly better than the male as vectors of the virus.

By means of the bud-grafting technique, evidence has been obtained that the virus moves out of inoculated leaves on the fourth day following inoculation, and that in the majority of cases it travels first towards the roots.

Histological study of leaves affected by the virus has shown that no disintegration of tissues takes place in the leaf, but there is loss of chlorophyll in the cells of affected areas, and the parenchymatous tissue of leaf-veins below the bundles shows hyperplastic growth at some places. As a result of this abnormal division of cells, a solid tissue develops giving rise to pronounced thickening of the veins on the lower sides of the leaves.

Hibiscus tetraphyllus, an annual weed, has been shown to harbour the virus, but this weed is not commonly found in the fields.

(b) *Mosaic disease of Datura alba.*—An extensive study of the host range of the virus has been made, and it is finally concluded that the virus is a new one.

(c) “*Katte*” *disease of cardamom.*—The virus has not yet been transmitted by sap inoculation. Plants grown in sterile soil from surface-sterilised rhizomes taken from diseased plants have produced symptoms typical of “*katte*” disease.

(d) *Yellow vein-mosaic of Ageratum conyzoides.*—*Bemisia gossypiperda* has been shown to transmit yellow vein-mosaic virus of *Ageratum conyzoides* (referred to as yellow vein-banding by Gadd in Veylon). The virus is different from that of tobacco leaf-curl.

(e) The following virus diseases have been collected: sann-hemp mosaic, yellow mosaic of *Phaseolus aconitifolius*, yellow vein-mosaic of *Ipomoea batatas*, yellow spot of jasmine, green mosaic of goose-berry, mosaic of *Crotalaria retusa*, mosaic of *Cassia sophora*, and yellow vein-mosaic of *Leucas ciliata* and *L. stelligera*.

(f) *Physiology of virus-affected bhendi plants.*—It was reported last year that the total carbohydrate content of diseased leaves of *bhendi* plants affected with yellow vein-mosaic virus was less than that of leaves of normal plants. These differences have now been shown to

result from decreased photosynthesis and increased respiratory activity of diseased plants. The intensity of chlorosis of leaves produced as a result of infection is directly correlated with reduction of plastid pigments.

Results show that in healthy plants hexose and not sucrose is the first sugar of photosynthesis, but this relation is not clear in the case of diseased plants. In normal and diseased plants sucrose is the sugar of translocation.

The amount of water lost by transpiration in diseased plants is less than in normal plants. This loss of water seems to be regulated by the action of stomata, since the perimeter of stomatal aperture in diseased leaves is less than in healthy leaves. There are, however, no great differences in the numbers of stomata per unit area of normal and diseased leaves.

12. *Wheat Rust Research Scheme.*—Work on testing rust reactions of wheats was commenced in September 1941. Single-spore cultures of seven physiologic races of black stem rust of wheat were obtained from Rai Bahadur Dr. K. C. Mehta and have been maintained in the glasshouses constructed for rust work at Mahabaleshwar. Seventy-two samples of wheat supplied by the Wheat Specialist, Central Provinces and Berar, and 120 samples sent by the Deputy Director of Agriculture (Crop Research), Bombay Province, were examined in detail for resistance to six races of black rust prevalent in India, at the seedling stage. Of the wheat samples, one sample from the Central Provinces and Berar and two from Bombay were found to be resistant to all the six races. No field tests on adult resistance were carried out as arrangements for such tests are not yet complete.

13. *Scheme for varietal trials of Indian potatoes.*—Experiments for determining the relative suitability of different types of potatoes for general cultivation in the potato-growing tracts of Poona district, were continued. In addition to *Numbri*, *Sitbo* and *Darjeeling Red*, which were found to be most suitable in last year's trials, *Dunbar Cavalier* and *Katie Glover*, seed potatoes of which were received from the United Provinces, were also tried. These trials were laid out at four centres of potato cultivation, and the "lay-out" of the experiments at each centre was a randomised block arrangement of seven to eight replications.

Numbri maintained its superiority over the other varieties both from the point of view of yield and of vigour of plant growth. Seed potatoes of *Numbri*, *Sitbo* and *Darjeeling Red* from the previous season's crop gave low yields, though germination of the sets and stands of the crops were normal. It appears that long storage of over eight months in cold rooms affected the yielding capacity of these varieties.

Experiments to test the behaviour of the *Numbri*, *Sitbo* and *Darjeeling Red* varieties in kharif season proved a failure due to abnormally heavy rains received after planting.

Small-scale experiments were made to compare the cultivator's method of storing potato tubers with the so-called pit method of storage. The percentage of loss due to rot in the case of *Numbri* was 5.5 when tubers were stored in pits for over two months as compared to a loss of 18.1 per cent. in storage of tubers by the cultivators' method.

14. *Eelworms on betel vine.* Field experiments to test the practicability of eradicating *Heterodera marioni* by means of a trap crop and by cultural methods have been undertaken at Bassein. The results of these trials are not yet available.

Advisory and Development work.

Numerous enquiries on plant diseases were, as usual, dealt with during the year, and advice and assistance were promptly given to cultivators whenever required. The services of the plant pathological section of the Department in the prevention and control of plant disease are appreciated by the public.

Agricultural Education.

The Plant Pathologist to Government was assisted by the staff in the teaching of plant pathology and agricultural bacteriology.

A special lecture demonstrating the diseases of crop plants and methods of control was delivered to the Civilian class held during the year.

Several students were refused admission to the post-graduate course in plant pathology owing to lack of adequate staff. There were three post-graduate students, two of whom were preparing for the Ph. D. degree and the third for the M. Sc. (Agri.) degree of the University of Bombay.

Miscellaneous Work.

Dr. B. N. Uppal continued to work as Secretary-Treasurer of the Agricultural Graduates' Employment Board, which is doing useful work in finding suitable employment for agricultural graduates.

Six meetings of the Insect Pest and plant Disease Committee, of which Dr. B. N. Uppal is the Secretary, were held during the year. A large programme of work on insect pests and plant diseases was dealt with at these meetings. The most notable results of the work of the Committee were the passing of the Bombay Agricultural Pests and Diseases Act, 1941, and the scheme for the organisation and extension of protective and control measures against insect pests and plant diseases of crops in the districts of Bombay Province, proposals for which latter are now under the consideration of Government.

Work on disease survey of the Province was continued during the year. Twenty-two new records of fungi on sixty-one hosts have been made, and of these, two are Phycomycetes, thirteen Ascomycetes, three Basidiomycetes, and the rest are included in the Fungi Imperfecti.

B. N. UPPAL,
Plant Pathologist to Government,
Bombay Province, Poona.

**Programme of work under the Plant Pathologist to Government
for the year 1941-42.**

Work on the following items of research will be undertaken, but detailed programmes of work are not given :—

- (1) Fusarium wilt in sann-hemp.
- (2) Fusarium wilt in *Lathyrus sativus*.
- (3) Fusarium wilt in tur (*Cajanus cajan*).
- (4) Fusarium wilt in gram.
- (5) Fusarium wilt in Pyrethrum.
- (6) Root rot of *Lathyrus sativus*.
- (7) Twig blight and fruit rot of mango.
- (8) Black spot of mango.
- (9) Soft rot of ginger.
- (10) Nematode on betel vine.
- (11) Koleroga of arecanut.
- (12) N-fixation in cultivated soils.
- (13) Damping off in tobacco seed-beds.
- (14) Rust of chrysanthemum.
- (15) Downy mildew of maize.
- (16) Cotton Wilt Breeding Schemes.
- (17) Plant Virus Research Scheme.
- (18) Wheat Rust Research Scheme.
- (19) Scheme for investigation of " Small Leaf " disease of cotton.
- (20) Varietal trials of potatoes in Poona District.
- (21) Disease Survey.

