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The Indian Council of Agricultural Research

ESTATE FARMING IN INDIA

*A study in large-scale agricultural enterprises
in India*



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INTRODUCTION

INDIA is a land of small holders and the average holdings vary from 12.2 acres in Bombay to 2.5 acres in the U. P. There have always been a certain number of large Zemindaries (estates) but until recent years none of these were organized concerns. The present volume is a description of large-scale farming enterprises carried out by those who have created and managed them and deals with what is in effect a new departure in Indian farming.

There has, throughout the world, been much discussion on the virtues and values of small-scale and large-scale farming and there have been many examples and experiments in the latter, particularly the colossal nationwide experiment of the U.S.S.R. in its system of collective farming.

Of the many advantages accruing to cultivators on the best of the big Indian estates may be mentioned the following :

- (1) The supply of pure seed
- (2) Maintenance of stud animals of first class quality
- (3) Systematic collection of manure and composting of all waste material
- (4) Use and proper care of improved implements
- (5) A regular cropping plan carried over several years with crop laid out in blocks resulting in saving of irrigation water and maintenance of the fertility of the soil by fixed rotations
- (6) Keeping in good repair of irrigation channels
- (7) Pooling and marketing of crops at favourable rates
- (8) Encouragement of subsidiary industries

- (9) Provision for education, medical relief, upkeep of religious and other public buildings
- (10) Entertainment of common visitors and other worthy communal objects.

What has been done on these farms, can be done by neighbouring cultivators co-operating, and there are examples in the Punjab in which cultivators of a village, who are also owners of the land have, by co-operating to farm their lands according to the best practices, doubled and even trebled the yields obtained by the farming in the old individualistic manner. "Union is strength" and, while the small individualistic cultivator may be up against all sorts of difficulties and find himself exploited in the end, a group working together on a well thought-out and technically sound plan and marketing their produce collectively is in a strong position and is on the high road to that better standard of living which they so much require and to the building up a healthy rural community.

W. BURNS.

THE COLEYANA ESTATE

BY SIR EDWARD COLB

The Coleyana Estate Ltd., Okara, District Montgomery

THE Coleyana Estate is situated on the Lower Bari Doab Canal area of Montgomery district in the Punjab, 80 miles south-west of Lahore and some 400 miles from Karachi. It is 550 ft. above sea-level. The nearest market town is Okara, some three miles distant on a metalled road. Okara is one of the largest centers in the Punjab for wheat and cotton and is served by the main line of the North-Western Railway from Lahore to Karachi. At Okara is situated the Sutlej Cotton and Spinning Mill employing 3,200 men and working 22,000 spindles and 800 looms. The town has its own electric supply which provides power to the Estate.

Scrub jungle

The Montgomery district is one of the hottest and driest in the Punjab and until the opening of the Canal was a scrub jungle sparsely populated by graziers and cattle thieves.

The average temperature rises from 63 in January to 108° in June and for many days on end the thermometer will register over 120°. The average humidity and rainfall is shown in the following table :

	J	F	M	A	M	J	J	Y	A	S	O	N	D
Humidity (average 31 years)	73	65	52	38	32	41	58	63	57	44	52	64	
Rainfall (average 31 years)		56	46	49	36	35	88	2	23	28	15	3	03
Average number of rainy days; 18													
Average rainfall: 10 56 in.													
Hard frost may be expected during the months of December, January and February.													

The Estate consists of 7,500 acres and is held on a 40 years' horse-breeding lease from the Punjab Government.

The lease has 15 years to run. Under the terms of the lease a large number of brood mares has to be maintained together with their young stock and this necessitates keeping a large area under fodder crops. The Estate is therefore divided into two sections, one maintained primarily for the feed of the stock and the other under commercial farming.

The portion maintained for the stud and home farm is cultivated by paid labour; the other portion, the zemin-dari area, is leased annually to tenants on the customary Punjab rental of half *batai*, i.e. the tenant and landlord sharing half and half in costs and produce.

Organization

The Estate is divided into seven main villages each of about 1,000 acres. The tenants, originally from the overcrowded districts of the Punjab, namely Amritsar, Jullundur, and Hosniarpur, are by now almost permanent inhabitants of this District. For administrative purposes each village is in charge of a Lambardar who has under him an accountant and two to three assistants. These men are all Estate employees and are responsible for the proper carrying out of all the agricultural practices and at the end of each harvest they are responsible for the proper division of the crops between landlord and tenants. This staff works under the orders of an Indian Manager who is directly responsible to the owner.

With the bulk of the Estate cultivated by tenants, there is no labour in the true sense of the word. Such as is required for the home farm is usually found by the tenants on the Estate from surplus members of the family or their friends.

When taken over in 1916, the land was scrub jungle with much salt or *kalarati* land and much clearing and levelling had to be done by the original tenants before the land could be brought under canal irrigation.

Conversion of salt land

The original tenants would not naturally touch the salt lands so these had to be taken into the home farm and reclaimed and made to give some return, that is I had to get something to grow on these barren lands. My attention was early drawn to two indigenous grasses, *dhub* or *Cynodon dactylon* and *chimber* or *Elusine flagellifera*. The former I found growing on the edges of *kallar* patches and working into the *kallar*, and the latter was clearly the staple grass upon which the local cattle fed and grew fat, I therefore decided to grass down these *kallar* lands, and in order to get the advantage of the horse-manure, the stud was moved on to the land as it was grassed. I will not labour this article with the history of my efforts and my failures. I was working in the dark and had to be content with a hit or miss policy: but now ocular evidence will prove the success of this method of reclamation. Areas which were covered with white *kallar* have for many years been under regular crop rotation and are now some of the richest lands on the Estate.

In accordance with the Punjab Colony Act the Estate is laid out into squares of approximately 25 acres each and the whole system of rotation and cropping is based on this fact. The zemindari area is cultivated by tenants and each man is allowed $12\frac{1}{2}$ acres per plough. The tenancies are renewed every year and are conditional on the tenant maintaining a rotation fixed by the Estate and using only seed provided by the Estate.

Taking a square of 25 acres, the cropping is 10 acres of wheat, $7\frac{1}{2}$ acres, of cotton, and $7\frac{1}{2}$ acres fallow for the following cotton crop. In this rotation wheat follows wheat in $2\frac{1}{2}$ acres, and this area is lightly manured for the second crop. In the fallow area, with previous sanction, crops such as gram, *toria*, turnips may be grown, and $1\frac{1}{2}$ acres per square per crop is allowed to be sown as fodder for the tenants' cattle.

From an examination of the rainfall figures it will be seen that the Estate is entirely dependent upon canal supplies of water. The Estate has entered into a contract with the Irrigation Department by which it pays a lump sum per annum for the water instead of paying at a crop rate for the actual area sown each crop. This is a tremendous advantage, for with the complete control of the water it can be distributed to the greatest good of all and there is no need to spill water on to land merely because it is that area's turn.

Modern implements

All agricultural operations of the tenants are under careful European supervision and wherever it is thought necessary modern implements are used. These are principally the turn-over iron plough and iron harrows such as the Planter Junior, but it has been found by experience that the iron plough has distinct limitations. It is hard to beat for the first ploughing for opening up the soil and burying trash, but after that all operations up to the seed-bed are best done with the indigenous Indian plough helped out with that great time-saver, the Planter Junior.

Repairs and replacements for these iron implements are, however, always a problem. I have used up many a tractor from Austin through Fordsons to the International and my next will be something more powerful, of the Caterpillar type. All have done good work and are great time-savers, but one needs to have three on hand, one working, one ready to work and the third in the workshop being got ready for work. Much time is wasted and loss incurred by breakdowns and one has to have a reserve of bullocks to carry on with.

It has been said that the tenants have to use seed provided by the Estate. This I look upon as one of the most important points for any farmer. Without purity of seed no progress can be made. To ensure this purity of seed I have always made full use of the services of the

Agricultural Department and have enlisted their aid to rogue selected areas of wheat and cotton each year.

Maintaining seed purity

The Estate has a battery of six cotton gins and a grain cleaning and grading machine by Messrs Tattersall. The cotton from the rogued areas is very carefully ginned under European supervision and largely sent to Bombay where the Coleyana cotton finds a ready market. Similarly, the wheat is cleaned and graded and commands a premium as seed wheat. A point which I consider of great importance is that only a few acres of Mollisoni cotton is grown on the Estate and only two types of wheat. This very considerably lessens the chance of impurities appearing in crop or seed. The Estate is always in a position to supply pure cotton and wheat seed and large quantities are bought annually by the Agricultural Department.

Sugarcane is grown in community plots five or six acres to a village. We have not enough manure available nor is the market attractive enough for a larger area, but our crops are gradually improving with the help of the Coimbatore varieties. It takes time, however, to find out the variety best suited to the particular soil. We have had some bad failures simply because the variety was not right for the land chosen.

Thanks to the fine rust-resisting wheat produced at Lyallpur, we have been free of disease, but we take measures to sun dry seed and treat seed with copper sulphate. The fine cottons produced from Lyallpur are ravaged yearly by jassids and white fly, and losses are very heavy. The scientists are looking for a 100 per cent cure. Let us have a 30 or 50 per cent cure if there is one and work up to the total extinction of these pests.

In the last 20 years astounding progress has been made in the quality and outturns of our crops, thanks to the labours of our botanists; but yet the fine seed which they produce does not get down to the ordinary zemindar,

partly because of his own carelessness and apathy and unwillingness to pay a few annas more for good seed.

It is no good growing seed unless the fertility of the soil is maintained and the question of how I can increase my supplies of manure is ever before me.

Compost manufacture

Each village on the Estate has a series of small shallow pits, one per house, around a pond. Each morning the villagers bring out the house and yard sweeping and dung and throw them into the pits where there is a man paid by the village who attends to the processing of the trash on the Indore method, watering and turning. In addition, the Estate has for many years bought the town refuse from Okara. This is brought in daily in rubber-tyred carts to a composting yard, where it is dealt with again on the Indore system by a staff employed by the Estate. The Estate bears all capital costs and charges the tenants one-third of the cost of the prepared compost. Similarly, in the home farm area all the horse manure and vegetable refuse, weeds, etc. are composted. I calculate that I prepare some 8,000 tons of compost a year, but I could do with five times the amount.

The soil on the Estate is alluvial with preponderance of clay which quickly runs together and the value of the organic manure in the form of compost lies in its physical property of keeping the soil open rather than in the NPK value. On these lands it is astonishing how soon the sun burns out organic matter which has to be continually renewed. In the stud area this is done by ploughing in the grass every fourth years, but elsewhere on the Estate it is difficult to obtain sufficient material to rot down. In this rainless country there is no surplus vegetation to plough in; and green-manuring is not always a success and calls for much irrigation water.

Dhub grass

I am now experimenting with short leys of *dhub* grass. This is a matter for the landlord's attention, to take up

an area of low productive capacity, say ten acres, grass down with *dhub* after rain, then in *rabi* sow *maina* or *maini* or *shaftal* in the grass and use the ground as a grazing area for the village, until ready to plough in. The less water used the better. To grass down with *dhub* is quite simple with the technique now followed at Coleyana. The land is ploughed, preferably after rain. Then old tough *dhub* grass is cut up in lengths of about 1½ in. through a chaff cutter if desired. This is then spread over the land thickly, followed by a *sohaga* (leveller beam) to press the grass into the land. It is watered again. The grass soon strikes. Another watering may be necessary in 15 to 20 days' time, after which little water is required. *Dhub* is a very deep-rooted grass: the roots soon get down into the land. By this process old impoverished arable land can be fertilized and *kallar* lands reclaimed. This grass planted in June gives a very heavy cover crop by September and is easy to plough in.

Outturn

The average outturn for the last 20 years has been: wheat 20 md. and cotton 10 md.; but much still remains to be done to further increase outturns.

With control of the water such crops as sugarcane and chillies are now grown in blocks in each village. This makes for large savings in water over the old system by which each man sowed a small area. Supervision and cultivation is also easier.

The farmer in India is faced with many difficulties. With the climate he cannot contend, but with the aid of the Agricultural and Industries Departments there is much that he can do to better his lot. He can use better seed, he can combat some of the crop pests, he can have more for himself and his cattle if he will get rid of the present surplus and useless cattle. Government, on the other hand, I think, can do much in organizing markets. In the Punjab, the wheat and cotton markets are well-

organized, but we have no arrangements at present to deal with our lesser crops such as *gur*, chillies, medicinal plants, potatoes, etc. Some central buying organization is called for.

This Estate is lucky in belonging to the Okara Zemin-dars' Cooperative Society through which it effects all its sales in Okara. It is impossible in an article of this length to go into the working of this society, but if any reader is interested I will gladly put him in touch with the Secretary who will give all details.

Co-operation on the Estate

In addition to the purely agricultural side of the Estate, I am always endeavouring to get the tenants to co-operate and do something for themselves to improve their financial state. It is an extremely uphill task. Education, I hope, will in time enable people to look ahead. Cooperative farming is making a start in the block system of sowing sugarcane and chillies and an outdoor hospital has been started under a retired assistant surgeon to which the tenants subscribe a small amount each month. The Estate pays in an equal amount. The management is in the hands of a committee of tenants and staff.

A primary school has been started with the assistance of the District Board in which emphasis is laid on agricultural education and animal husbandry, and I hope gradually to work up something on the lines of the young farmers' clubs in England. The composting of the village refuse is now worked cooperatively.

In regard to increasing income a start has been made with sericulture in which I receive great support from the Department of Industries. Many thousands of mulberry trees have been planted out. Silkworm seed is purchased by the Estate and distributed to tenants free. The tenants look after the worms and either spin the silk or sell it as cocoons. The Estate makes no charge, and a man can

easily earn 60 to 70 rupees for a few weeks' work. Weavers on the Estate have been helped to buy improved looms and are now making a decent income. But I still have to see any real desire on the part of the people to help themselves : the incentive to earn more seems wanting.