B. N. UPPAL,
Plant Pathologist to Government,
Bombay Province, Poona.

APPENDIX K.

SUMMARY OF WORK DONE UNDER THE ECONOMIC BOTANIST TO THE
GOVERNMENT OF BOMBAY FOR THE YEAR 1941-42.*Administration.*

Professor L. S. S. Kumar held charge of the section throughout the year. Mr. V. M. Chavan, Assistant Professor of Botany, was on leave for one month from 25th July to 24th August 1941. Mr. S. R. Godbole acted in the place of Mr. Chavan.

The following staff were appointed under the Pulse Breeding Scheme. Mr. D. S. Ranga Rao, Mr. A. DeQuadros, Mr. S. R. Kaiwar. The last named relinquished his services in the beginning of June 1942 and his place was taken by Mr. A. R. Argikar. Mr. Y. R. Karnik was appointed to the post of Linseed and Oilseeds Breeder from the beginning of June 1942.

Teaching.

The Economic Botanist was assisted by the Assistant Professor of Botany and Demonstrator in Botany in carrying out the teaching work at the College of Agriculture, Poona.

Mrs. Kamal Randive was awarded the M.Sc. degree of the Bombay University for her research in cytology of Anonaceæ and *Cynotis*. Mr. G. B. Deodikar was awarded the Ph.D. degree in Botany for his researches in cytogenetics of *Commelina* species.

Striga Research.

During the year under report, the selection of *Striga*-resistant *jowars* under controlled conditions of temperature in soil temperature tanks was continued. The percentage of resistant plants obtained under these rigid conditions was very low.

Two varieties from Burma have proved highly resistant to *S. lutea*, but very susceptible to *S. densiflora* when tested in pots.

In sand cultures, it was found that the amount of attack of *S. lutea* and *S. densiflora* and the damage done was inversely proportional to the strength of the nutrient solution used.

Pulse Breeding.

The improvement of some of the important pulse crops of the province has been taken up under a scheme partly subsidised by the Imperial Council of Agricultural Research and partly by the Bombay Government. The breeding work is in progress at Jalgaon on *udid* and *mug*, at Poona on gram and *mathi*, at Dharwar on *kulthi* and at Arbhavi on *tur*. Many of the pulses grown show that they are all impure for a number

of plant and economic characters. More than 35 district samples of each of the six pulse crops were grown at their respective centres and from these nearly 200 individual plant selections have been retained from a much larger number of plants selected for next year's sowing.

For the selection of wilt-resistant *tur* and gram types, wilt-infected plots for *tur* at Arbhavi and for gram at Poona and Dharwar are being maintained. On these plots, plants promising for wilt-resistance under field conditions coupled with other economic characters are being selected and inbred.

Linseed Breeding.

Yield trial of selected strains was carried out in the districts. The Nasik strains have yielded significantly more than local strains in six out of nine trials carried out over different years and at different places from 1938 onwards. Arrangements are being made to multiply the seed of promising selections for distribution to cultivators.

The progenies of some of the crosses made are in the third hybrid generation (F_3) and certain selections combine high yield, large seed size and better colour of seed than their parents.

The performance of the linseed-flax hybrids, the seeds of which were supplied by the Imperial Economic Botanist, Delhi, under Poona conditions was not encouraging.

Oil seeds Breeding.

Further selections of individual plants from the progenies of selected plants of the previous year were made in the three oil seed crops in which breeding work is in progress.

Twenty-three selections in sesamum and 19 in niger combining high yield and high oil percentage have been retained for next year's sowing. Selection in safflower is being continued.

Grass Experiments.

Acclimatisation of exotic fodder grasses and legumes.—The seeds of exotic grasses and legumes were grown on a large scale in beds. Seventeen exotic grasses and four legumes showed good progress. Twenty-four Indian grasses grew satisfactorily.

The commencement of the scheme on Rotational Grazing and Ecology of Forest Grasses, sanctioned by the Imperial Council of Agricultural Research was postponed by a year, as the Government of Bombay could not provide the necessary funds to fence the grazing areas.

The trials on yield, palatability, feeding and determination of prussic acid (HCN) content of the Giant Star Grass are proceeding.

Orobanche Research.

This work is being financed by the Sir Sassoon David Trust Fund from 1st June 1941.

Twenty-one species of *Nicotiana* tested for resistance to *Orobanche* attack were found to be susceptible. Nineteen varieties of *N. tabacum* were tested and seven resistant plants were obtained from four varieties. Fourteen resistant plants were selected from the progeny of eight resistant plants from two varieties obtained the previous year.

The application of sodium nitrate, ammonium sulphate, Nicifos, potassium nitrate or super-phosphate did not check *Orobanche* attack. Of the herbicides tried, sulphuric acid and Atlacide appear to be promising.

In a seasonal test of the germination of *Orobanche* carried out, the best germination was obtained in January and February. *Orobanche* seed shows hardly one per cent germination without host.

Experiments on Agave cultivation.

A scheme for experiments on cultivation of Agave in Bombay Province has been sanctioned by Government with effect from May 1941. Suckers of *Agave sisalana* and *Agave cantala* were collected and have been planted on Government Farms at Dohad, Poona, Dharwar and Kumta. Some extra-provincial types have also been included in the trials.

Cytology of Papaya.

A number of preparations of the pollen-mother cells of the male and hermaphrodite plants and preparations from root tips and somatic tissue of the three different sex types examined showed that there was not any outstanding difference either in structure or number of chromosomes which could be correlated with the sexual characteristics of the respective types. The chromosomes of the female gamete are yet to be examined to complete the study.

A well illustrated paper on "Papaya, its botany, uses and culture" has been accepted for publication in the Journal of the Bombay Natural History Society.

Seed Testing.

Forty-two seed samples received were tested for the germination and were reported on.

The hardness in leguminous seeds is being studied. The longevity tests of grass seeds is being continued and similar tests of vegetable seeds is to be undertaken again since the previous test could not be completed.

Miscellaneous Experiments.

White-flowered groundnut.—The white-flowered type which arose as a mutant from the local type has been crossed with "Small Japan" to select a new type combining the desirable characters of the exotic with the local type which is used primarily for consumption.

African Bajri v. Local Bajri (Str. 59).—A split plot method of comparison of the yield performance of African and local *bajri*, each having a different sowing time and different spacing, was carried out. By sowing early or late and spacing wide or close, the African *bajri* yields more fodder and grain compared to the local type. The trial is to be repeated for one more year.

Intergeneric cross.—The promising selections for fodder from the cross between *Euchlana* x maize are being tested for yield on larger scale.

Inheritance studies.—Inheritance study of some selected plant characters in chilli and castor crosses is continuing.

Weed-killing.—The use of sodium chlorate as weed-killer in *bajri* plots has given satisfactory results.

Hedge plants.—A trial of some suitable plants as live-hedge under irrigated and dry condition showed that they grow rapidly under irrigation. Spineless cactus, *Agave cantala* and *Euphorbia tiruculli* have grown satisfactorily under both conditions.

Induced Polyploidy.—Polyploidy was induced in *mug* by colchicine treatment. A few fertile tetraploid plants have been obtained which show greater vigour for many of the plant characters, particularly, the seed size. A preliminary test shows that the tetraploid *mug* contains 15 per cent. more protein. Similar work in *tur*, *bajri*, *jowar* and a few oil seeds is in progress.

Miscellaneous Work.

Herbarium.—One hundred and seventy-eight plant specimens received were identified and were reported on. Some specimens were added to replace old ones which were damaged.

Economic enquiries.—Seventy-two enquiries were attended to during the year. Information on plants useful for camouflage purposes was supplied to the Military Department.

Seed supply.—Spineless cactus sets and *Agave* suckers were supplied to Jodhpur and Dungarpur States. Pigeon pea and sesamum types were supplied to Fiji Government. Collection of grass seeds was made for the Land Reclamation Scheme in Pandharpur Taluka.

Departmental Fodder and Livestock Committee.

This Committee was set up to meet periodically and discuss subjects pertaining to livestock and fodder. The Director of Agriculture is the Chairman of the Committee and the Professor of Agriculture, the Livestock Expert and the Economic Botanist are members. The last named officer is the Secretary of the Committee.

Since its formation, the Committee has met six times and in all 40 subjects have been discussed, and steps have been taken to implement the decisions arrived at by the Committee.

Provincial Fodder and Grazing Committee.

This Committee met only once during the year. Among several subjects discussed the Committee considered two schemes, viz. (1) Survey of Grassland and Fodder in three selected talukas of the province, and (2) Establishment of Grass Breeding Stations. The Government has agreed to finance the former scheme and the latter was submitted to the Trustees of the Sir Sassoon David Trust for sanction of the necessary grant.

Of the 18 District Fodder and Grazing Committees set up, nine Committees held meetings during the year and considered problems relating to improvement of grasslands, fodder pits and livestock improvement, storage of fodder, construction of silo pits, plantation of roadside and fodder trees : —

Programme of Work for 1942-43.

- (1) *Striga* Research.—Further work as laid down in the technical programme will be carried out.
- (2) *Pulse Breeding*.—The work according to the technical programme will be continued.
- (3) *Cytology of Papaya*.—Chromosome studies of the female gamete will be taken up.
- (4) *Linseed Breeding*.—Selections of the desirable types in F_3 will be made.
- (5) *Oil Seeds Breeding*.—Further selection in inbred strains is to continue.
- (6) *Grass Experiments*.—Root studies of "Napier" and "Giant Star" grasses to be started.
- (7) *Induction of polyploidy*.—The work of inducing polyploidy will be continued.
- (8) *Agave cultivation*.—The observations on rate of growth to be commenced.
- (9) *Miscellaneous Experiments*.—The experiments on live-hedges weed-killing, inheritance studies, etc., will be continued.
- (10) *Orobanchae*.—Selection of resistant tobaccos and trials on effect of weedicides will be continued.

L. S. S. KUMAR,

College of Agriculture,
Poona, 20th July 1942.

Economic Botanist to Government,
Bombay Presidency, Poona.

APPENDIX L.

SUMMARY OF WORK DONE UNDER THE CROP BOTANIST TO THE
GOVERNMENT OF BOMBAY, KARJAT (KOLABA), FOR
THE YEAR 1941-42.*Administration.*

Charge.—Throughout the year, the Section was in charge of Dr. B. S. Kadam.

Rice Breeding Station, Karjat, Kolaba.

The following varieties of rice are under improvement at this Station :—

(1) *Zinya*—(a) *Selections.*—Sixty-three promising selections obtained from a new lot were replicated in a quasifactorial design. Out of these, 14 selections, superior in yield to Z-149, have been retained for further use.

(b) *Synthetic material*—(i) *K-540 × Z-149.*—Some new selections have been made from the two midlate families of Z-31 and Z-32 and also from hybrid bulk material of the cross. Seven selections have been retained. These are superior in yield and fineness to K-540.

From the late material of this cross nine selections were compared with K-226 and Z-149. Out of these, four are superior in yield to Z-149.

(ii) *K-226 × Z-242.*—Out of the 7 promising selections under replication test, two are better in yield to K-226 and Z-149. These will be tested further along with the late selections of the cross, K-540 × Z-149.

(iii) *Z-149 × K-42.*—The object of this cross was to improve both Z-149 and K-42 in yield and lustre of grain respectively. Seventy-one selections were replicated on a small scale. Eighteen promising selections are retained for further yield test.

(2) *Kolamba.*—Out of the fresh material collected during 1939, 18 selections were replicated on a small scale. Eight promising selections will be tested with K-42 next season.

(3) *Bhadas*—(a) *Selections.*—Ninety-one selections are made from fresh material and replicated on a small scale. Promising selections are being carried further for further trials.

(b) *Synthetic strains.*—The trial of the two good strains, C-14 and C-48 was repeated and they continued to show superiority in yield over local Bhadas from Mahad.

(4) *Kada*—(a) *Selections.*—The fresh selections tried in replication do not show significant increases over the local. A selection 2Kd-68-1 from the second lot, is somewhat better in yield than the local. Yield in this variety will have to be improved by hybridization.

(b) *Syntheticals*.—Early, midlate and late cultures from F_3 of P-515 \times Kada were replicated on a small scale and after rejecting the poor yielding ones 6 cultures are retained and will be replicated with 2Kd-68-1 as check. These cultures will be purified for flowering and kernel colour, after their yielding capacity is tested thoroughly.

(5) *Jirbuti*—(a) *Selections*.—From the fourth lot, 52 selections were under replication test on a small scale. Out of these, 11 promising ones are retained for further trial on a large scale.

(6) *Mahadi*—(a) *Selections*.—Eight promising selections have been made from the 2nd and 3rd group and these will be further tested.

(b) *Syntheticals*.—Two good and early cultures will be tested for yield. These are earlier in flowering and at the same time higher in yield to Mahadi. From the midlate group, 6 cultures are selected on the basis of their yield and they will be compared for yield with local Mahadi. A few late cultures better in yield than 1B-12-11 are retained for further study.

(7) *Other varieties*.—A large number of selections from the coarse grained varieties of Thana and Kolaba were under replication trials. Promising selections from Ghosalwel, Tornya, Dodka, Patni, Patya, Bhura Halwa and Garwel are on hand.

(8) *Varieties from outside Konkan*.—Some selections from Sutarsal have been made. Three of them are longer and better in lustre than the local and one of them is higher in yield. These will be tested against the higher yielding strain given out in the district and the local.

Manurial Trials.—Preliminary trials with groundnut cake were undertaken during the year. Application of powdered cake at the rate of 60 lbs. Nitrogen per acre gave substantial and significant yield increases over no manure plots. The range of increase ranged from 36 to 70 per cent. From next year regular experiments with differential doses of nitrogen per acre will be undertaken.

Trials in the Districts.

Improved Bhadas selection, 1B-12-11, and two synthetic Bhadas strains were tried in Alibag taluka of Kolaba District but the results were inconclusive as the season was very unfavourable. The strain, K-501 was compared with a local coarse variety which, however, proved better at two places out of three.

Multiplication and Distribution of seed.

Paddy.—Seed of different improved strains was multiplied on the seed multiplication area. The total quantity of seed distributed for 1942 crop season was 8,092 lbs. to various Deputy Directors, States and foreign countries.

Gram.—Seed of Chafa (Niphad-816) gram was also multiplied and 577 lbs. was distributed to the Central and Northern Divisions.

Improvement of Minor Crops.

Val (Dolichos lablab, L.).—Fresh selections made last year were replicated on a small scale and 32 higher yielding plants than the local have been retained for further tests.

Rice Breeding Station, Vadgaon, Poona.

This is the second year of the station. In the beginning of the monsoon heavy rains flooded the farm area, causing considerable damage to the young seedlings and washing away part of the bunds. However, sufficient amount of seedlings was received from the main Station at Karjat, so that the entire area of the farm could be put under the crop. Trouble from crabs was controlled successfully.

1. *Ambemohor*.—Out of 340 selections, 174 have been retained for further use. It is observed that quite a large percentage of selections possessed extremely weak scent or none at all. Only those that are scented would be tested. From new bulk samples, 1,500 selections were made in the field. Of these, 219 scented and high yielding selections will be further tested.

2. *Chimansal*.—One hundred and ninety selections have been retained after the season's trial.

Rice Breeding Station, Igatpuri, Nasik.

The Station commenced to function from June 1941. It is primarily meant for the improvement of rice varieties grown in Nasik and Ahmednagar Districts. Improvement of Nagli is also taken up at this station as there is an extensive acreage under this crop in Nasik.