BUNDI AGRICULTURAL SYNDICATE

By E. F. SYKES

The Bundi Agricultural Syndicate, Bundi, Rajputana

IT is proverbial that the Pioneer pays, and our experience has not proved the adage untrue. We have bought a lot of experience dearly, but are by no means satisfied that our misfortunes could have been avoided. The Institution of Civil Engineers is always maintaining that more is to be learnt from failures than from successes: and what is true of engineering is equally true of agriculture for probably agriculture offers more unknown factors than even engineering. So we will proceed with our adventures (or misadventures?)

Waste land taken up

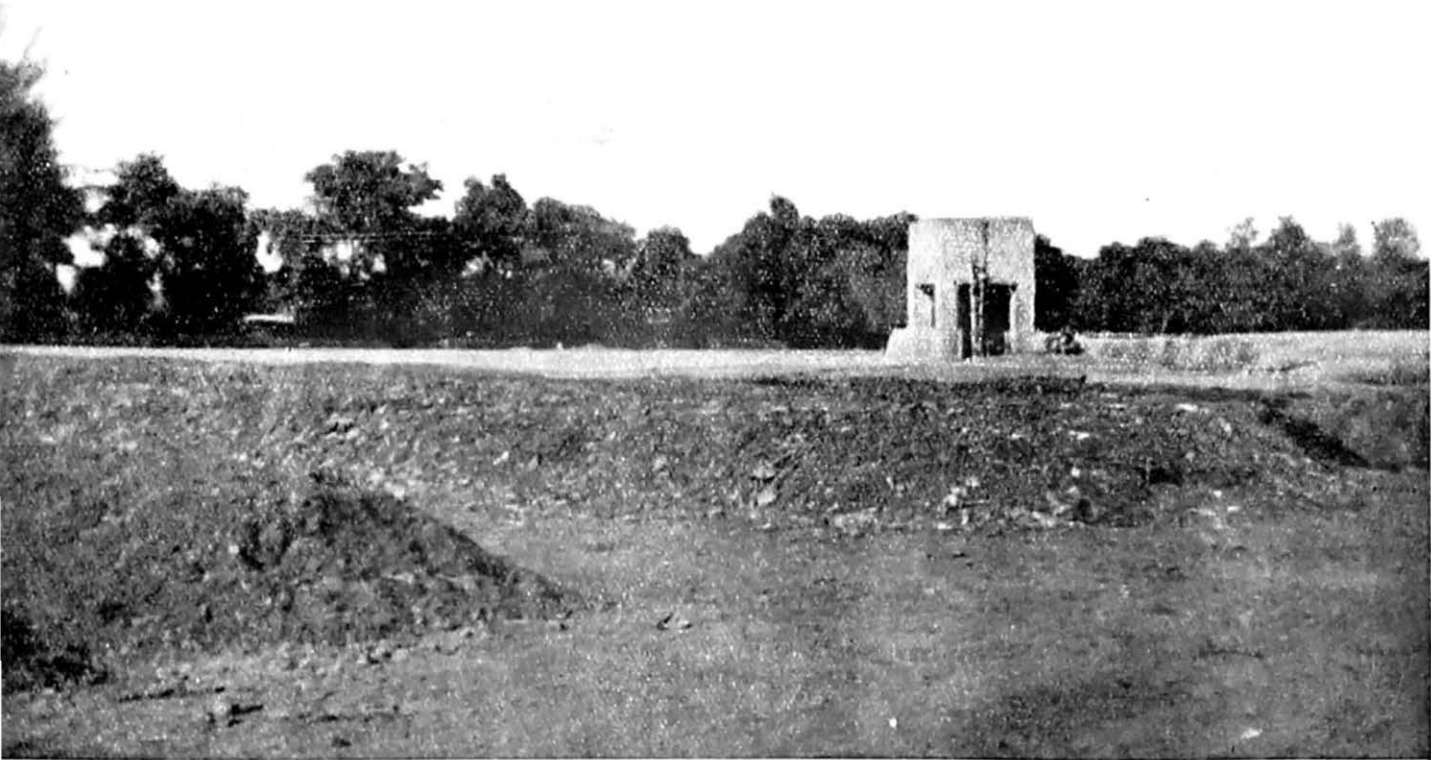
Everyone familiar with the Punjab knows the appearance of the Bar before Irrigation has been brought to it. A level uncultivated plain, with a fairly heavy growth of trees and bush *jhand* or *phulai*, *wan* and *karil*. And the waste land in Bundi, the Syndicate was formed to take up, was not dissimilar, if for *jhand* and *phulai* you substitute *kikar* and *khejru*. The present acreage under cultivation is 1,800 acres. There was nothing on the surface to show that the soil was in any way inferior, and although an analysis of the soil showed a deficiency of humus, it did not appear that there was anything to prevent the soil being fertile enough under cultivation. It is true that there was reason for surprise that so much land should remain uncultivated when the average rainfall was about 24 inches: but there were various explanations at hand. On the fringe of the area taken up there were wells which bore good crops, and the old maps of 1872 showed that the cultivation was much more extensive than at present; and from tradition confirmed by the census report it was known that there had been an immense loss of population on the great famine of 1900 which even now has not been



Reclamation : Cotton and pigeon pea



Reclamation : Middle distance—grass : Foreground—turnips



Composting town refuse—Water tower : Compost in various stages of preparation

PLATE 3



Village composting

made up. It was known that although in good years the *barani* (rain-fed) land produced good crops of *jowar* in *kharif*, in *rabi*, owing to the early cessation of the rains and the practical absence of winter rains, the *barani* wheat, linseed and gram were not good. But it was reasonably assumed that with irrigation and good tilth this could be remedied. By way of testing the response of the soil to irrigation we have for five years cultivated a couple of acres continuously with wheat and the average has now stabilized itself at $7\frac{1}{2}$ md. This shows that there was nothing specially bad about the land, and from the appearance of the crops on the wells there seemed to be nothing wrong with the cultivators.

Water storage problems

So we had no reason to hold back, and therefore proceeded with the construction of a *bund*, and the formation of a tank to hold in the first instance four hundred million cubic feet. The tank now holds one thousand million cubic feet. The project we worked on was one prepared by a special irrigation officer deputed by the Government of India after the great famine. There were other projects which we proposed to take up after this one had proved its worth. But one was enough to start with, and in some haste the *bund* was built in the next summer. That year we found we had been too modest in our estimate of the proper capacity of the tank. It is true the rainfall in the next monsoon was exceptionally heavy; but the flood that overtopped the *bund* (a masonry *bund* which acted as its own spillway) gave a maximum discharge estimated at 50,000 cusecs. It was evident then that a raised *bund* would provide considerable reserves of water, and there was another reason for having a greater depth of water in that the greatest loss of water in the harsh climate of Rajputana, with its fierce hot winds, is by evaporation which may be taken to amount to five feet in *depth* through the year. It needs little arithmetic to show that the deeper the tank the greater the percentage of

available water. But it was not worth while collecting more water until it was known what it could produce. Of course, it is evident that as perhaps half the evaporation losses occurred after the end of *rabi* irrigation, the policy that would make the best use of the water would be to empty the tank by that time. This argument would be effective in the Punjab where there is hardly any part where the use of flow irrigation is not understood; but probably the one mistake we made was in assuming that we should be able to find cultivators who were competent to utilize flow irrigation. It seemed natural to think that once we had established successful irrigation in our own land (which was not unlimited) we should have no difficulty in disposing of surplus water either direct to cultivators or through the Revenue authorities: meanwhile let us develop our own land. When we put the local cultivator on to it we found out that we had given him too much credit. Or rather we had omitted to notice that during the last half of the last century, the administration engineers and cultivators of the Punjab had been educating one another in the use of flow irrigation. During that period the results of the canals then constructed did not give great confidence in the future. In the annual administration reports it can be seen how bit by bit the duty of water was increased. Of course, this can be overdone; but it certainly taught economy, and as a result all subsequent projects were a success. As soon as a new canal was opened, men could be found who would on short leases develop the land with a prospect of subsequent ownership. But it must be noticed that this was a result of long experience. Nothing of the kind existed in Rajputana: hence our troubles. We will not go into them in detail: but the result showed that much training was necessary, and this could only be given by carrying on direct cultivation.

Trials with sugarcane

This being decided, the first thing to be taken up was

sugarcane, as this was where the local cultivation broke down worst: although the prospects were not brilliant, as Government had not yet started on the protection of cane, and the local market for *gur* was not tempting. However, we got in a wagon-load of seed of Co. 213, then quite a popular cane, and planted as much as it would run to, and soon extended it to as much acreage as we could deal with. Incidentally, this variety has spread all over the state, and until Coimbatore reached out into the three hundreds we found nothing better, although we tried many. We were much encouraged when sugar protection came in, as it became worth our while to set up a *khandsari* sugar plant. This for a time eased the situation, but looking ahead it did not seem that as a permanent arrangement it was entirely satisfactory. To begin with, the climate is even worse suited to cane than the rest of northern India. In the hot weather, when the cane should be making its vegetative growth, it was held back by the scorching hot wind; the rains were apt to start late and finish early, so that we did not get the benefit of our average rainfall. Again, the best cane growing is done in densely populated areas where a large amount of work can be done by manual labour which we had to replace by the less satisfactory tillage of implements. Again we had a certain advantage locally from protective duties. Who could say how long they would last? And even these would be lost if we produced more than could be sold in the local market. Further, the central protection was granted on the understanding that the industry would before long be self-supporting: we could not foresee the future course of the sugar question. We feared that the price of sugar would be brought down to a much lower level; and after all *khandsari*-making is an extravagant business. The only prospect was in extending our cane area until some kind of a factory could be put up: even then there was the difficulty of disposing of our output while the extension was in progress. Again, the water we had was sufficient for the extended area. So the first thing

was to find sites where more water could be stored : in the meantime we added another six feet to the *bund* as a first step, and then set out to find new sites.

Success with rice

In this exploration we had the luck of Saul the son of Kish. Seeking dam-sites (which we didn't find) we came across a village most appropriately called Garerda*. Here we found the local people growing rice which they watered from an old *bund*, nearly silted up. Nevertheless, they did grow it, even though they had to wait for the rains until they could sow their nurseries. Here was a suggestion. Local enquiry went to show that the output was respectable; in fact, under the circumstances not quite credible. However, we probably had the advantage of being able to sow our nurseries timeously, and felt encouraged to proceed. The first year we put down some 20 acres, and found that the local labour (at that season little occupied) was quite willing to engage in transplantation, although not so forthcoming at harvest. However, by using early and late varieties this difficulty seemed likely to be overcome: and in the last resort, labour could be imported. The results of this first attempt were so far successful as to tempt us to multiply it several times: and again the results were cheering. Little we knew what we had done for ourselves. After this came the great shortage of rainfall in 1939, when the distribution of the rainfall (such as it was) did little to fill the tank. It was clear that we should not have water to sow cane, or, if we had, we should not have enough to carry it through the hot weather, and therefore not enough to carry the ratoons either. Here was a pretty kettle of fish: ruin stared us in the face. However, we could only see one remedy and that was to make a manifold extension of our rice area. It was rather a desperate affair, as there was no hope of giving the land any preparation before the rains. Fortunately, a fair dollop of rain early in June eased the situation; but the transplantation had to be so far extended that

*Garar is the local name for paddy.

Before it could be completed we had a heavy crop of grass to deal with before the rice could be transplanted. Well, there is an end to everything, and so there was an end to our transplantation. Anxiously we awaited the results at harvest. Some areas where the preparation had to be scamped had a very light crop, but on the whole the results were not as bad as we feared: at any rate they decided us to abandon cane-growing and to concentrate on rice.

A bold decision

It was a bold decision: but another season has passed by and another crop, somewhat more extensive, has confirmed us in our views. Not that we are unaware of the troubles in front of us. Some are already on us. The rainfall of 1941 was even less than that of 1939: we are again confronted with the prospect of an empty tank when we should be planting nurseries. On the other hand, we shall have been able to do a good deal of preparation, and not have such a scramble as we did in 1939. Also our experience is greater. But those who have been concerned with rice-growing will sympathize with us in our contemplation of the vast amount of fresh experience we have to acquire. We get quite a lot of assistance from institutions like the Institute of plant Industry at Indore, and the Experimental Station at Nagina: and we hope for more especially in the way of new varieties, from the latter which may suit our conditions. But there is no institution which can help us in fitting together the jigsaw puzzle of commercial cultivation. So many questions arise: the question of how many cattle to keep; how much permanent labour; how to ensure a proper supply of temporary labour; how, while harvesting is in process, to get in recuperative leguminous crops; whether green-manuring, so strongly recommended, is possible under our special climatic conditions; what ratio of early to late varieties is the most profitable, and how far circumstances

will allow us to keep to these proportions ; these are only some of the problems we have to solve by constant experiment and observation. We shall certainly be able to say that rice cultivation is not dull, nor lacking in variety. Let us hope that it will be sufficiently profitable to enable us to carry on long enough to solve these problems.

By the kindness of a friend we are able to attach to this note some photographs of last year's harvest. There are many points in these photographs we might draw attention to : but we will confine ourselves to the one showing the reaping of the crop. The variety there shown is T23—a variety we now learn is obsolescent : yet it had great attractions for us. It was quite prolific, and a late-ripeners—which is no drawback with our warm autumns ; but the photograph shows the results of the strong hot winds we had untimely in September. It will be seen that a good deal of it has lodged ; but the most interesting thing is a row of upright spears on the sky-line. These are the ears that the hot wind prevented from falling, and so allowed to remain erect : another of the troubles that our peculiar climate brings to us.



Reaping T23 paddy



Threshing paddy



Winnowing paddy



Spreading paddy for drying

B. C. G. A. FARM, KHANEWAL

BY SIR WILLIAM ROBERTS, C.I.E., M.L.A.

*Managing Director, British Cotton Growing Association
(Punjab)*

IN an article in *The Agricultural Journal of India* in March 1924, the writer wrote on 'Some Aspects of Large-scale Farming in the Punjab'. The farm of 7,300 acres had then been worked for three years only. It has now reached its majority—21 years—and an account of some of our methods and results may be of interest.

When the farm area was taken over in 1920 certain portions were already under cultivation since 1914, but practically no levelling had been done, so that only low-lying portions could be irrigated.

Many parts of the farm area had sand hills as high as 60 or 70 ft. One sand hill occupied an area of 180 acres and even today occupies 60 acres. It took five years to clear the jungle trees and level the land. One fifth of each square was tackled annually and tenants were given the land to be levelled free of rent or share of produce. Government also assisted colonists by remitting land revenue collection for two crops.

The whole of this remission by Government has been put aside as a separate fund for development work and assistance to tenants. The lambardari fee paid annually by Government for collecting the land revenue is also paid into this fund which stands at Rs. 50,000 at present.

Scheme of rotation

The annual rainfall at Khanewal averages five inches per annum; so our crops depend almost entirely on canal water. The whole area is divided into squares of 25 acres, as is all the irrigated land on the Lower Bari Doab Canal where the farm is situated. The five lines of five acres each in every square is further divided by us into two, thus making 10 lines of $2\frac{1}{2}$ acres per square.

Irrigation channels or watercourses flow between each five-acre line.²¹ The rotation is roughly a three-year one of wheat, fodder, cotton with four lines of wheat, three of fodder or fallow and three of cotton. If in any one year cotton comes on lines 4, 5 and 6 in one square, it will be in the same lines in other squares so that often there is a length of 8 or 10 squares or two miles of cotton $\frac{1}{10}$ of a square wide. The fodder area will be similarly in continuous lines, say 1, 2 and 3. The irrigation water can thus be made to travel always in the crop and rarely over fallow land. It is estimated at least 15 per cent of the water leaving the Minor is lost in watercourses; so this tends to minimize the loss.

A further saving is effected by puddling the water channels with a sludge of bicarbonate and *bhusa* as recommended by Dr. McKenzie Taylor of the Irrigation Research Institute, Lahore. In this way the best use possible is being made of every drop of irrigation water that is available.

All our crops such as cotton and wheat are sown in lines and intercultured either with a Gujrat hoe costing Rs. 8 or in the case of wheat by a Bar harrow costing Rs. 10. This also tends to save waste of water by evaporation and keeps weeds down. The latter can only flourish at the expense of the crop and is therefore the deadly enemy of the farmer.

Manure pits

At the point where four squares meet, i.e., in the centre of every 100 acres, we have a plantation of $\frac{1}{2}$ acre consisting of *shisham* (*Dalbergia sissoo*) and *kikar* (*Acacia arabica*). The idea is to encourage the tenants to keep the cattle on the land rather than in the villages. The manure is stored in pits and all refuse available is added to it. Seventy such glades of trees are flourishing at the farm and serve as sources of timber for implements and house repairs. At the villages themselves a large-scale manure pit factory is in operation on the Indore

lines. Except for about 12 squares, the whole area is under tenant cultivation on the *batai* (half-share) system. Some $\frac{1}{2}$ seer per maund is taken from the common heap at harvest time to pay for medical relief, education payment of mid-wives, etc. and is being appreciated. Half the cost comes from the tenants and half from the landlord.

Ploughs, barrows and other iron implements are kept at village headquarters and loaned out as required to the tenant. Iron ploughs are used at least once a year on all cultivated land.

Owing to the damage done by *tirak* or bad opening, our date of sowing for cotton has tended to become later and later. We used to sow in early April but now the best date is 10 June and sowing starts 10 days earlier and continues up to 25 June. Picking of American cotton starts in early November and is finished by the end of January.

Origin of N T cotton

The farm has been used extensively to test on a large scale new varieties of wheat and cotton. In the case of cotton the farm had a major share in introducing 289F cotton of which a few ounces only were brought by the writer from Mr. Milne's selections at Lyallpur in 1921. All subsequent long-staple types in the Punjab and Sind of the N T class are derived from this original seed. The most successful of all is a type selected at Khanewal Farm by Mr. Roger Thomas eight years ago and now grown over two lakhs of acres in the Punjab and a lakh of acres in Bahawalpur and Sind. The total production of 289F types today is not less than four and a half lakhs of bales and the area under it probably 1,000,000 acres in the Punjab, Bahawalpur and Sind.

With Khanewal as a centre and applying the principles worked out here we have taken large areas on lease in the Punjab, Bahawalpur, Sind and Baluchistan

and now control over 200,000 acres of irrigated land, and operate besides thirteen ginning and pressing factories and two large oil mills.

Seed for the Agricultural Department in the Punjab and Bahawalpur and for cultivators in Sind is supplied for well over 2½ lakhs of acres of cotton and about a lakhs of acres of wheat every year.

Our average yield of cotton for the last two years has been 12½ maunds of 82½ lb. and of wheat 20 maunds per acre. Our highest average yield of cotton has been 15½ maunds and of wheat 22 maunds.

Social welfare

The houses put up first were rough and ready, though the four villages of the farm were carefully laid out and trees planted along all roads. We have recently been reconstructing tenants' houses according to a regular plan. Nearly half the houses have been rebuilt in this way and it is hoped to complete the work in three or four years more.

A visiting doctor is employed and a dispensary established at the headquarters village. An average of over 40 patients a day are treated at the dispensary.

As the mortality among children and in childbirth was high, we started training mid-wives six years ago and have now trained twelve altogether.

We are now starting a fund contributed to equally by us and by the tenants for welfare work. Sir Chhotu Ram Reserves credit for the idea which originated from him when he was a Minister of Agriculture.

The tenants will virtually control the expenditure of this fund, though the Farm manager retains the right of veto. This fund is being registered to ensure that the whole of it will be spent for the benefit of the tenants only.



Ploughing with
Rajah plough

Sowing wheat by
Johnston drill



American cotton





Wheat harvesting



Cotton picking

THE MILITARY FARM, OKARA

By LT.-COL. A. H. SCRIVENER

Officer Commanding, Military Farm, Okara (Punjab)

THIS estate, comprising 22,040 acres in Montgomery district, Punjab, is unique, the nearest approach to it being Army Remount Department farms run for fodder production in conjunction with Remount Depots, and military dairy dry stock farms.

The farm is an independent unit of the Indian Army managed by a King's Commissioned Officer of the Military Farms Department assisted by a small cadre of departmental personnel.

The land comprising the estate is the property of the Punjab Government and has been held on lease since the farm's inception in 1914 when the project was started as an oat hay farm for Army requirements. With the gradual increase in mechanization the production of oat hay was dropped but large reserves of grain (wheat) and *bhusa* were, and still are, available in time of need. As the call on fodder reserves gradually became less, the farm increased its purely agricultural activities and now produces the usual Punjab crops, cotton, wheat, *toria* and mash for sale in the open market. In the near future it will considerably widen the scope of its activities.

Owing to the very large increases in the herds of the military dairy farms and the consequent congestion at the farms, it has been decided that nearby military dairy farms should despatch their dry stock to the Military Farms, Okara. Stock will be maintained until due to calve, when they will be returned to their respective farms.

Batai system

The estate is managed on the *batai* system, the whole area with the exception of very bad land being on one-half *batai*. The farm controls the cropping programme

and supplies the seed in some cases free and in others on payment and takes one half of the resultant crop. With the exception of cotton the crop is divided at the time of harvesting.

The principal food of the Punjab cultivator being wheat, the tenants' share of this crop is seldom available for sale, being required for his own use until the next harvest comes in. *Toria* provides him with ready money for his half share. Cotton, however, being solely a money crop is sold *in toto* and this the farm undertakes to do on behalf of the tenant whose personal account is credited with one-half share of the outturn of his fields at the average prices obtained for the particular variety he has grown.

The chief aim since the inception of the farm has been the production of pure seed, almost the whole of which is taken by the Agricultural Department of the Punjab for distribution to cultivators. To this end the most rigid control is exercised over seed, all of which is supplied by the farm from trust-worthy sources.

As a further measure, a highly efficient mechanical seed cleaner has been installed by which all wheat is purified, cleaned and graded before sale, giving the farm a substantial premium over ordinary market produce. The seed itself is rejuvenated periodically with pure strains obtained from the Agricultural Department farm at Lyallpur. The seed cleaner is also used to grade and purify all purchased seed including berseem before sowing. All wheat reserved for seed is dusted with copper carbonate as a preventive against smut and a proportion is solar-energy-treated at Lyallpur before despatch.

Help of scientists

For the production of pure cotton seed constant liaison with the Lyallpur specialists is maintained. Varietal tests for both *desi* and American cottons are put down each year and selected seed areas are systematically rogued

and tannin-tested* under their supervision. For seed production the farm does its own ginning and, not content with that, also puts all seed through the seed heater—a unique device, designed to destroy by heat and pressure the larvae of the pink bollworm.†

The whole area of the estate is canal irrigated and 741 squares each of 25 acres are cultivated. This entails constant and unremitting outdoor inspection to ensure that the comprehensive programme of crop control is being carried out. Close liaison is maintained with the Canal authorities whose advice and assistance in such matters as siting of watercourses, reconstruction of outlets, etc. have been invaluable. As more land has gradually been brought under cultivation, new watercourses giving a more direct flow, new outlets and straighter *khals* (watercourses) have become possible. The heavy loss of water by seepage, friction and breakages has been considerably reduced by a special method of staking and *lepai* (mixture of mud, *bhusa* and water), and in this case soda and a strict control of the fixed irrigation *wari*‡ of each tenant reduces wastage to a minimum.

As with water so with cropping programmes and general farm policy. All farming operations are strictly controlled and, allowing for deviations due to irregular or non-productive land the cropping programme for each of the 741 squares is identical. For this purpose the rectangle is divided into ten strips each of $2\frac{1}{2}$ acres and rotation of crops is based on the strip unit.]

*A test devised by Prof. R. H. Dastur (at present in charge of the research on cotton 'failure' in the Punjab) to find out if plants require additional nitrogen.

†*Indian Journal of Agriculture Science*, Vol. XI, part VI, December 1941, page 906.

‡*Wari* is a turn. A *wara bandi* is a roster for water, each tenant's name and number of hours of water allowed being entered therein. Time is controlled by ringing a gong in the village office.

Provision for manure

One of the difficulties with which a farm of this size has to contend is that of manure. No city rubbish is available and artificials are both expensive and limited in value. Full use is made of green manure in the rotation programme and all village manure is composted in a special manure factory attached to each village. Every tenant is allowed two days' use of his own litter per week for fuel. The balance is carted under farm arrangements to the factory where it is composted and, when ready, is issued to tenants for application to the land.

A village of approximately 50 squares should produce two pits of compost per week sufficient for a manuring programme of about 8 loads per acre per crop. This is admittedly not a large allowance but is better than nothing. In addition tenants are encouraged to use the *khurli* (a portable feeding trough) so as to apply cattle droppings and urine directly on to the land. This system is also combined with the 'sheep and goat' method of reclamation and the tenant-cum-shepherd who can support himself on a good square while reclaiming a bad one by folding sheep and goats is encouraged.

Many acres of what appeared to be hopelessly *kallar* land have been reclaimed by the 'sheep and goat' method which though slow, is effective. Sheep and goats are folded at night on a fixed area and are moved on when their droppings have accumulated sufficiently to be ploughed in. As an encouragement the farm has started a small herd of Hissar Dale sheep, the male produce of which is sold to tenants to improve their own flocks.

— Tenants reside in 17 *chak* villages provided by the estate. Much has been done to keep these in good repair and in a sanitary condition particularly by the provision of chimneys, of fly proof ventilators both for roofs and walls, of good wells with clean water and by the systematic removal of litter and waste to the compost pits. The question of housing on so large an estate is a

big one but modern *katcha-pakha* houses provided with verandah and compound walls are gradually replacing the old ones.

Modern machinery used

The fullest use, consistent with local conditions, is made of modern machinery. All wheat is sown by Mc Cormick Deering seed drills. The Ceres plough and lever tooth harrow are fully utilized to supplement country implements and their value is appreciated not only by our own but by outside zemindars who often approach the farm to purchase these implements for them. For sowing cotton an improved *desi* drill sowing three rows at a time with predetermined spacing produces good results.

One useful gadget is the ancient Roman *abacus* adapted for cotton weighing. This consists of a wooden stand supporting three parallel steel wires on each of which are ten steel beads. One bead is spun over for each *palli* weighed and a count of these in all three lines representing units, tens and hundreds can be made at a glance at any time to check with the weigh book.

All produce is sold through the local zemindars' co-operative society of which the farm is a member and much of the carting is done by the farm's own pneumatic-tyred carts whose greater capacity and easier load render them well worth the extra initial expense and upkeep. Some comparative loads are given below.

Produce	Country carts	Pneumatic-tyred carts
<i>Bhusa</i>	30 md.	40 md.
Wheat, etc.	14 bags	20 bags
Cotton	25 to 30 md.	30 to 40 rd.
Lint	4 <i>boras</i>	5 <i>boras</i>
Cement	20 cwt.	30 cwt.

Transport for the directing staff consists of two Ford V8 cars, the change over from horses having been effected several years ago in the interests of both economy and better supervision.

How Village Fund is spent

Something should be said of the use made of the *dharat*. Canal colony law provides for a levy on produce payable by each tenant to the landlord. On the military farm this *dharat* is at present $1\frac{1}{2}$ seers in the maund taken from the common heap, i.e. $\frac{3}{4}$ seer is contributed by each party. Realizations under this head are separately accounted for as a Village Fund and are expended on amenities, both social and personnel, for the tenants.

The principal Village Fund expenditure is on medical facilities, schools and veterinary treatment. The farm maintains a hospital and two outpatient dispensaries staffed by qualified doctors one of whom is a lady for women's and children's work. The medical staff have the use of a V8 station wagon fitted up as a travelling dispensary-cum-ambulance and handle an average of 36,000 outpatients and 390 inpatients per year.

Three schools are maintained on the farm, which also lends support to one outside school on its borders.

A veterinary assistant surgeon is employed for treatment to tenants' cattle, and stud bulls are maintained for the improvement of livestock on the estate. Hand tube-well pumps are provided for schools at central points in distant squares and also in villages where the well water has become too brackish for drinking. The simple needs of the tenants are catered for by the installation of village shopkeepers whose charges are controlled and by the provision and upkeep of religious buildings and teachers in each village. In addition provision is made for a yearly *mela* at which prizes for sports, bullocks ploughing, etc. are awarded.