Rice.—Large number of preliminary selections have been made from bulk samples of Kamod, Chimansal, Ambemohor, Kalavarangal, Kolpi and Varangal. Part of the area was utilized in multiplying various improved strains of Kolamba, Zinya and Bhadas, from the Rice Breeding Station, Karjat. A total of 3,358 lbs. of seed was produced.

Nagli.—Preliminary plant selections were made from bulk samples collected from local sources. Selections from varieties from other districts have also been made.

Cereal Breeding Station, Kundewadi, Niphad, Nasik.

The following crops are being improved at this Station :—

(1) *Bajri*.—A mass selected strain, a group-bred strain and a synthetic strain, from a cross with the giant African Bajri, have been giving consistently higher yields over the local Niphad variety for the last three years. These strains will now be compared with local bajri in districts.

A large number of out-of-province varieties were grown for crossing purposes.

(2) *Wheat*.—Niphad-81 and Niphad-31 were compared with local Bansi and Bansipalli-808. The experiment did not show statistically significant difference, but N-81 was the highest yielder. Further comparisons will be discontinued.

A very large grained variety with good yield has been isolated. It will be multiplied and tried in districts.

A synthetic improved strain of Baxi, 165-6, has been found to be better yielder than Baxi-33 and local. It will be tried as irrigated Baxi in Ahmednagar District.

A new, early irrigated wheat, Niphad-4, was again compared with Pusa-4 on the Farm and it continued to give higher yields than the Pusa strain. At Kopargaon Farm also, Niphad-4 gave better yields. The variety has resulted from a specific cross involving Pusa-4 and Bansipalli-809. It was specially designed to eliminate the defects of Pusa-4. Niphad-4 is fully awned, does not shed its grains, which are bigger and more lustrous than those of Pusa-4. It flowers at the same time as Pusa-4 and is better or equally good in yield.

Wheat rust.—A large number of wheat strains and varieties are being tested at Mahableshwar to isolate strains for use as parents to evolve rust resistant wheats.

In district trials, Vijay (Niphad-81) wheat continued to give better yields than local varieties in the Nasik District. Tried for the first time in Ahmednagar District, it surpassed the local wheat everywhere. In west and East Khandesh, however, it failed to beat the respective improved varieties, Motiya (Bansi-168) and Gulab (Bansi-224). It appears that too early a variety like Vijay is not so well suited to heavy soil conditions of Khandesh.

(3) *Gram.*—Agronomic study of Chafa (Niphad-816) was continued. Some promising synthetic strains of gram for parching have been evolved and are under trial. Some desirable selections from the Khandesh gram are on hand also.

Chafa (Niphad-816) continued to give higher yields than local varieties in districts of Nasik and Ahmednagar, it being tried for the first time in the latter district. In Gujrat and Khandesh it is more or less equal in yield to local varieties but has a smaller grain. It is therefore not likely to succeed in these tracts where large grained varieties are required.

Chafa was multiplied on 5 acres and 10 gunthas for supply of pure seed to Divisional Deputy Directors.

Tur.—The improved strain, T-84, continued to give higher yields over local and other selections. Trials of T-84 at Jalgaon indicated that the strain is significantly better in yield than the local, but is 2 weeks later in maturity. Since tur is a row crop, extension of the strain will not be affected.

Sesamum.—During the year the best strains were replicated, but no significant differences in yield were observed, although N-85 gave 10 per cent. more yield over the local. District trials at Jalgaon and in Nasik Taluka showed superiority of improved strains over local.

Safflower.—The improved strain, N-630, continued to give higher yields. It was given out for the first time to a progressive farmer at Kundewadi, who was satisfied with its performance. N-630 will prove suitable in areas like Nagar and Poona.

New selections have been made to further improve the yield.

B. S. KADAM,

Crop Botanist,
Government of Bombay, Karjat, Kolaba.

**Programme of work under the Crop Botanist to Government
of Bombay, Karjat (Kolaba), for the year 1942-43.**

I. Rice Breeding Station, Karjat, Kolaba.

Improvement by selection and hybridization of different varieties of rice in Thana and Kolaba will be continued. District trials of new strains and multiplication of seed will be continued.

II. Rice Breeding Sub-Station, Vadgaon.

Trials of selections from Ambemohor, Chimansal and Sal will be continued.

III. Rice Breeding Sub-Station, Igatpuri.

1. Selection and comparison of desirable cultures from a number of varieties of Nasik and Nagar will be continued.

2. More selections will be made in Nagli and those of the last year will be compared.

IV. Cereal Breeding Station, Kundewadi, Niphad.

1. *Wheat*.—Hybridization of improved strains with rust resistant varieties will be taken up on a large scale.

2. *Bajri*.—Improved strains will be compared in the districts. F_1 seed of various combinations from inbred material and top-crosses will be compared with local variety.

3. *Gram*.—Selections from Khandesh and new synthetic varieties will be compared with local varieties.

4. *Minor Crops*.—Improvement of other minor crops will be continued.

B. S. KADAM,
Crop Botanist to Government
of Bombay.

APPENDIX M.

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL CHEMIST TO
GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1941-42.

Staff and administration.—Dr. J. A. Daji continued to hold charge of the office and laboratories of the Agricultural Chemist throughout the year.

Analytical and advisory work.—Four hundred and eighty-eight samples were received during the year for analysis. Of this, only twenty-six were from the public, the rest being from Government farms and other institutions. Of the samples received from the public, waters and manures formed the largest number. Advice was given wherever necessary in the light of the results of analysis. In addition to this, a number of enquiries were attended to.

Agricultural education.—This section is responsible for the teaching of Chemistry and soils to the students of the Poona Agricultural College. The teaching of soils to the students of the Forest Rangers Training Class is also looked after by this section. There were no post-graduate students during the year under report. One student was given training in the methods of analysis of agricultural products.

Research Work.—The manurial experiments on mosambi that were laid out to see the effect of balanced *vers* unbalanced nutrition on the "sudden wilting" of mosambi trees were continued during the year. Of the three orchards where these experiments are carried out, that of Dr. Gune at Ashwi did not show any marked improvement in the general condition of the trees though there were no fatalities. The yield of fruits seems to be no criterion, for the present at any rate, for judging the progress of the disease. The second plantation belonging to Mr. Oturkar at Deogaon which consists of young non-bearing trees seems to progress very well. It is expected that trees which have been given balanced nutrition from their young age may be able to withstand the disease better which usually appears after the plants begin to bear. One more plantation belonging to Mr. Kaniyalal at Utran was taken up for experimentation during the year to study the effect of manures under a different soil condition.

Investigations on nitrogen-fixation by *azotobacter* could not be continued during the year owing to the preoccupation and subsequent transfer of the assistant in charge of this work. The results of the previous work were written up and will be published in due course.

The study of the physico-chemical nature of soil type developed under different climatic conditions was continued. This year's work confirmed that of the last year's, viz., that the type of soil formed under similar climatic conditions at widely different places in the province was the same. The analyses of the lower horizons of these profiles were completed during the year.

An advantage was taken of certain experiments on green manuring laid out by the Professor of Agriculture at the College Farm to study the effect of different methods of green manuring on the physical properties of soil and, more especially, on soil structure. Though the results obtained cannot be taken as conclusive they seem to indicate that the usual method of green manuring and the addition of compost prepared from previous year's green manure tend to maintain a better soil structure than where the land is fallow or where the roots only of the green manure are incorporated in the soil.

Miscellaneous.—The Agricultural Chemist worked as staff editor and manager of the Poona Agricultural College Magazine. He also worked as a member of the Plant and General Chemistry Committee appointed by the Imperial Council of Agricultural Research. The Assistant Professor of Chemistry continued to work as Rector of the College Hostels and as a library adviser. Facilities for work in the laboratory were granted to various sections at the College as well as to the All-India Village Industries Hand-made Paper Research Centre and to the Village Industries Workshop of the Department of Industries.