Necessarily the directing staff is fully occupied and, in these days of petrol rationing and with one's nearest neighbour living several miles away, normal social intercourse is difficult. On the whole, however, the life is both healthy and interesting and brings one into close contact with the daily life of the rural population to the mutual benefit of both.

The outside world

Much time is spent in settling disputes both domestic and social. The policy of the farm is to deal with its social and other problems itself and reference is rarely made to outside civil authority. Village lambardars are carefully selected for their tact and powers of control over their respective communities. Field staff are selected from all communities so that there is no preponderance of any one class. Direct access to the Officer Commanding is the right of every individual and the knowledge that any grievance however slight and whether real or fancied will be listened to does much to make for general contentment and to stop any form of *zulum*. Communal troubles are literally non-existent on the military farms. All villages are of mixed communities who live in harmony together bound by their common interest in the land.

Large numbers of tenants have been on the farm since 1914. Many have purchased land of their own but still either stay here themselves or keep their sons here in the squares they themselves originally brought under cultivation. During the reallocation of land just completed only 100 tenants left the farm out of a total of 1,100 and for this land over 200 applications were received. The war has not been forgotten. Well over 100 tenants' sons have joined the Forces, and the farm deposits approximately Rs. 500 per month in Defence Savings. The sudden appearance of a smart soldier in khaki in the office is now fairly common and it is often difficult to reco-

gnize in him the country bumpkin who only a few months ago left his plough to fight for his King and country. We look forward to his return, his mission accomplished, when peace reigns again. His training, discipline and knowledge of the outside world will make easier the task of creating a new India.



An improved triple Cotton Seed Drill with adjustable spacing.
Set in this picture to 2 ft. 6 in.

PLATE II

Cotton weighing. The abacus in the foreground shows the number of *pállies* weighed, enabling one weighman to control several weighing points.

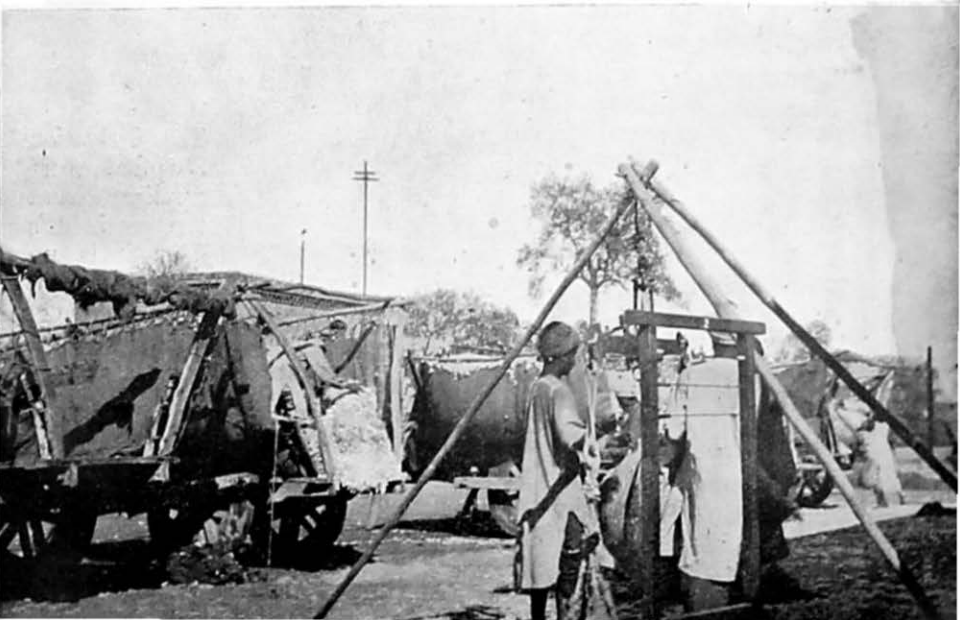




PLATE 12



A McCormick
Deering Seed
Drill for wheat

The Irrigation
Department
supplies water at
the zemindar's
door—it is up
to him to make
the best use of
it. A good water-
course minimiz-
ing waste and
friction.



The Irrigation Department supplies water at the zemindar's door—it is up to him to make the best use of it. A bad watercourse.

THE INDIAN MILDURA FRUIT FARMS, LTD.

By 'KISSAN'

THE Indian Mildura Fruit Farms, Ltd., Renala Khurd, Montgomery district, Punjab, was established in 1920 when the late Mr. F. J. Mitchell was given a grant by the Punjab Government of 722 acres of land in the Lower Bari Doab Canal Colony for the purpose of improving fruit-growing in the province and to encourage commercial fruit-growing in that newly irrigated area by importing proved varieties of fruit trees and propagating from these.

Enemy of viticulture

It was the first intention of Mr. Mitchell to plant a large area with vines for the production of grapes for the dried fruit market. He definitely proved that it was possible to grow many varieties of vines and produce satisfactory crops of grapes in the Punjab plains and under irrigated conditions similar to irrigated areas in Australia on the Murray River (e.g. Mildura). It was for this reason Mr. Mitchell sent his manager to Australia to study viticulture and the drying of grapes and on his return the manager brought with him all varieties of vines he considered would prove equally successful here. This project was eventually given up as being too ambitious, with too many unforeseen difficulties presenting themselves. The white ant was the main enemy, and after spending a great deal of money on using poisons, gassing equipment and other known methods of destroying this pest, it was found that hoeing and other means of intensive hand cultivation was the only practical but not the most economical method of effectively destroying the pest. The white ant in this locality is the scavenging variety working near the surface in very small narrow runs and not like other varieties which have wider runs, are easily gassed, and are not so widely distributed in small colonies. Other pests were birds, mostly parakeets, and numerous species of ants which were ever ready to attack the fruit on

drying trays. It is possible to produce a first class dried Sultana, Muscatel and Zante Currant in the Punjab. Varieties of vines grown were Muscat of Alexandria, Sultana, Zante Currant, Thomson's Seedless, Black Humburg, Red Humburg, Gros Colman, Waltham Cross, Doradilla and other varieties with a view to the possibilities of developing the wine industry as a secondary development. Only varieties of grapes which ripened before the arrival of the monsoon really proved successful, and a most interesting collection of these are now in a demonstration plot at the Lyallpur Agricultural College where anybody interested in viticulture can see them.

Import of citrus plants

Citrus cultivation did not present so many difficulties. The main difficulty was to produce satisfactory nursery plants to keep pace with the rapid planting programme demanded by the Government. It would have saved much time and money if we had been given the opportunity of propagating from trees imported by us of known parentage and after they had proved themselves capable of producing fruit of quality and in satisfactory quantity in these climatic conditions. The following varieties of citrus have been imported by us from Australia, Florida, South Africa Palestine, and Japan :

Australia : Washington naval (have not given satisfaction), Valencia late oranges.

Florida : Marsh seedless and Duncan's grape fruit.

South Africa : Eureka lemons, Duncan grape-fruit, and Valencia late oranges.

Palestine : Clementine, Satsuma, King, Temple, Tangebis, Nagami, Dancy, and other varieties of oranges ; also Eustis limequats and Meiwa kumquats.

Japan : Trifoliolate orange.

Had Alexander the Great and other rulers in India taken as much interest in citrus-growing as did those Mediterranean countries where seeds brought by Arab

traders from India and the East were cultivated there would probably have been no need for us to import citrus plants into India where very little history of this valuable fruit has been recorded. As gardening and fruit-growing were, and even now are, considered only possible for the very (idle) rich, it is likely that the citrus fruit in India has a longer history than is now realized by the various Agricultural Departments. A search for more history may reveal some interesting information. We can claim that we have almost a complete collection of all varieties of the citrus family. Not given time to produce our own nursery plants, we were forced to buy wherever we could at high prices from nurserymen, who before the appointment of the present Fruit Specialist to the Punjab Government, were uncontrolled and extremely unreliable. We have been obliged to cut our worthless trees to the value of nearly a lakh of rupees and hope that others, reading this will not suffer likewise.

Teaching of experience

Before planting an orchard it is strongly advised that the prospective fruit-grower should first select land which is most suitable for the class of fruit to be grown. Any money spent on a thorough survey by an expert analytical soil chemist will be money well spent. At Renala Khurd we would have saved thousands of rupees if we had avoided *kalelar* patches that have since appeared and other undesirable areas. Uniformity of trees is most essential. If citrus trees are properly shaped in the nursery, by judicious early pruning, they should not require further pruning for four years or more. Suckers should always be looked for in spring and early monsoon and should be removed when very small. The value of a citrus grove is greatly enhanced if different varieties, early and late, are planted in separate blocks to facilitate protection and harvesting. We have a very good demonstration of good planting at Kissan station. Plant orange trees not less than 22 ft. and lemons, limes and grapefruit

not less than 25 ft. apart. Obtain full information and benefit from others' experience before planting. Do not experiment. No farmer can afford this expensive hobby—leave this important work to the Agricultural Department. Stray animals, especially goats, will ruin young trees, spoil their shape and cause hundred of rupees' worth of damage in a few minutes. A buffalo bull, in a few minutes, by rubbing his forehead, will destroy almost completely several four-year-old orange trees producing their first crop. Therefore keep cattle away from fruit trees, but encourage poultry. Fruit-growing cannot be carried out as ordinary zemindari on the tenant system: strict supervision must be kept over labour and the only way to train supervisors is for the owner to train them himself.

Value of seedling stocks

During his visit to South Africa in 1927-28 the writer was very much impressed with a seedling orange orchard owned by Major Thomson outside Pretoria and on his return planted a seedling orchard of Nagpuri oranges. This orchard has proved of great interest and may yet help to prove that Nagpuri or other Mandarin oranges are best grown from seed of selected seedling trees. The complaint of die-back, common to this variety of citrus, can possibly be overcome if a thorough and continuous research over a long period can be carried out on the propagation and growing of selected seedling stocks. Among these seedling trees we have, growing by mistake, Malta type orange trees which are also of interest. In the photograph it will be noticed that these seedling trees grow much higher than budded trees.

Other fruits grown by us are figs, plums, peaches, dates, loquats, mangoes, *phalsas* and *jamans*. Figs and plums we have canned with very satisfactory results. We have a few peach trees bearing fruit of very good quality and quantity and in due course we have to increase the number of these trees. We think that research on suitable peach stocks and scions for each locality in the province, such as

has been carried out at the Agricultural Station at East Malling near London on apple stocks and scions for every locality and country of the United Kingdom, would show peach growing to be a remunerative branch of horticulture in the Punjab and elsewhere in semitropical climates of India.

We are grateful to the Entomologist to the Punjab Government for his valuable advice in combating the figborer and other insect pests.

Attractive packing

In order to maintain satisfactory returns for the fruit grown in an area of over 500 acres we considered it essential to try and build-up a direct trade in fresh fruit and so started selecting, grading, and offering our citrus fruit to the public in attractive packing. In this we have found good results, but at the moment of writing, owing to the war demand for paper, wood, nails and steel strapping, it appears that we may have to depart from our usual methods until after the war. Without satisfactory marketing arrangements, the full value of any produce cannot be obtained. Fruit being a perishable article, this is all the more important. The Lahore fruit-market, before the Punjab Fruit-Growers' Cooperative Board interested themselves in this most important centre, was the worst kept manure heap in the province. On a wet day it was unapproachable on account of mud and stench. All markets should be controlled by municipalities who can derive much revenue from increased sales on fruit and at the same time benefit the public by preventing food contamination. The development of public opinion in urban areas will no doubt bring about the much more necessary urban than rural reconstruction in India.

Fruit products

Having dealt with first-grade fruit for the market, our attention was directed to the disposal of fruit which was more suitable for the manufacture of fruit products. We

are now producing in our factory, situated actually in the citrus groves, orange, lemon, grapefruit squashes with and without the addition of barley, lime juice cordial (large quantities of which are now being supplied to the Army) marmalade, tinned grapefruit, figs in syrup, plums, etc. all marketed throughout India and adjacent countries under the 'Kissan' trade mark. This successful venture has now developed into a business with much larger capital expenditure and turnover than first anticipated. Our new canning factory, we hope, will be in production by May 1942, when we hope to be able to extend our assistance to the Supply Department. In order to avoid any waste we are investigating the possibilities of turning any excess of skin and pulp, which at the present is used for manure, into a cattle feed. Our cattle keep in very good condition fed on fresh surplus skins and we hope to be able to produce a balanced feed at a price within the means of all cattle owners. The photograph shows our cattle feeding on skins after the juice has been extracted. We give a photograph also of one of the staff quarters and as horticulturists endeavour to encourage other to maintain happier surroundings. The reason why most agriculturists do not spend money on beautifying their homes is that there is little security of tenure in India which in many cases is the cause of inefficiency of agriculture.

Government assistance

Having developed the largest commercial fruit farm and probably the largest fruit preservation factory in India, we can now say that fruit farming is the most difficult branch of agriculture to take up and that the manufacture of its by-products is equally difficult. Unfortunately, our fruit preservation department has introduced an atmosphere foreign to the usual pleasure of Indian farming. The Factory Act and other regulations to satisfy a different class of labour are forced upon our rural life. Improvements can be and will be made in our fruit orchards and likewise in our factory. We have hundreds

of visitors yearly and willingly give them assistance and show them round—provided the staff is available and sufficient notice is given.

We would express our appreciation of the Fruit section of the Agricultural Department of the Punjab for their valuable assistance and cooperation during the last 12 years in fruit-growing and the preservation of fruit.

SHANTINAGAR LAND COLONY

BY ADJUTANT D. WALKER

*Late Manager, Salvation Army Land and Farm
Colony, Shantinagar (Multan)*

ESTABLISHED by the Salvation Army during 1916, on virgin soil, near a major canal which was being opened at the time, this colony continues to flourish, even though several other projects which started at the same time and with the same object of helping the depressed classes have all failed to mature.

Possibly this colony had an initial advantage over the other projects in the well-chosen site. A good start goes a long way towards success, and, besides getting an abundant supply of canal water for several years, there were also small mounds of earth, which enriched the soil like good manure as they were levelled out bit by bit.