Programme of work for 1942-43.

The following investigations will be carried on:—

1. Manurial experiments on mosambi.
2. Nitrogen fixation by *azotobacter*.
3. Physico-Chemical nature of soil types.
4. Effect of different methods of green manuring on soil structure.

J. A. DAJI,
Agricultural Chemist to Government,
Bombay, Poona.

APPENDIX N.

SUMMARY OF WORK DONE UNDER THE BUNDING SUPERVISOR,
BOMBAY PROVINCE, POONA, DURING THE YEAR
1941-42.

Government in G. R., R. D., No. 1798/39, dated 9th December 1940, sanctioned a scheme, in all estimated to cost Rs. 3,60,491 (Non-recurring Rs. 14,575 and Recurring Rs. 3,45,916) spread over a period of 3½ years for giving technical advice and assistance in the preparation and construction of bunding schemes, both of a major and minor nature and the introduction of Dry Farming methods. This scheme actually came into operation from October-November 1941, when the Senior gazetted staff joined their duties. Before this, the work of preparation of plans and estimates for Bunding schemes was being carried out by a few bunding officers or Senior Surveyors (Poona, Yeola, Bijapur, Dharwar and Dohad) under the control of the Divisional Deputy Directors of Agriculture. From January 1942 the entire staff came under the control of the Bunding Supervisor, Bombay Province, Poona.

(2) A scheme for Developmental Projects was drawn up by the Director of Agriculture, Bombay Province, Poona, who convened a meeting in December 1941, to which all staff connected with Bunding were invited. In this meeting, the Director explained in detail the object of the scheme and the various stages it has to go through and the ways and means for the same. The experienced Bunding staff of the Department suggested some 50 villages, wherein in their opinion, large scale bunding operations could be carried out with the initiative and co-operation of the people.

(3) Preliminary inquiries in the 50 villages suggested by the experienced bunding staff were carried out during the months of January and February 1942. These inquiries threw light on the selection of the most suitable villages, which can be surveyed on a priority basis.

In the meantime the survey staff required under the Bunding and Dry Farming Survey and Development Scheme was selected and trained so that the field parties commenced survey work in the month of March 1942. The following is the distribution of staff.

- (1) One survey party at Dharwar for Dharwar and Belgaum Districts.
- (2) One survey party at Sholapur for Sholapur District.
- (3) One survey party at Poona for Poona and Satara Districts.
- (4) One survey party at Bijapur for Bijapur District.
- (5) One survey party at Ahmednagar for Ahmednagar and Nasik Districts.
- (6) One survey party at Jalgaon, for the East and West Khandesh and Gujrath Districts.

Each party has a staff consisting of a Senior Surveyor, 3 Junior Surveyors and one or two sub-overseers.

(4) Before the formation of the survey parties, the staff was engaged entirely on the disposal of tagai applications for the purpose of individual bunding schemes. From March onwards, a part of the staff in each District was engaged on the Developmental Projects, while the remaining staff was put on the survey of individual or Tagai cases. During the year in question, survey of individual or Tagai cases over an area of 19,000 acres was carried out. Survey of 22 Developmental Projects aggregating 26,000 acres was carried out since March 1942. Of these, plans and estimates for 4 were prepared, 2 of which have since been sanctioned and funds allotted by Government. The remaining projects are under preparation now.

(5) There has been a very good co-operation between the staff of this Department and the other Departments, specially the Revenue Forest and the Rural Development Departments, with whom the staff of the bunding section generally come in contact. The Bunding staff of the Rural Development Department are of late referring all bunding plans for technical advice of the staff of the Agricultural Department. As per request of the Collectors of Ahmednagar and Dharwar, the staff of this section attended a few shows held by them and explained all about bunding to the public with the help of models. Short course training in bunding was given to Field-men of Taluka Development Associations in Nasik and East Khandesh Districts. Similarly a bunding propaganda class was held with Demonstration in Peint Mahal of Nasik District. The Rural Assistants at Manjri and Dhulia were given training in bunding. Two Agricultural Officers of Kolhapur Durbar were trained in bunding for 3 months.

(6) The Bunding Supervisor, and the Survey Engineer, Deccan District Division, were sent on deputation to the Punjab along with 2 Forest Officers to study the work being done by the Soil Conservation Circle of the Punjab Forest Department.

M. S. VENKATA RAMA RAO,

Bunding Supervisor,
Bombay Province, Poona.

Programme of work for the year 1942-43.

During the year in question plans and estimates for the Projects surveyed in 1941-42 will first be completed during the Monsoon and submitted to the Director. In all they amount to 18 projects. During the coming year it is anticipated that a total area of 60,000 acres be surveyed, which would mean some 30 developmental projects amounting to 30,000 acres and the rest to comprise of Tagai and individual cases. The most important thing that is programmed for the coming year is to see that at least one Developmental Project will be under construction in each District. To feed the project party with sufficient survey work, sufficient preliminary inquiries are already on foot.

STATEMENT No. 1.

Statement showing the progress on survey of Bunding Schemes in Parts of Bombay Province during the year 1941-42.

Serial No.	Name of District.	Number of acres for which plans and estimates were prepared.		Remarks.
		Individual Tagai or in Blocks or for model farms.	Developmental projects.	
1	2	3	4	5
1	Bijapur ..	6,580	1,320	(1) The Wilson Anti-famine Institute Bijapur, have reported that the area actually bunded is about 5,000 acres and for which a subsidy of Rs. 17,383 were distributed. (2) 1,200 acres in Bijapur District and 1,000 acres in Dharwar District under column 3 are in blocks of 200 acres or more. (3) Total amount of the Tagai applications dealt with in Poona, Satara, Ahmednagar and Nasik Districts Rs. 42,000. (4) In Poona, Nasik, Ahmednagar and Satara Districts so far 1,100 acres are reported as actually bunded.
2	Dharwar ..	2,000	1,800	
3	Belgaum ..	460	440	
4	Sholapur ..	54	5,300	
5	Poona ..	1,600	4,500	
6	Satara ..	260	1,400	
7	Ahmednagar ..	3,500	5,200	
8	Nasik ..	1,950	2,200	
9	East Khandesh.	225	2,400	
10	West Khandesh.	40	1,000	
11	Panch Mahals ..	2,350	1,000	
12	Thana ..	11 (for aboriginal tribes).	..	
13	Surat ..	300 (for Model Farm).	..	
	Total ..	19,429	26,560	
		45,989		

STATEMENT No. 2.

Statement showing the villages in which survey for Developmental Projects was completed in the year 1941-42.

Serial No.	District.	Village.	Total No.	Remarks.
1	Belgaum	Yekkundi	1	Tulsigiri submitted to Director.
2	Dharwar	Saswihalli and Meundi.	2	Rohinal will shortly be submitted to Director.
3	Bijapur	Tulsigiri, Ronihal and Dhanur.	3	Arjunsoda sanctioned by Government and funds allotted.
4	Sholapur	Arjunsoda, Uplaj Budruk, Lotewadi.	3	Kharpudi sanctioned by Government and funds allotted.
5	Satara	Gotewadi	1	
6	Poona	Kharpudi Budruk, Saizpurwadi and Sonewadi.	3	
7	Ahmednagar	Pimpri Wadgaon	1	
8	Nasik	Mangrul and Zodgi-kandani.	2	
9	East Khandesh	Mhasawad, Nagar-Deola, Mehumbare.	3	
10	West Khandesh	Malpur	1	
11	Panch Mahal	Mudahada, Salia	2	
		Total	22	Aggregating about 26,000 acres.

APPENDIX O.

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF ENTOMOLOGY,
COLLEGE OF AGRICULTURE, POONA, FOR THE YEAR 1941-42.