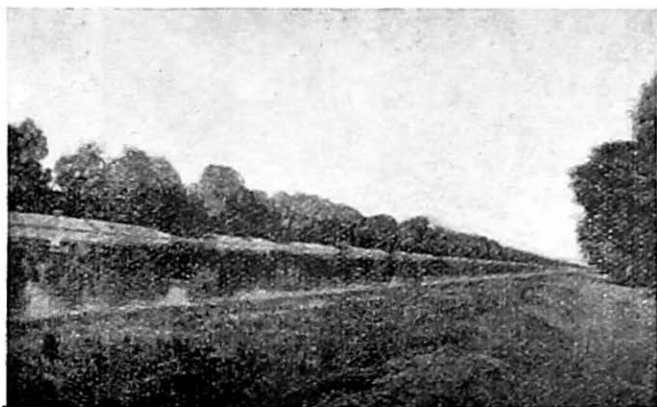
After a few years, however, these advantages came to an end. The water supply was greatly reduced and the land, after being overworked by inexperienced men, became impoverished. The yield became less and less each year and the cultivators began to complain. To add to their troubles prices dropped very badly and Government dues could hardly be met.

Departmental advice useful

Something had to be done about it, and so approach was made to the local Agricultural Department. The result was that better seed was introduced into the colony. A good yielding variety of wheat, better and more reliable types of sugarcane replaced the old stuff that was alright while the land was rich. An exhibition was given in up-to-date *gur*-making and the adoption of this proved economical in fuel as well as in producing *gur* which sold better. The *gur* and *shakkar* later won for



Indian Manager's quarter



**The Lower Bari Doab Canal at Renala Khurd
30 miles from the headworks**



A windbreak grown round each
25 acres



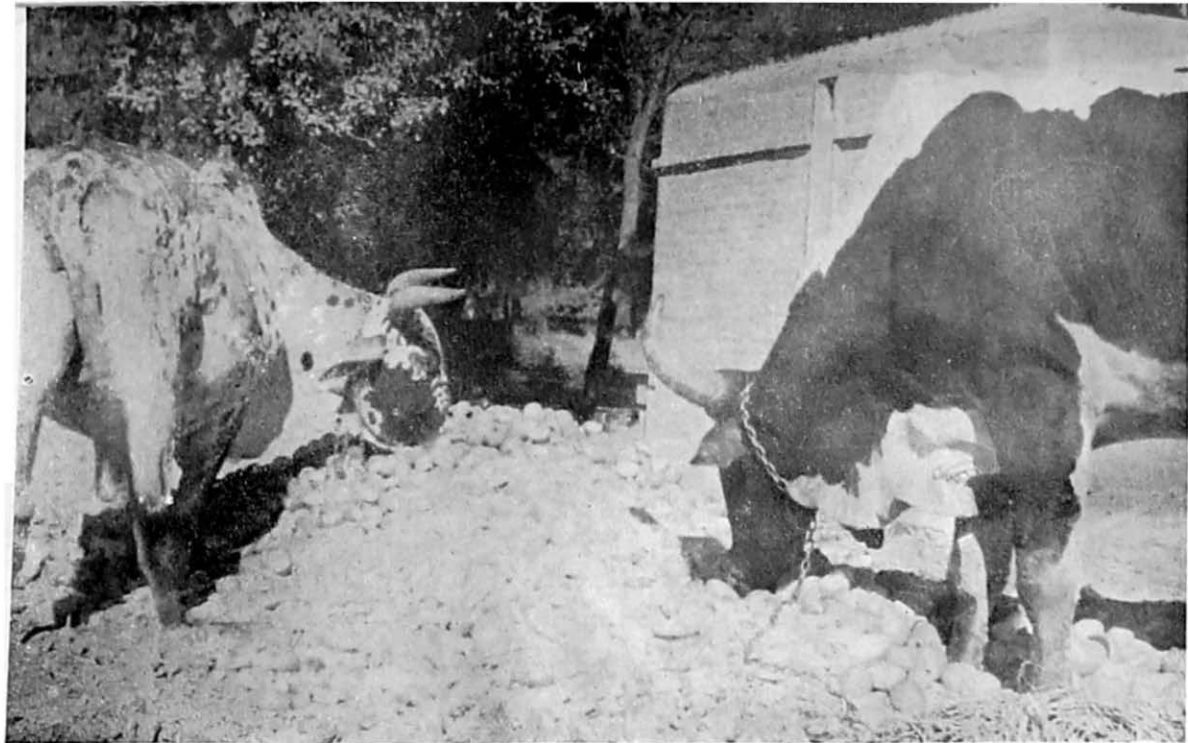
Seedling Nagpuri tree



Budded Nagpuri tree



Mildura Fruit Farm exhibits at the Punjab Fruit Show



Cattle eating orange and other citrus skins

the cultivators many prizes at local shows as also did the wheat produced.

The sowing of *desi* cotton was discouraged and an excellent variety of American seed was obtained from the nearby British Cotton Growing Association farm. There were still, however, some complaints about the yield obtained from the cotton on account of pests, etc. until what appeared to be the real cause of the trouble was discovered. It came out in this way: a man who, because of the bad system of dividing land up among the heirs of a deceased holder, is the possessor of only two acres, sowed one acre of cotton. The acre yielded 24 md. and this was more than the yield obtained by a neighbouring cultivator who had sown four acres. It came out that the man with one acre had piled it well with rotted manure, whereas the other man who also sowed sugarcane had put all his manure into the sugarcane and nothing into the cotton.

Supply follows demand

After that compulsion was used where possible to make cultivators manure the land when preparing it for cotton and they themselves soon appreciated the value of it. This caused a greater demand for manure and the cry was, where can he get it? So, in order to help to meet the demand, pits were dug in the stalls just behind where the cattle stood feeding and the result was the saving of every bit of manure possible and even the benefit of urine was not lost, and besides increasing the manure supply, this arrangement won the approval of Mr. F. L. Branye, the Uplift Commissioner of former years.

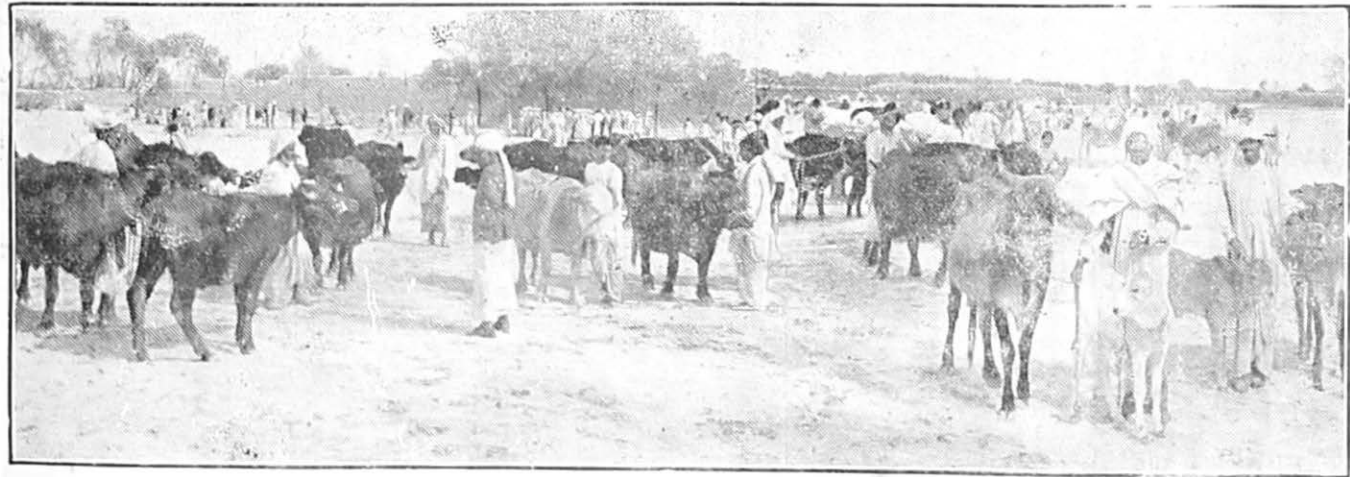
At the same time green manure was ploughed into the land where possible. This led to the need of better ploughs and the Raja became very popular. But this in its turn demanded better bullocks and to help the stock a bull was obtained from the District Board and was given the freedom of the place. The cultivators

themselves were greatly interested in improvements and took a lot of trouble to improve their affairs. Of course, there are still a few that stick to the old rut, but these are becoming fewer. The colony as a whole tries to keep up-to-date and even the old stuffy room in which *gur* was formerly made is gradually being replaced by high, well-lighted and ventilated places. Better conditions are also provided for cattle as well as a more continuous supply of fodder.

Transformation

A system of crop rotation has been worked by a number of the men for quite a time now and it has proved a very successful arrangement. A man holding a square of 25 acres can work it as ten lines of five *bighas* each. One line is generally sown with sugarcane each year and it means that each line of five *bighas* only comes under a crop of sugarcane once in ten years. In the meantime it gets its turn to be under berseem or some such crop and has one year of more fallow besides having green manure ploughed in at some time or other.

The colonists themselves in many cases give one the impression that life to them is worth while and it is evident that many have been transformed. The colony has its own dispensary and schools for boys and girls. Mr. F. L. Brayne remarked on seeing the children: 'There is not much left of the look that their grandfathers had.' For the young men of the colony football games were started and they showed their mettle by winning a small cup at a local show. Many of these young men are now serving in the forces. Religion is of course kept well to the front and the men are regular in attendance at the worship of God who causes the seed to grow and give fruit for the benefit of all mankind.



Wheat-fields and cattle-show indicate the industry and farming ability of the 2,000 Salvationists at the Land and Farm Colony at Shantinagar, Multan district, Punjab.



A view of Gosaba

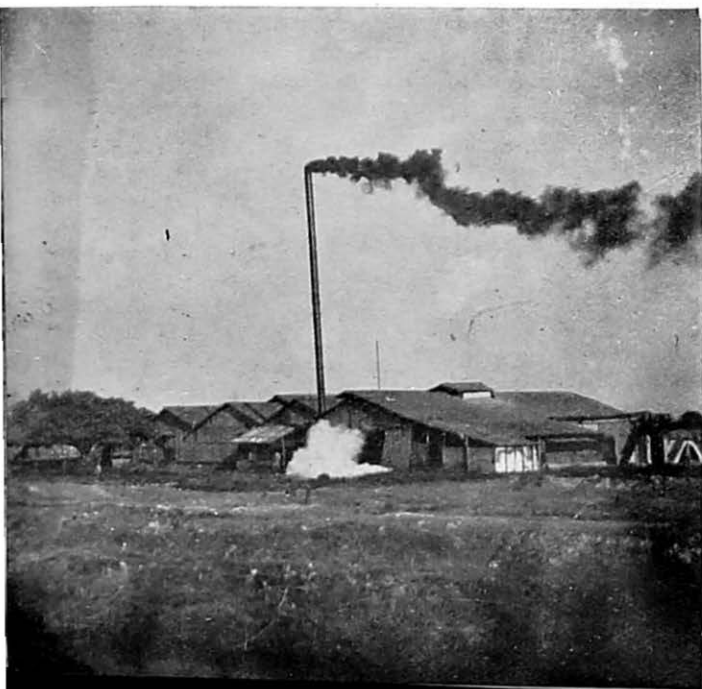
Office building—
Estate and cooperative offices

PLATE 19





The Gosaba Agricultural Farm



Gosaba Cooperative
Rice Mills

GOSABA

BY S. B. MAJUMDAR

Manager, Sir Daniel Hamilton's Estate, Gosaba

WHAT is Gosaba today rose from all the mud and clay of the Sunderbuns, the beautiful forest, the lovely home of tigers and crocodiles and all the varied animals of the marshy tropical jungle washed by the tidal waters of the sea. It was in 1903 that Sir Daniel Hamilton of Messrs Mackinnon Mackenzie & Co. of Calcutta took a lease from the Government of the forests of the three islands in the southernmost part of the Sunderbuns for deforestation and colonization with a view to creating an ideal estate and tackling in his own way the problem of unemployment among the middle class of Bengal. To that end land was let only to *bona fide* cultivators, and he was ever on the alert lest the land should get into the hands of middlemen. The estate now comprises of four islands of a total acreage of 22,000 the last addition being lot No. 148 in 1909.

Jig-saw puzzle

The land in those days was more like a jig-saw puzzle, criss-crossed as it was by numerous creeks and canals. For years the rivers deposited their briny silt on either side, making the entire area uncongenial for agriculture.

Sir Daniel Hamilton started work in the utter wilderness of the jungle. He had to import labour from distant areas and to arrange for all their requirements and set up a powerful distilling plant for drinking water. The reclamation of land, however, was a onerous task and could only be carried out with great caution and very slowly—the nature of the soil was such. Only a small portion of the land, 1,000 or 1,500 acres, could be taken up at a time. A belt of say 120 ft. of jungle round the area was cut and earth dykes were set up in the belt; and later one after another the numerous creeks

and canals were *bunded*. Work could only be carried on in the dry months. When the area was enclosed, the jungles were cut, but the trunks were left standing. The rains came and washed the land, but sluice boxes were made for drainage of the water in the enclosed area into the rivers during the ebb tides. The reclaimed land did not grow much paddy, but as the land got good washings for some years it seldom failed to yield bumper crops. In the early years dibbing and later broad casting of paddy was resorted to, and when the tree-trunks were taken off, the land allowed ploughing.

Invitation declined

When the first portion of the land was successfully enclosed and reclaimed, Sir Daniel invited people to come and settle down. But such was the state of affairs in the Sunderbuns caused by the deception of the ignorant by unscrupulous zemindars or their officers and by money-lenders that the people believed nobody and any gesture, however well-meant, was always taken amiss. The Sunderbuns were then the *alsatia* of criminals and the refuse of society and many things were read into the benevolent mission of Sir Daniel Hamilton.

In 1910 the population of the estate was about 900 including coolies, though land had been reclaimed to the extent of 3,000 acres. There were not many tenants as people failed to appreciate the aims of the estate and Sir Daniel also had no intimate knowledge of them, their customs, their mode of living, their indebtedness and their social conduct. No effective steps could be taken to remove the age-long distrust of the people or to give them correct guidance. The *ryots* were accustomed to borrowing from the local *mahajan* (money-lender), the cancer of Indian village life, and he was still the people's guiding star.

A huge expenditure on the estate had been incurred on account of reclamation which, to give a conservative estimate, was at least Rs. 24 per acre. There was no

income. Nevertheless, Sir Daniel had good drinking water tanks dug, opened charitable dispensaries, started village schools and invited shopkeepers to open shops. A post office was also started on the estate. Even in those remote days Sir Daniel was keen to see that the maximum yield of paddy, the staple crop, was had from the fields and tried to educate people in the selection of paddy seeds and in the regulation of the water-level in the paddy fields on which the crop largely depended. The introduction of vegetables and fruit orchards was also attempted and vegetable seeds were distributed free. As the land was saline, large-scale coconut plantation was tried but with little or no success. This is attributed by some to the stiff clay and the extreme salinity of the soil and by others to the sudden fall of the water-level when cutting paddy. During paddy cultivation the water-level is within a foot of the surface of the artificial highlands for fruits and vegetables and during harvest there is a sudden fall of the water-level from 2 to 3 ft. owing to the drainage of water from the paddy fields,

Moneylenders banished

All the philanthropy of the estate came to nothing. As Sir Daniel observed, there was little or no change in the financial position of the agriculturists, not to speak of their mental outlook and their apathy towards anything new. Nothing escapes the eye of an astute businessman, and he was convinced that there was no hope of improvement whatsoever so long as the *mahajans* were allowed to play so important and so abused a part in the life of the agriculturists. There was no salvation until they were freed from the grip of the money-lenders and the labyrinth of the system they stood for in which the tillers of the soil were held captive. Sir Daniel was greatly disturbed to see that money-lenders were foiling his work. He launched a crusade against them, and though the debts of the agriculturists with the moneylenders were found to be much more

than their actual assets here, he saw all his people freed from the *mahojans* within a week and the pest was once for all banished from the estate. The bold step worked wonders. By the repayment of the loans in instalments of a fixed percentage annually, the people found themselves free of debt within a few years.

Not content with this, being a votary of the co-operative system, he decided to introduce co operation in the Sunderbuns and thereby educate the people to share responsibility. But little was the response because of the unlimited liability of co-operation and the attraction of easy finance from the estate. Great persuasion was required to start the first co-operative village society in Gosaba in 1915 with the initial capital from Sir Daniel. This proved to be the nucleus for 15 village societies, and they were later federated in 1924 into a central society styled the Gosaba Central Cooperative Bank. Now almost the whole of the estate has been covered with village co-operative societies, 24 in number. There are besides three societies of limited liability, viz. (1) the Gosaba Cooperative Bhandar, (2) the Rice Mill, and (3) the Employees' Cooperative Society, Ltd. (Credit).

But all these remedies for alleviating the burden of indebtedness and provision for easy finance can only form a part of the larger plan of rehabilitation of agriculture and cottage industries.

Increased rice outturn

Indebtedness, it was not forgotten, is both a cause and a consequence of poverty. A central model farm was therefore started in 1919 to experiment with vegetables and fruits and especially to research on paddy and demonstrate the results with branch model farms attached to schools in every village. The Bengal Government lent the services of an officer to run the model farm and his salary was borne by the Government. As a result of work at Gosaba, a distinct variety of paddy well known as Gosaba 23 Patnai was evolved from a

good ordinary Patnai strain, secured from the Calcutta Chetla market, by culture over seven or eight years. In the varietal test carried out by the Rice Research Department of the Government of Bengal, this particular strain stood first in yield. It bears the distinct characteristic of withstanding drought and disease. This single achievement has no doubt revolutionized the financial position of the farmers on the estate, as the new strain yields an average of 10 md. per *tigla*, while previously the yield never exceeded 6 md. It fetches 4 as. more per maund and has a good foreign market. The variety now covers most of the paddy tracts here and has been propagated even to distant parts of Bengal. The people of Gosaba, however, required some time to take up the variety and even the small-scale demonstration in the central and branch model farms could not impress them with its potentialities, and it was only the large-scale farming, undertaken directly by the estate, of areas varying from 100 to 500 *bighas* in almost all the villages and the outstanding qualities and good price of the strain that opened their eyes. The large-scale farming of the estate has among its other blessings the education of the cultivators in turning unproductive and partially productive tracts into good arable land, the timely and well-regulated cultivation of fields, the cultivation of suitable strains of paddy in different types of land and the selection and preservation of good seeds. Experience here shows that the suitable strains for high, medium and low or water land are Rupsal, Gosaba 23 Patnai, and Kumragore respectively. Another distinct strain known as Gosaba 298 is under culture and the experts are of opinion that it has immense possibilities. Among others several Burma paddy strains are being experimented with, and some of them bid fair to suit water land.

The estate, not content with improved rice, distributes every year free to all cultivators seeds of successful vegetables, and as a result winter crops, including

English vegetables, and both *ribi* and *khurif* crops are grown by almost all the people. In the search for a second major crop *aus* paddy was tried some years ago with little or no success: at present *kesari* (pulse) finds favour. Long-staple cotton is grown in the highlands with success and the cultivation of fodder crops like Guinea and Napier grass has been introduced. The soil does not permit deep ploughing and the old implements are therefore in order. The land is still quite rich but green manuring with *dhaincha* (*Sesbania aculeata*) has been adopted with good result. Farmyard manure and activated compost are largely used in the gardens and chemical manures have also been introduced with no little success. As regards measures against pests, light traps have been used both in the paddy fields and in the gardens with some success. Last of all but not the least, the water in the paddy fields is very cautiously regulated. The central model farm records the rainfall and its statistics are always a good guide. The average rainfall here is 60 in. In order to give an impetus to the Grow More Food, movement, the estate holds a paddy-yield competition every year, and 40 prizes of the total value of Rs. 2,000 are awarded to the best cultivators of Rupsal, Gosaba 23 Patnai, and Kumragore strains in the ten divisions of the estate. The largest yield recorded in the competition is 17 md. 38 sr. of Gosaba 23 Patnai per *bigha*. This shows what a good yield the land can achieve.

Livestock improvement

No scheme for improvement of agriculture is complete without the simultaneous improvement of the livestock. This has been attempted, though with unequal result. Without any past experience to serve as guide, the estate imported large herds of Montgomery, Nellore and Ayrshire bulls and cows in its early days on the recommendation of the Bengal Veterinary Department and tried to raise a herd therefrom and to diffuse the breeds

by selling the cattle among the peasantry at nominal prices. But the scheme did not prove a success as the breeds could not longstand the climate here. Some crossbreeds, however, thrived well. The estate tried several other breeds and spent large sums over them and in its long struggle found a solution of the problem in the Sindhi breed, which is thriving all right. Under its present scheme of cattle improvement the estate has castrated all stray bulls of two of its islands of a total acreage of 6,000, and has arranged for service by pure Sindhi stud bulls imported from the Panjab. The Sindhi cross-breeds are really an asset. The keeping of too many cattle prevalent among the peasantry of this part of the country is discouraged and propaganda is carried on for growing more fodder crops like Guinea and Napier grass. Sheep and goats are also reared with considerable success. The land being marshy, buffaloes do well. Foultry farming has not been neglected and attempts have been made to improve the local breed. But the climate being moist, the place is not ideal for poultry, though, on the other hand, in the marshy lands ducks are a great possibility.

Successful cottage industries

As an integral part of the economic plan, cottage industries were introduced, and a central weaving institute was started in 1928 for training in spinning, weaving, bleaching, dyeing, mixing of colours, *dhurrie*-making, etc. with its branches in all of the 23 village schools of the estate. As a result, weaving has been taken up as a profitable cottage industry. The work of the sons of cultivators both in the weaving institute and in their homes finds a place in the market and their silk and wool are of no mean order. As an impetus to weaving as a cottage industry, the estate declares a subsidy of 3 pies per yard of goods woven by the people. It is no small pleasure to note that the inhabitants of a village have organized themselves into a weaving

society on cooperative lines. The preparation of lemon squash and tomato ketchup have lately been introduced on a commercial scale and the products have a good market in Calcutta.

Easy cooperative finance alone cannot serve as a panacea for all ills. Marketing facilities are equally important, and in 1918 Sir Daniel started a consumers' cooperative society to supply the people with their requirements at low rates.

To provide marketing facilities to the agriculturists a paddy co-operative sale society was started in 1923 and as there still was, between the society and the consumers, a chain of middle men who appropriated much of the profit, a cooperative rice mill as a necessary annex to the paddy sale society suggested itself to Sir Daniel Hamilton and was started in 1928. It was able to establish direct and easy contact with the consumers through its mother society, the Calcutta Central Co-operative Paddy Sale Society.

Character building

Character, the foundation on which alone these enterprises can succeed, did not escape attention. Sir Daniel was anxious to raise the man-standard of the place by every possible means and firmly believed that the man-standard—the character—was the primary requisite of success. To him character was the credit, and labour the capital.

To fight illiteracy which is at the root of most of the evils, upper and lower primary schools have been started in every village, with a central middle English school at the headquarters where instruction is given with an agricultural and industrial bias, agriculture and weaving being compulsory in all the schools. Basket making and soap-manufacture are also taught. For adult education the night classes in the village schools are doing good work and the endeavour is supplemented by the circulating library. In the census of 1941 the

estate recorded a population of about 15,000 and a literacy percentage of 25 except in lately reclaimed areas. Magic lantern slides, gramophones and radios have also been called in to aid adult education and rural reconstruction. Bratachari training and music find a place in the school curriculum. In the schools, religious instruction is given on principles common to all religions.

Training for Bhadralog

As a great lover of young Bengal, Sir Daniel was anxious to tackle in his own way the unemployment problem among the young middle class *Bhadralog* and as a result a number of young educated men took to farming in the early days of the estate. But the want of training in agriculture proved too much of a handicap for many of them and the scheme failed to make progress. In later years, with the same object in view and to train up young workers for village reconstruction, Sir Daniel started a Rural Reconstruction Institute at Gosaba in 1934. In its senior course of two years, training is given in both practical and theoretical agriculture, co-operation, weaving, accountancy, dairy and poultry-farming; while in the junior course of four years, student, qualify for the University matriculation examination and get training in agriculture and allied subjects. Stress, however, is always laid on the practical side. Students of the Institute senior course have either taken to farming successfully or have been employed otherwise

Very liberal arrangements have also been made in the three charitable dispensaries of the estate for free medicine and attention, and the doctors as a rule visit patients in their homes free of charge. Maternity cases are entrusted to the estate midwife, and a representative health committee looks after the health and sanitation of the entire estate divided into many wards. Provision has been made for the treatment of difficult cases in Calcutta hospital at the cost of the estate.

Helping the many

In all these endeavours Sir Daniel strictly adhered to the principle that not more than 25 *bighas* of land, which an able-bodied man can at best cultivate, be settled on one and that land never gravitated into the hands of a few. He successfully maintained his life's mission—'Not to enrich a few but to help many.'

While deeply lost in his ascetic devotion to his experiment in the solitude of the Sunderbuns, he was not indifferent to the wider problems of the country and was never tired of impressing upon the Government the urgent need to expand the paper currency and thereby to monetize the idle labour of the country in productive nation-building work. In his disappointment he started in 1936 a paper currency of his own as a practical lesson, and the Gosaba one rupee note as an addition to the existing Government money proved the soundness of his economic theory.

The entire estate has been built up on a cooperative plan with a wide catholicity of outlook in religion. Where the jungle law reigned 30 years ago, now reign small village societies. The boards of directors of the co-operative banks, who look after the welfare of the village and govern them, act as court of justice. The High Court is the directorate of the central bank, together with the directorates of any six village banks; they compose, disputes, act as a court of wards, control the *Dharmagolas* they have in every bank for emergencies. As a result there was not a single criminal or civil case within the estate for over 30 years, and even the Government survey and settlement operations recorded not a single dispute. They get together once a month in the *Samabaya Baithak* to forward their recommendations to the General Welfare Committee, the advisory board of the estate, and so Gosaba marches on. Sir Daniel Hamilton the founder is no more; but Gosaba continues to work under his inspiration, with Lady Hamilton as guide and leader.

Gosaba
Cooperative
Bhandar

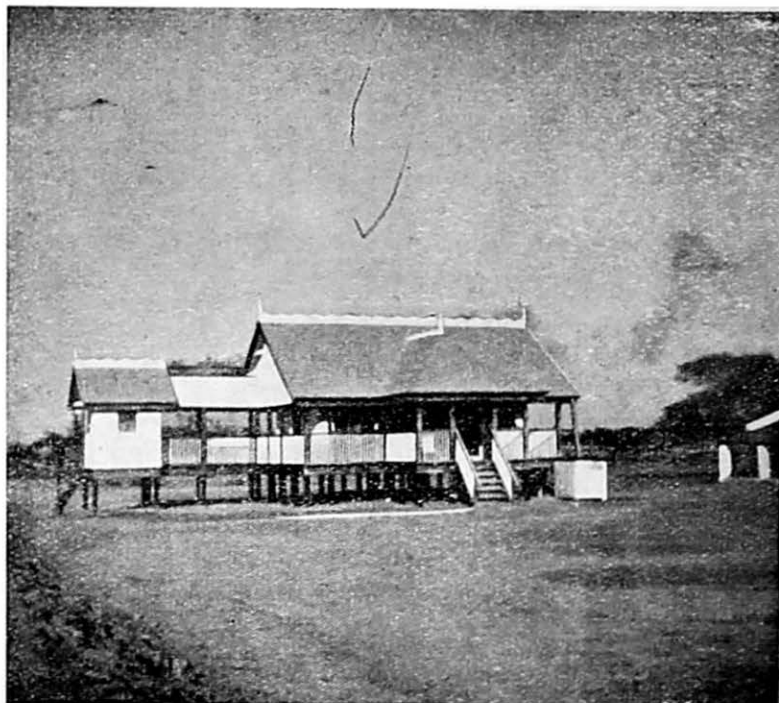


PLATE 21

Gosaba
Guest
House





The Gosaba Church

THE INGRAM ESTATE

By F.M. DE MELLO, B.A., B.Sc. (ECON.)