(A) Staff and Administration.

I continued to officiate as Professor of Entomology, throughout the year except for a month from 27th October to 26th November 1941, when I was on leave and the charge during this period was held by Mr. B. S. Patel, the Principal of the College. A new post of the demonstrator in Zoology has been created this year.

(B) Research Work.

(1) *Mango hoppers (Idiocerus spp.)*.—This year the attack of mango hoppers was not so severe as in the last. Nymphs of mango hoppers were collected from the different tracts, and their species identified. The figures this year, showed that the majority of nymphs were of *I. niveosparus* at all places except Bassein, where *I. clypealis* was predominant. It is quite striking that almost the whole population was of *I. niveosparus* at Haria in Surat District. Last year, *I. clypealis* was found to be the dominating species at all places (Haria was not visited). It appears from this that the same species is not found to breed predominantly every year. It would be worthwhile undertaking a study of the climatic or other factors which are favourable for the breeding of each one of the species.

The effect of sulphur on the nymphs of the three species was tested both in the laboratory as well as in the field. In the laboratory trials, *I. niveosparus* appears to be more susceptible to the action of sulphur than *I. atkinsoni* while the results of the field trials are not quite conclusive. The comparison between *I. atkinsoni* and *I. clypealis* also did not give quite conclusive results. Sulphur dusting was tried against the nymphs of *I. niveosparus* under controlled conditions in a garden at Haria. Within 5 days, 75 per cent. of the nymphs were found to have cleared off, whereas under Ratnagiri conditions where *I. clypealis* is predominant the flowerheads are cleared of almost the whole infection within this period. From these trials it appears that *I. clypealis* is the most susceptible to the action of sulphur while *I. niveosparus* is more resistant. *I. atkinsoni* appears to be still more resistant. The trials will be repeated next year.

(2) *Fruit flies (Chaetodacus spp.)*.—Laboratory trials were made with Sodium fluosilicate and Tartar emetic to find out which of the two poisons was better as foliage spray for controlling fruit flies. The latter was found to be quicker in action. An experiment was laid out in the guava season in the Ganeshkhind garden to test the efficacy of the poison sprays and the traps jointly and separately. The blocks being close together, the effect of each individual treatment could not be judged but the combined effect of both the treatments over the whole block was quite satisfactory. The percentage of affected fruits was found to be 17 as compared to 59 of the previous year when only traps were tried.

These experiments were also tried in the mango season, and the same difficulty was again experienced. As the result of these treatments the percentage of infected fruits in the whole block was found to be only 2.1. As the fruits were sold through contractor hitherto, no idea of the damage done by the pest in the past could be had.

(3) *Betelvine Bug (Disphinctus maesarum, Kirk)*.—This is the 5th year of the scheme financed from the Sir Sassoon David Trust Fund. During this year, large scale field trials, covering an area of six acres in all were undertaken with three different treatments viz. Nicotine sulphate, Fish oil rosin soap and tobacco (Dhus) extract. All the three treatments were almost equally effective but the tobacco extract was found to be the cheapest. Two to four sprayings had to be given in all for controlling the pest. Further trials with tobacco extract only are being carried out for confirmation of the results.

(4) *Grapevine Beetle (Scelodonta strigicollis, M)*.—This is the third year of the scheme, also financed from the Sir Sassoon David Trust Fund. The study of the life history of the beetle having been completed and confirmed, greater attention was now paid to finding out suitable methods of control. A simple method of collecting the beetles in large numbers in a tray kept below the vines, by shaking them early in the morning in September when the temperatures are low, has been devised. The beetles thus collected could be killed by throwing them in a bucket full of water with kerosene on the top. Other methods of control that are being tried are the stirring of the soil in the monsoon and spraying of the vines with stomach poisons and deterrents.

(5) *Trials of insecticides*.—The insecticides tried during the year and the results of the trials are as under :—

Name of insecticide.	Pest against which it was tried.	Results.
1. Cymag	Land crabs in rice	Was found to be less effective and more costly than cynogas "A" Dust.
2. Fygran	Weevils in wheat and Bruchids in gram.	Not effective in both cases.

(C) *Advisory and Development Work.*

As usual advisory work on the control of insect pests and supply of silk worms, prickly-pear cochineal insects and insect specimens etc., to cultivators and educational institutions, were carried on. The scheme for the demonstration of control measures against Katra in North Gujarat was actually started but had to be postponed due to floods.

(D) Agricultural Education.

This section has to teach two subjects viz. Zoology to the F.Sc. (Agri.) and Entomology to the B.Sc. (Agri.) classes. Out of the 80 students of the F.Sc. (Agri.) 89 per cent. passed in Zoology while 95 per cent. passed in Entomology out of the 66 students of the B.Sc. (Agri.) class.

(E) Miscellaneous Work.

The Professor of Entomology toured during the year for 36 days and visited 32 places for advisory and investigation work. The lecturer toured for 28 days and visited 19 places. The Professor of Entomology attended 6 meetings of the Insect Pest and Plant Disease Committee.

P. V. WAGLE,
Professor of Entomology.

Programme of work for the year 1942-43.

1. Study of the species of Mango hoppers in the different tracts and the action of sulphur on each one of them.
2. Field trials of poison sprays against fruit flies.
3. *Betelvine Bug*.—Field trials of insecticides (Scheme financed by the Sir Sassoon David Trust Fund).
4. *Grapevine Beetle*.—Trials of remedial measures. (Scheme financed by the Sir Sassoon David Trust Fund).
5. Jassids on cotton, Bhendi, potato, etc., control measures.
6. Trials of insecticides.

APPENDIX P.

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURAL
ENGINEERING, PHYSICS AND MATHEMATICS, COLLEGE OF
AGRICULTURE, POONA, FOR THE YEAR
1941-42.

A. Staff and Administration.

I was in charge of the section throughout the year. The section attends to teaching, Soil erosion, Research and inquiries and advice on Land Development.

B. Research work—Study of Soil erosion.

As proposed last year, no fresh observations were taken during the year under report. The data collected so far were compiled and the following remarks are offered. The plotting could not be completed due to shortage of staff. Last year's heavy rain has brought about filling in gullies and terraces. Disturbance of lines and removal of bench marks have affected the observations at various places.

(1) *30-acre plot near Chaturisingi Hill.*

(i) *Erosion plots.*—A study of silt collection data from four and three guntha plots shows that erosion is maximum when there are a large number of rainy days with heavy rainfall ($1\frac{1}{2}$ inches and over). This is also noticed in the gully fillings during last year. The plotting of lines in this area is incomplete and is now taken on hand.

(ii) *Gully Nos. 1 and 2.*—Gully No. 1 has several bends and varying grades. The lengthwise filling ranges from 0·5' to 1 foot and cross filling from 0·05' to 1 foot. At sharp bends and narrow sections, the banks have eroded, the cutting ranging from 0·05' to 0·2'. In gully No. 2 the lengthwise filling ranges from 0·2' to 0·6' and cross filling from 0·1' foot to 0·55'.

(iii) *Hill lines with steep and moderate grades.*—Line No. 1 with a total fall of 36' in 540 feet lies along a ridge. The erosion ranges from 0·02' to 0·46' being maximum at the steepest grade. Line No. 2 is slightly inclined to the hill slope with a total fall of 35' in 505 feet. The erosion ranges from 0·01' foot to 0·1 foot. Small pockets have been filled up. A gully across the line has deepened by about 0·2' and widened by 6 feet.

(2) *Kirkee Cantonment Line.*

Observations along the line had to be dropped out due to removal of bench marks and murum therefrom.

(3) *Katraj Valley Terrace observations.*

Observations show that the slopes within the terraces tend to level up due to plowing and internal soil movement caused by rains. The maximum filling is 0·27' at the lowest spot. In one of the terraces across a nala receiving plenty of silt, the filling ranges from 0·4' to 1·5'.