*Editor, Imperial Council of Agricultural Research,
New Delhi.*

THE Ingram Estate has a history going back to more than a hundred years. For services to the estate, Colonel James Skinner, founder of Skinner's Horse, was given some grants of land near Delhi to which he added various farms bought from neighbouring cultivators. His estates, formed about 1830, were after his death partitioned and in 1890 the Gurgaon portion came into the possession of his great-grand-daughter, Mrs. Ingram, who died in 1938. This property, comprising some 18,000 acres, is now managed for the Ingram family by Mr. E.T. Munday. Until two years before her death, Mrs. Ingram came out to India every winter and camped on the Estate by the side of the Jumna at a spot, still marked by ruins, where the Moghuls broke their journey by river to Agra. She took great pleasure in meeting her tenants, getting to know their desires and difficulties, and in providing for their welfare. It is still recalled that every year on Christmas day she used to hold a great durbar and invite the leading tenants to a sumptuous dinner.

Tradition built up

Thus was built up a tradition of mutual regard and loyalty between landowner and tenants. There are no difficulties in recovering rents; no lawsuits or evictions for non-payment of rent; no arrears of land revenue. The Estate provides a variety of services which are greatly prized by the tenants. The Indian staff is recruited locally: the present assistant manager has been in service for 23 years, having succeeded his father who had a record of 55 years, service. Conditions of work security and prospects are assured for the staff, and for their old age they have a provident fund and pension.

The greater portion of the 18,000 acres of the Estate is rented out to tenants at will paying cash rents. The population is over 16,000 spread over 30 villages; there are 1,600 holdings varying in size from 5 to 30 acres. Half the tenants are Hindu Gujars and half Mohamadan Meos, with a sprinkling of Jats. The ancestors of the present Gujar tenants cultivated the area in pre-Mutiny days, but the Meos are more recent inhabitants, the majority having come from Mewat on the border of North Rajputana during the last 60 years.

The south-east of the Punjab is notorious for the vagaries of the monsoon. The average rainfall taken over a thirty-year period is 23.50 in., but during the last four years it has been only 12 in. The tract would therefore be considered precarious were it not for the Agra Canal. This canal, administered by the United Provinces, irrigates a large area in the Punjab in addition to the United Provinces, and some 12,000 acres of Estate land is under its command.

The Gurgaon experiment

What has the management made of the men, the land and the bountry of nature? The inspiration came from Mr. F. L. Brayne 17 years ago when he was Deputy Commissioner of the Gurgaon district which includes the Palwal tehsil where the Estate is situated. A variety of improvements adopted as part of the rural reconstruction of the 'Gurgaon Experiment' are permanent features of life on the Estate.

To put first things first, the Estate emphasizes the importance of manure which is generally denied to the land in India. Every village has its batteries of manure pits dug by the villagers themselves on land given free for the purpose by the Estate. A typical village has pits in lines on all four of its sides. There are 1,600 pits on the whole Estate and some 12,000 tons of manure are put back on the land every year. Most tenants have one pit and some two so as to enable the manure in one pit to

not while the other pit is being filled. Sunday is cleaning day, when houses are cleaned and tidied up, village streets are swept and the rubbish thrown into the pits. The pits are used willingly and there is a demand for the construction of more.

Where rainfall is precarious, every drop of water is precious. No effort is spared to conserve the natural rainfall as well as canal supplies. Irrigation channels are straight, they are regularly cleaned every year, they are conveyed across roads by masonry culverts, and *dols* or embankments surround sloping fields. The Estate maintains one permanent team of 10 labourers and at busy times two extra casual teams to carry out such work for the tenants. Many tenants do this work themselves, but those with the bigger holdings prefer to have the work done for them and are ready to pay the cost. In the course of a drive round the Estate, it was interesting to observe how many times the Manager stopped to inspect wells, water-lifting gear or culverts needing repairs, and draw the attention of the cultivators to deficiencies in this regard. As a matter of fact, without constant reminders regarding repairs, a great deal of canal water would be wasted and the money spent on it thrown away.

Improved varieties sown

With plenty of manure and water supplies assured, it is a comparatively simple proposition to sow improved seeds and reap the advantages science has placed at the cultivator's disposal. Improved seeds play a large part in the improved agriculture on the Estate. C591 wheat is now practically the only type sown. Last year 1,750 md. of this type were distributed as seed to the tenants and 1,000 md. were sold to the Agricultural Departments for distribution in the Patwal tehsil. Two years ago Riwari barley was tried out and found successful, and its cultivation is annually increasing. Sugarcane is a very important crop in spite of the fact that there is no sugar factory in the neighbourhood and all cane is turned into *gur*.

Coimbatore types 213 and 312 have been grown extensively for a number of years, and there is now an increasing demand for Co421 which was tried out two years ago experimentally on the Estate farm and has been found superior to both Co312 and 213. Every encouragement is being given to the cultivation of green fodder crops and the acreage under lucerne and berseem is increasing.

Cultivators' credit

The Estate plays its part in this improved agriculture not only by propaganda, which is comparatively easy, but by financing the cultivators' seed requirements and by seeing that the seed is available at sowing time. Seed is supplied on credit and its cost *plus* interest at 12 per cent per annum is collected at harvest time. In addition to seed, bullocks, implements and Persian wheels are similarly financed. Lest the cultivators spend the loans on marriage festivities or other non-productive objects, they are supplied with the seeds, bullocks or implements they require. In special cases, loans are made free of interest. For instance, a sum of Rs. 2,000 is allotted annually to enable poorer tenants to purchase a better type of bullock. This sum is advanced free of interest and is repayable over a period of four years. The same importance is attached to the improvement of the tenants' houses and villages as to their agriculture. The manure pits not only provide manure for the land but are dumping places for village refuse, resulting in cleaner and more sanitary houses and streets. Most houses are fitted with ventilators and a large number with chimneys. Every well on the Estate has its masonry parapet and where required a masonry trough for watering animals. Many have corrugated iron roofs and pulleys and chains for drawing water. Attention has been given to drainage, and the approaches to the wells are not made ugly and insanitary by pools of stagnant water. In four villages a system of double ponds is in existence, whereby one pond is used for drinking.

water for animals and the other for excavating mud for sun-dried bricks and for plastering houses. After a time the process is reversed : the pond formerly used for watering is emptied and from then on used for bricks and the latter pond is used for watering animals. Thus the village is not disfigured by numerous and scattered depressions, and the water-holding capacity of the ponds is steadily increased.

Provision for health and education

The Estate works in the greatest cooperation with the District Board in matters of health and education. At the headquarters of the Estate, the District Board has provided a rural dispensary and a veterinary hospital which serve not only the Estate but outlying villages as well. The Estate has supplemented the work of the District Board by providing additional buildings, such as wards for in-patients in the dispensary and stables for horse and donkey stallions in the veterinary hospital. The Estate also provides extra medicines and instruments for both institutions. Thus in sickness the tenants get free medical attention, and the Estate sees to it, by providing substitutes, that their work does not suffer when they are in hospital. A woman welfare worker is employed on the Estate, and it is her duty to go round the villages and instruct the women in the care of children, the management of their homes, better cooking, needlework and other domestic arts. On the Estate there are a boys' middle school with a boarding house, six boys' primary schools and three girls' schools, all of which are well attended. The Estate gave the land for the buildings free the cost of the boarding house for the middle school, four acres of land for a school farm and the cost of the buildings for three of the primary schools and for the girls' schools. On finishing school, some of the boys obtain work as patwaris or clerks, but the majority settle down to cultivation on the Estate, better equipped than their fathers for the business of farming. The Estate has sent to the Army

some 300 recruits since the war started, and the remittances they sent to their relations help to improve village conditions. When the war is over these men will come back to the land, bringing with them the discipline and the wider knowledge of the world gained during service, which will help to improve village life.

Village organization

The village organization suggests that the true Indian village community has survived here and in the Gurgaon district generally better than it has elsewhere. In every village there is the unofficial village panchayat which regulates the private affairs of the community. To this panchayat quarrels, disputes, petty thefts and complaints are referred for settlement and appropriate punishment of the guilty. The Estate is informed of every decision made by the panchayat so that if an obviously unjust decision is arrived at—as is always possible when party feelings run high—the case can be referred back to the panchayat for review. The panchayat controls the village *malba* or common fund and its expenditure. Accounts of the fund are maintained and audited, and every anna that goes into the fund is spent for the benefit of the village. By no means the least useful work of the panchayat is the settling of small disputes which might otherwise have to be decided by a civil court at heavy cost but little satisfaction to the disputants. The panchayat arranges for the night guards for the village, an essential matter in the riverain tract of the Jumna and the borders of the province where cattle-lifting is common. Every villager takes his turn on night patrol and the system has been the means of preventing a number of thefts. To decide matters affecting the Estate as a whole a general panchayat of the whole Estate is held every six months when such questions as grazing rights, the relationship between cultivators and village menials, etc. are discussed and settled. A decision recently arrived at by the general panchayat was that, in order to conserve manure, the

making of *oplas* or dung-cakes should be stopped from Holi to Diwali (February to November).

Help in marketing

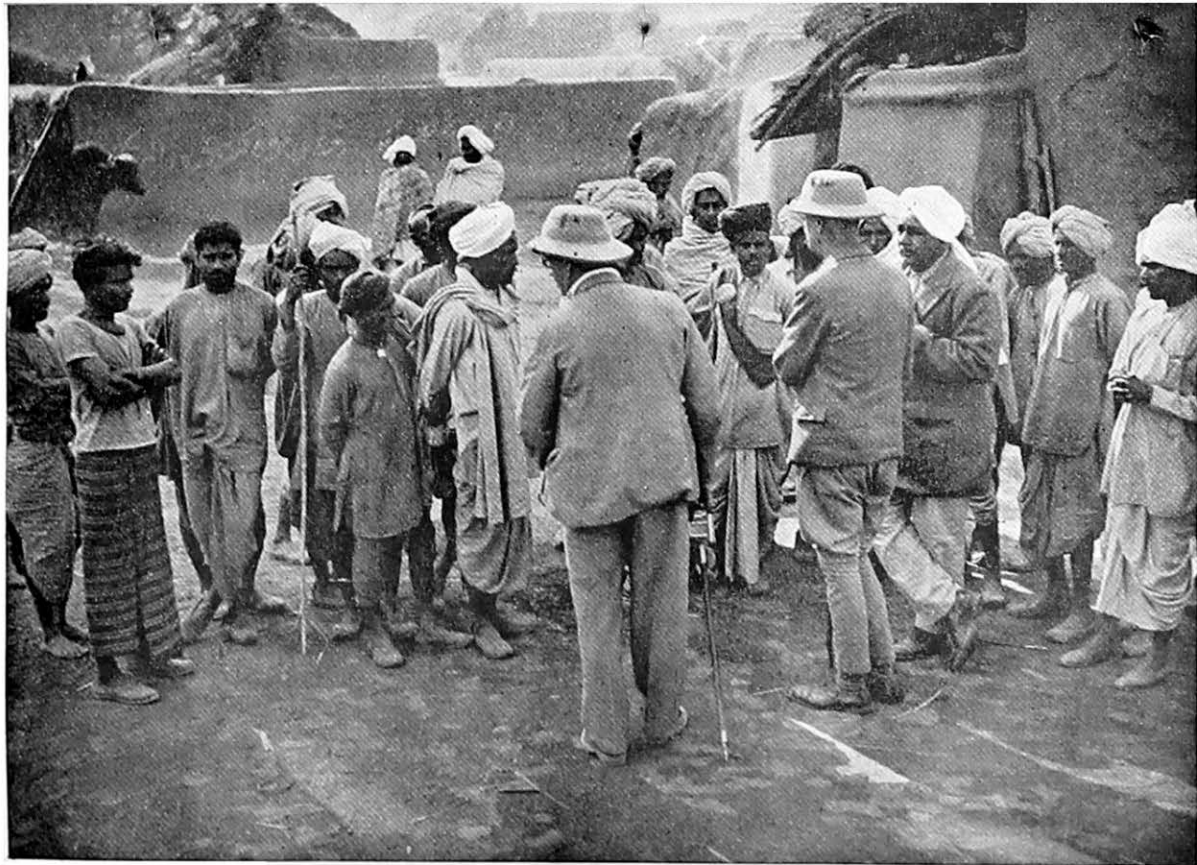
To improve facilities for the marketing of the tenants' produce, the Estate, two years ago, opened its own co-operative sales commission shop at Palwal, the nearest market town. All the tenants are members, holding shares of Rs. 10 each. With a capital of Rs. 16,600 the shop, since it started, and in spite of market *hartals*, has disposed of some 1,20,000 md. of produce of the value of Rs. 3,50,000 with a profit to the shop of Rs. 1,400 and with considerable gain to its members in that they pay no charges whatsoever in cash or kind and they are assured of fair weighment and straight-forward dealings. Another enterprise is the collection and marketing of ghee from the Estate. The tenants deliver their weekly output at the Estate headquarters at the rate ruling in the village. It is melted, cleaned and packed in the tins and despatched to Gurgaon and Delhi to a large clientele who find difficulty in obtaining pure ghee. The ghee has a high reputation for purity, and a panchayat fine of Rs. 50 is a deterrent to any attempt at adulteration. On the other hand cash advances, in order to buy better buffaloes, are made to those tenants who undertake to supply their ghee to the Estate.

The Estate has its home farm of some 200 acres of partly irrigated and partly *barani* (rain-fed) land. To this 75 acres are being added this year by clearing jungle to grow more food. On the irrigated portion experiments are carried out with new crops and improved types of seed. The Coimbatore sugar-canes, improved wheat and barley now grown generally by the tenants were first tried out on a field scale by the management so that the cultivators might see the value of a new idea without risk to themselves. An interesting experiment in progress is the cultivation of soybean first tried this year. On the un-irrigated land dry farming by mechanical cultivation is

being carried out, and it is hoped that the experiments will show the ordinary cultivator how to get better results from his *barani* lands. Cigarette tobacco was tried a few years ago, but it proved to be a failure. A stationary Diesel engine is installed at the headquarters to operate grain-grinding mills, cotton gins and oilseed crushers. Full advantage of these facilities is taken by tenants and outside villagers.