(4) *Karjat Valley observations.*

The terraces along the valley receive silt from a large hill side catchment and show a filling ranging from 0·5' to 1 foot. The terraces across the valley tend to level up. Breaching of terrace bunds has lowered the level of higher terraces and raised the level of lower ones.

(5) *Pashan Valley terrace observations.*

A slight change in levels is noticed here. This is due to shifting or adjustment of the terrace line, while straightening it out and probably due to water flowing over the terrace edge. The maximum lowering amounts to 0·07'.

(6) *Divaghat area observations.*

Five terraced gulleys were under observations. The terrace levels were raised. The filling in the gullies ranges from 0·04' to 2·7'.

C. Agricultural Education.

Two subjects, Physics and Mathematics and Agricultural Engineering together with their laboratory and field work, are taught by this section. The students did well in both the subjects. 85·2 per cent. passed in Physics and Mathematics and 90·2 per cent. in Agricultural Engineering.

As per revised University regulations, the examination for the subject of Agricultural Engineering has been transferred from the second year old course to the Final year new course. Part of this course will now be taught in the second year and the remaining in the third year.

A fresh batch of forestry ranger students has joined the College and their training in Physics, Drawing, etc., is taken up this year.

D. Miscellaneous work.

A.R.P.—The A.R.P. works and equipment at the College, Dairy and Veterinary Hospital are looked after by the undersigned at the request of the Principal. The College upper subordinate staff and the menial staff were trained in fire fighting.

Programme of work for the year 1942-43.

1. Visits and advisory work in the districts for land development.
2. Compilation of the erosion observation data for the 30-acre plot.

A. A. VASAVADA,
Professor of Agricultural Engineering,
Physics and Mathematics.

APPENDIX Q.

SUMMARY OF WORK DONE BY THE PROFESSOR OF AGRICULTURAL
ECONOMICS, AGRICULTURAL COLLEGE, POONA, FOR THE YEAR
1941-42.*Staff and Administration.*

Dr. M B. Ghatge continued as Professor of Agricultural, Economics, throughout the year under report.

Research Work.

(1) The work of the scheme for investigation into the supply and demand of Milk in Poona City and the utilization of fodder produced round about Poona was further continued throughout the year.

The important milk exporting centres like Nasarapur on the Poona-Satara Road and Vadagaon and Lonavala on Poona-Bombay Road were visited and the problem of milk supply and demand was explained and discussed with the Gawalees and milk collecting agents. Information regarding the annual cost incurred by them on production of milk and its transport to Poona was obtained from them and enquiries were made regarding the difficulties encountered by them in their business.

The chief fodder supplying villages in the Sirur Peta and Indapur Taluka were visited and some of the dealers and producers of fodder were interviewed to obtain information regarding the cost of production and transport of fodder to Poona Market. The Poona Milk and Fodder Markets also were studied with a view to study how the transaction is carried out.

(2) The scheme to start collecting data with a view to studying the economics of betelnut industry and the allied crops in Kanara mentioned in the programme of work for 1941-42 in the last year's report could not be started as the funds were not available. It is not known as to when funds will be made available for this work.

(3) The scheme to ascertain the cultivating and economic holding in a dry tract of Poona District as a basis was taken up in hand at the end of the year under report and a preliminary information to work out the plan of the scheme is being collected from various sources.

(4) To collect necessary information so as to be able to prepare a map of Taluka in Poona District showing economic homogeneity. In this connection it may be stated that the information is being built up slowly as and when it is convenient to move out to collect data.

(5) Figures of cost of cultivation of the important crops raised at the Taluka Demonstration Centres on the improved basis recommended by the Agricultural Department are being collected from different tracts of the Bombay Province with a view to study the latest cost of production of crops on private cultivators' farms and to compare them with the local cultivator's of the same tract.

Agricultural Education.

During the year, for the B.Sc. (Agri.) Examination of the Bombay University, 72 students appeared in Agricultural Economics—the subject taught by this Section—out of which only 3 students failed.

Miscellaneous Work.

(1) *Aid and Assistance to the Public.*—The Professor of Agricultural Economics attended the 3rd Conference of the Indian Society of Agricultural Economics held during X'mas at the Agricultural College, Poona, and read two papers on "Mixed Farming" and "The problem of Agricultural Surpluses in India as a result of the present War", respectively.

(2) The Professor of Agricultural Economics prepared 7 lessons on "Rural Economics" a book proposed to be composed for the students of the new Agricultural High Schools, at the request of Prof. K. S. Kulkarni.

(3) *Enquiries*—Replies were sent to the questionnaire received from Dr. V. K. R. V. Rao, Principal, Gujarat College, Ahmedabad, on employed time of the agricultural labour and the labour units for individual crops for Charotar tract in Gujarat.

M. B. GHATGE,

Professor of Agricultural Economics,
Agricultural College, Poona.

**Programme of work under the Professor of Agricultural Economics,
College of Agriculture, Poona, for the year 1942-43.**

In addition to teaching Agricultural Economics to B.Sc. (Agri.) students the following would be attended to during the year:—

(1) Investigation into the supply and demand of milk and utilisation of fodder produced round about Poona (Final stage).

(2) To start collecting data with a view to study the economics of betelnut industry and the allied crops in Kanara.

(3) To work out a scheme to ascertain the cultivating holding in a dry tract area of Poona District as a basis.

(4) To collect necessary information so as to be able to prepare a map of Taluka in Poona District showing Economic homogeneity.

(5) Enquiry to obtain some reliable figures to indicate what share of the price which is charged to the ultimate consumers of certain types of agricultural products is actually received by the producers of each products in this Province.

M. B. GHATGE,

Professor of Agricultural Economics,
Agricultural College, Poona.

Poona, 21st July 1942.

**List of Agricultural Bulletins published by the Department
of Agriculture and kept for sale at the Government
Book Depot, Bombay.**

[N.B.—Bulletins marked in asterisk are out of stock and not available for the present.]

No. Year.	<i>Subject.</i>	Price.
		Rs. a. p.
32 1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa	0 8 0
33 1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0 4 0
34 1909	Night-oil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona	0 4 0
36 1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist	0 14 0
37 1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0 4 0
*39 1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona	0 5 0
40 1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon.	0 12 0
*41 1911	Groundnuts in the Bombay Deccan	0 4 0
*43 1911	An Examination of the Seed-Supply of the Broach District, Part II	0 5 0
44 1911	Preliminary-Study of the Red Rot of Sugarcane in the Bombay Presidency	0 8 0
45 1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency	0 14 0
46 1911	Seed Selections Series I, Broach Cotton	0 8 0
47 1911	San Hemp	0 4 0
48 1911	Poona Furnace	0 7 0
	Do. (Marathi)	0 6 0
49 1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0 5 0
50 1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0 3 0
51 1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew	0 3 0
*52 1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0 8 0
*53 1912	A Method of Improving the Quality of Cotton Seed	0 7 0
55 1913	An Examination of the Seed-Supply of the Poona District	0 3 0
57 1913	Improvement of the Indigenous Plough of Western India	0 12 0
*59 1914	Common Salt and its Use as Manure in the Konkan Division	0 3 0
*62 1914	The Value of Castration of Deccan Bullocks	0 3 0
*63 1914	Substitutes for Rab	0 3 0
*65 1914	A List of Diseases of Economic Plants occurring in the Bombay Presidency	0 4 0
*67 1914	An Examination of the Seed-Supply of the Sholapur District	0 3 0
*69 1914	The Rice Stem Borer in the Konkan	0 3 6

No.	Year.	Subject.	Price.
			Rs. a. p.
*70	1915	Improvement of Cotton in the Bombay Presidency (except Sind)	0 3 6
*74	1915	Well Waters from the Trap Area of Western India	0 6 0
*79	1916	The Cultivation of Guavas in Gujarat	0 5 6
*80	1916	List of Seeds available on the Agricultural College Farm, Poona	0 5 3
*81	1916	Note on Fencing Construction	0 6 9
82	1916	Cultivation of Drilled Paddy in South Bombay Presidency	0 8 0
83	1917	The Spice Gardens of Sirsi in Kanara	0 10 6
84	1917	Seed Selection Series—Kumpta Cotton	0 1 0
85	1917	Note on Cattle in the Bombay Presidency	0 11 0
86	1917	Establishment and Management of the Dairy Farm	0 7 0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm	0 9 0
*90	1918	Work on the Manjri Farms for the years 1915-18	0 7 3
92	1919	Classification and Description of the Jowars of the Bombay-Karnatak	0 10 3
93	1919	Palm Gul Manufacture in the Bombay Presidency (principally Date Palm)	1 3 9
*94	1919	The Sugarcane Worer and its Control	0 4 3
97	1920	Prickly-Pear as a Cattle Food	1 4 0
*100	1920	Fodder Crops of Western India	2 1 0
101	1920	Fruit Culture in Palitana and Jamnagar	0 8 6
102	1920	Investigations on Potato Cultivation in Western India	1 15 0
*103	1920	The Book of the Mango Do. do. (Marathi)	3 5 0
104	1920	The Ganeskhind Botanical Garden, Kirkee (Its Genesis and Development)	0 15 6
105	1920	The Groundnut Bug and its Control	0 2 0
106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement	0 7 0
107	1921	Gonag—a Weed in Drilled Paddy	0 5 0
*108	1921	Summary of the work done on Jalgaon Farm Do. do. (Marathi).	0 5 6
110	1922	Year Book of the Agricultural Department in the Southern Division	0 5 0
*111	1923	A Note on Well Boring	0 8 0
114	1923	Studies on the Rice Plant and on Rice Cultivation	0 13 0
115	1924	Shevri as a Fodder Crop	0 3 0
116	1924	Sugar Industry in Western India and Methods of Sugar Manufacture	1 2 0
117	1924	Investigations in Fig Culture and Treatment	0 5 6
118	1924	Land Crabs as Agricultural Pests in Western India	0 8 0
119	1924	Year Book of the Agricultural Department in Southern Division, 1924	0 4 6
120	1924	Silage for Fodder in Western India	0 4 0
121	1924	Further Investigation on Potato	0 6 0
*72	(Revised 1925)	Experiments with the Automatic Water Finder in the Trap Region of Western India	0 4 0
122	1925	Sugarcane Varieties of Bombay Presidency, India	0 2 6
*123	1925	Ridge Cultivation in Lower Gujarat	0 8 0

No.	Year.	Subject.	Price.
			Rs. a. p.
*124	1925	The Chemical Composition of Food-grain Vegetables and Fruits of Western India	0 3 6
125	1926	Some of the promising Exotic Sugarcane Varieties of the Manjri Farm	0 13 0
127	1926	Elephant Grass—a new and useful Fodder Crop in Western India	0 1 0
129	1926	The Treatment of Patches of Inferior Tobacco in Northern Gujarat	0 1 6
130	1926	Some useful Forest Trees and Shrubs of the Coastal Tract and their Fodder Value	0 8 0
131	1926	The Fig Industry of Asia Minor	0 4 6
132	1926	The Improvement of Tobacco in Northern Gujarat	0 4 0
133	1926	Work of the Ganeshkhind Botanical Gardens and Modibag Garden in 1921-25	0 2 0
135	1927	An Improved Method of Growing Turmeric in the Deccan	0 4 0
*136	1927	Cattle Breeding in the Bombay Presidency, Principles and Progress	0 5 6
137	1927	Notes on the Lemon Industry in Italy	0 2 0
139	1927	Sugarcane Mills and small power Crushers in the Bombay Presidency	0 6 6
140	1927	Tobacco Cultivation in the Southern Maratha Country	0 3 0
141	1927	Trees and Shrubs for producing Green Manure in the Konkan and North Kanara.	0 3 0
*142	1927	Dry Farming Methods in the Deccan	0 6 9
143	1927	Experiments on Cotton Manuring in Khandesh	0 1 3
144	1927	Furnaces for making Gul or Crude Sugar in the Bombay Presidency	0 7 3
95	(Revised 1927)	The Cultivation of Oranges and allied Fruits in the Bombay Presidency	0 3 0
146	1927	Crops of the Bombay Presidency: their Geography and Statistics, Part II	1 11 0
*147	1927	Organisation and Cost of Gul-making in the Deccan Sugarcane tracts	0 2 6
*148	1927	Culture of Guava and its Improvement by Selection in Western India	0 7 3
151	1928	Selections in the Jowars of the Bombay Presidency	0 6 0
152	1928	Water-finder Work in the Bombay Presidency	0 8 0
*153	1928	Economic Value of Fruit Farming in Western India	0 6 0
154	1928	Assimilation of Nutrients by the Rice Plant (Technical series).. .. .	0 5 0
155	1928	Die-back Disease of Citrus Trees and its Relation to the Soils of Western India	0 5 0
30	(Revised 1928)	Field, Garden and Orchard Crops of the Bombay Presidency	0 7 0
*156	1928	Grape Culture in Western India	0 7 0
157	1929	Study of the Soils Associated with the Deterioration of the Cardamom Crop in North Kanara	0 3 0
*158	1929	Preliminary Note on the Possibilities of the Development of Lemon Industry in Western India	0 2 0
*160	1929	Soils of the Bombay Presidency	0 7 0
*161	1930	Cattle Feeds of Western India	0 1 0
162	1930	Popaya Cultivation in the Bombay Presidency	0 3 0
163	1930	Powdery Mildew of the Grape and its Control in Bombay	0 3 0

No.	Year.	Subject.	Price.
			Rs. a. p.
164	1930	Study in Intensive Farming near Poona under Canal Irrigation	0 4 0
165	1930	The Frost of January 1929 and its Damage to Crops of the Bombay Presidency	0 6 0
166	1931	Bansi Wheat of the Bombay Deccan and its Improvement	0 2 0
167	1931	Improvement of Manat Lands in the North Konkan	0 2 0
168	1932	Preliminary Studies of important Crops in the Bombay Deccan in the Post-war Period	0 10 0
169	1932	Cumin Powdery Mildew in Bombay	0 3 0
170	1932	Report on the Export of Mango to Europe in 1932	0 11 0
171	1932	Grassland Problems in Western India	0 3 0
172	1933	Summaries of the Annual Reports of the Experimental Work done under the Economic Botanist from 1893 to 1916	0 2 0
173	1933	Marketing of some Agricultural Products exported from Bombay to the United Kingdom	0 3 0
174	1933	Composition of important Manures and Manurial Constituents of important Crops in Western India	0 2 0
		Publication on "Experiments in Manuring Crops in the Bombay Presidency, 1896 to 1931"	2 9 0
175	1934	Manufacture of White Sugar and Gul by the Open-Pan Process.	0 3 0
176	1934	Fungi of Bombay	0 12 0
177	1935	Pea Powdery Mildew in Bombay	0 3 0
178	1936	Improvement of Rice in the Bombay Karnatak, Part I—Selections in the Mugad and Antaresal Varieties of Paddy	0 3 0
179	1936	Mineral Constituents of Food Grains, Vegetables and Cattle Feeds of Western India	0 1 0
180	1938	Development of the Kagdi Lime Industry in Western India	0 2 0
181	1938	Improvement of Ratnagiri Rices by Breeding	0 4 0
182	1939	Habit of Growth of some of the Important Garden Crops under the Poona Conditions	0 4 0
183	1939	Scope of Improvement in the Technique of Cultivation of some of the Important Garden Crops under the Poona Conditions.	0 4 0