Cultivator's advantages

The scale of operations no doubt gives an advantage to the Estate in dealing with the outside world. The hire of a *kolhu* (sugarcane crusher) from a firm in Delhi is Rs. 90, but the cultivators on the Estate get it for Rs. 41 owing to the fact that the Estate places an order for 150 at a time. Owing to difficulties in getting and potato seed, the Estate arranged to put potatoes in cold storage at Meerut last summer at a total cost of Rs. 6 per maund and distributed them to the cultivators at showing time. The writer gained the impression that the management would be prepared to undertake any service of this kind for the benefit of the tenants if they wanted it. On the prosperity of the tenants depends the welfare of the landlord, and it is in his own interest that he should take steps to improve the conditions of life and work on his estate. Not only does such enlightened landlordship ameliorate physical conditions: it can and on this Estate does, overcome the peasants' natural resistance to innovation, awaken ambition and stimulate collaboration.



Mr. F. L. Brayne talking to villagers on the Ingram Estate



Cattle in a cattle yard separate from the living quarters

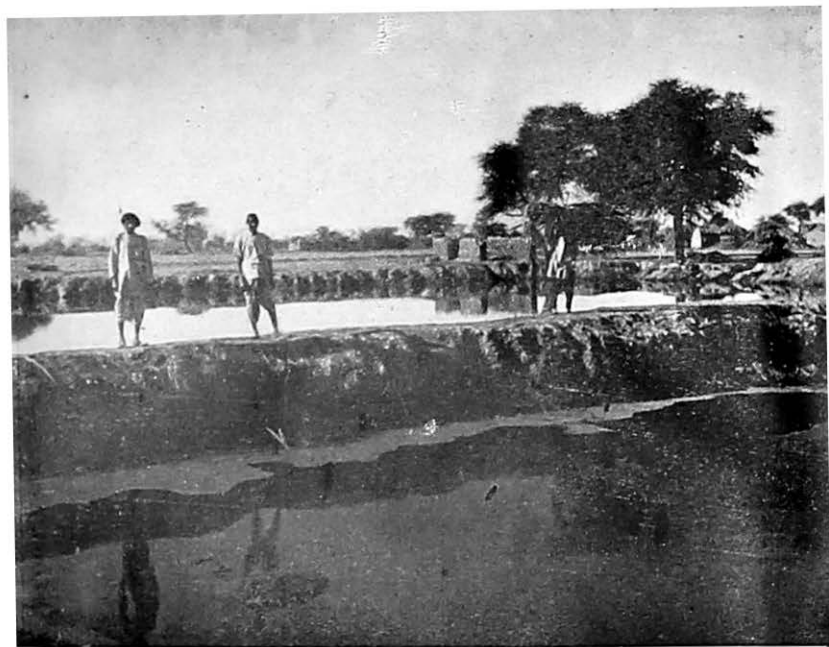


Sunday is cleaning day
A villager at work in the *abadi*

PLATE 25

Village refuse being thrown in the manure pit





A double pond. The men are standing on the embankment separating the two ponds

MERTHY COWANHALLA ESTATE

By SYLVESTER PAIS

Chikmagalur, Mysore State

ABOUT three quarters of a century ago the grandfather of the writer of this article, along with a friend and relative, ventured from Managlore on the Malabar coast to one of the remote mountain recesses of the Western Ghats in the Mysore State in search of a modest holding for coffee planting. This marks the beginning of the Merthy Cowanhalla and Merthy Subbangudige estates, both of which rank today among the well known coffee properties of Mysore. This was in the early days of coffee in India, when pioneer work had to be conducted in an entirely new field by hardy, adventurous and enterprising men who had not the benefit of the experience of an earlier generation. They had to discover the best environment in which the newly introduced coffee industry would flourish on a commercial scale, select the seed of the best variety to acclimatize in that environment, adopt the most suitable method of cultivating the new crop and experiment to discover the most responsive fertilizers suitable to a new crop in a new soil.

Spirit of adventure

Banks then did not exist, capital was scarce and shy, interest rates were high, and to crown all these difficulties, the beautiful but ragged mountainous coffee country had no roads and mountain fastnesses were accessible only by footpaths and mule tracks. Only brave hearts with extraordinary powers of endurance could venture in such an atmosphere with faith in God and trust in their own ability. The subsequent history of these plantations—Merthy Cowanhalla and Merthy Subbangudige—has amply demonstrated that a combination of adventurous human effort on the one hand and the cooperation of bounteous nature on the other can produce abundant wealth sufficient

to keep three generations happy, with a prospect of provision for generations yet to arrive.

Merthy Cowanhalla Estate is situated on Merthy Parvatha which is a prominent peak of the Western Ghats in Mysore. Its elevation is 5,444 ft. above sea-level. The name 'Merthy' is said to be a corruption of the word *Murthy* meaning God, as in *Thri-Murthy*; 'Cowan' is said to be the name of a *rishi* or religious recluse who lived in the remote past in a cave formation in a rock of gigantic dimensions on the peak; and 'hulla' means, in local Kanarese parlance, a stream. Very few names could boast of such a happy combination of ideas—the Creator presented by the word *Murthy*, one of His most favoured creations by way of a *rishi*, and life eternal represented by the perennial spring (*hulla*) originating in Merthy and giving, directly and indirectly, sustenance to the holy *rishi*.

Close by the Merthy peak is Kudremukh, which is one of the highest peaks of the Western Ghats, where originate the famous Tunga and Bhadra streams, ultimately uniting to form the Tungabhadra river. Merthly Cowanhalla Estate is situated 12 miles distant from the nearest post office, *shandy* (or market place) and church; and the only convenience which the locality can boast of is the Malnad* Improvement Dispensary, which has been established in this inaccessible locality through the solicitude of the Government of H. H. the Maharaja of Mysore. Round about Merthy Cowanhalla are located many other coffee estates with an aggregate of 2,500 acres, the most important of which are Merthy Khan and Merthy Subbangudige estates, where laboured Mr. C. P. Reed and Diwan Bahadur S. L. Mathias respectively, both of whom are outstanding figures in the annals of the Indian coffee industry.

Planned production

Merthy Cowanhalla consists of two blocks of 50 acres each, one of which is the old block and the other a new

* Land of rain and forest.

block. In this respect, the estate has been wisely planned, for it is an important matter in a coffee plantation to endeavour to keep up the average produce over a long series of years by this device. When the older trees begin to fail in yield due to age, the younger blocks come to the rescue with a fine yield due to the vigour of youth and thus give a chance to the planter, by helping to maintain a constant income, to replant the older block. In some inclement seasons, where one of the blocks fails to yield a crop it has been often noticed that the other compensates by bearing a relatively larger yield.

The average elevation of this estate is 4,000 ft. which is considered a suitable elevation for successful coffee cultivation; the average rainfall is 125 inches, which is a bit too heavy and is conducive to cause rot of leaf and crop during days of incessant rain, when for days together Sol is hiding-behind rolling masses of clouds and Pluvius reigns supreme. Water springs in the estate are many and preñial and vigorous, so much so that one wonders how such large quantities of water could come out of mother earth—from the bowels of a peak that gradually tapers into the sky. But Nature is baffling and spring formation in mountainous country is one of those baffling manifestations. The soil of the estate consists of a fine hæmatitic loam.

Profit and loss

From the beginnings of Merthy Cowanhalla, in the early seventies, when it was still primeval forest, up to this day the plantation has been lucky to be in the ownership of one and the same family. Many have been the successes and failures during this long period—large profits alternating with large losses as a result of favourable or adverse exchange, bumper and lean crops due to seasonal factors, competition or otherwise in world coffee markets, and many other causes all calculated to upset the year's budget in favour of the estate or against it. Epidemics like

plague, cholera and influenza or a steep rise in the price of foodgrains due to scarcity often rendered the labour problem acute. In spite of all such factors the family has clung to the estate and to the coffee industry. The fine soil and favourable environment of the estate have contributed their share in bringing about such a result.

The price of coffee was generally high round 1895, when a long slump came in. From 1905 to 1930 coffee fared well, excepting for brief intervals. From 1930 to 1940 there was another long and severe slump in coffee prices, during which period, apart from the rupee exchange question, tariff policies of various importing countries and export policies of large producing countries brought disaster to the coffee industry. (The Indian coffee industry depends upon foreign markets, as local consumption is, on the average, about a half of the total output.) At this stage the Government of India wisely promulgated the Coffee Control Ordinance (1940) to enable the coffee industry to carry on during the war, as the export of coffee was problematical owing to the shortage of shipping space. The ordinance proved to be a beneficial measure, which in due time was revoked and instead a legislative enactment, the Coffee Market Expansion Act (1941), took its place. These measures have tended to stabilize the coffee industry and to restore to some extent at least the planter and his plantation to their former position.

Cost of raising coffee

In the matter of raising a coffee plantation, as in the matter of erecting and establishing a house, there are varying standards of expenditure. Plantations have been raised at a cost of definitely under Rs. 500 per acre. There are many plantations that have cost the planter much more than Rs. 500 an acre. Merthy Cowanhalla Estate has been well laid out, not only in the matter of the coffee fields, but also in respect of buildings, stores, cooly lines and cattle sheds, so much so that the cost per acre exceeded the Rs. 500 limit. The average crop from mature

fields is 4 to 5 cwt. of clean coffee per acre, crops varying, according to seasonal conditions, from a fraction of 1 cwt. per acre to even 15 cwt. an acre in bumper crop years. The price of coffee has also varied from Rs. 25 a cwt. to Rs. 100 a cwt. Taking Rs. 600 per acre as the cost, Rs. 50 per cwt. as the average price of coffee and a 4 cwt. crop per acre as the average crop, also Rs. 100 per acre as the annual average cost of upkeep, the resultant profit works out of Rs. 100 on an investment of Rs. 600, i. e. the profit is about 16 per cent per annum.

In actual practice this calculation has only theoretical and academic value and is completely divorced from fact. Many factors enter into consideration in this connection. Coffee being a fruit crop (as against a leaf crop), a favourable or an unfavourable blossom makes a big difference. One fierce descent of hail may ruin the coffee crop of three consecutive seasons by destroying the very branches of the coffee trees. A combination of bumper crops with high prices or conversely a combination of lean crops with low prices make mighty differences in the profits or losses of the working of the estate.

Financially, Merthy Cowanhalla fared well between 1921-31, but lost heavily between 1931-41. The years 1891-1921 too were somewhat like the period 1921-41.

Marketing charges

This aspect of the coffee industry raises some important issues. Firstly, it is extremely desirable that the planter lays down an annual budget, adheres to it strictly and also builds up a liquid reserve fund in good years to draw upon when losses stare him in the face. Secondly, it is important that the Government, appreciating that India is mainly an agricultural country, devises means of supplying cheap capital in bad years to the agriculturist, to enable him to carry on or alternatively takes measures to see that the agriculturist producer (inclusive of the planter) gets the maximum benefit of the price

paid by the consumer. The following rather extreme example of coffee prices is significant:

1941-42 season—average price realized by the coffee grower—Rs. 50 per cwt.

1942-43 consumption year—average price paid by the consumer of coffee—Rs. 100 per cwt.

It is admitted that the above is an extreme example and not the rule. But it is the desire of the writer to show present tendencies. What is left for the grower may well be calculated by deducting cultivation costs, interest charges, curing charges and commissions—selling commission, financing commission, handling commission and collecting commission.

The difference of Rs. 50 represents the charge for the middleman's services, representing 100 per cent on the price paid to the producer. It is questionable whether this is a fair charge.

Anyhow, thanks to coffee control legislation, the the coffee industry of India has been to some extent integrated under the stress of the world war, channelled trade is carried on by the Indian Coffee Market Expansion Board, and the coffee industry bids fair to enter upon a period of reasonable prosperity.

The planter's ideal is to employ labour at the rate of one labourer per acre. Dearth of labour on the one hand and inadequate finance on the other stand in the way of the attainment of this ideal. Merthy Cowanhalla Estate has been employing labour at the rate of three labourers for four acres, which is just sufficient for the conduct of all the necessary items of seasonal operations.

Coming as the labour does from long distances to the plantations, a middleman, termed a *mukkadam* or supplier becomes a necessary evil. Merthy Cowanhalla Estate is proud to state that some of the labour has been continuously there from 1870, generation succeeding generation. The tea estates located alongside the coffee

estates by a higher rate of wages while some coffee estates in specially privileged positions also pay a higher rate. This complicates the labour problem.

Cultivation problems

One important aspect of the coffee industry is plant breeding, which in the past was done rather haphazardly. But, since valuable experiments were initiated on the Government Coffee Experimental Farm, Belehonnur, under the direction of Dr. L. C. Coleman, the first Director of Agriculture of Mysore, and now under the expert guidance of Mr. W. Wilson Mayne, greater and greater attention has been paid to plant breeding by planters. On Merthy Cowanhalla proved coffee seed selections are being tried under the guidance of Mr. K. H. Srinivasan, Senior Assistant Director of Agriculture, Mysore.

Balanophora indica, a rare coffee root pest, gave immense trouble at Merthy Cowanhalla. No biological remedy is up to now known for stamping out this trouble and it had to be eradicated by pulling it out mechanically. It is now under control. Other troubles are blackrot, leaf disease; stump rot, coffee borer, twig borer, moss growth, green bug and mealy bug. All these pests have to be attended to during the seasonal operations. Vacancies in the midst of healthy coffee, caused by pests or by accident, have also to be carefully filled in, in order to maintain a plantation in efficient condition.

India produces 1 to 1½ per cent of the world's coffee crop. Indian production is now estimated at 18,000 tons a year. As a result of the depression in the coffee industry (1930-40) coffee production in India has appreciably fallen, and many coffee trees have gone out of existence as a result of the coffee borer, whose inroads increase as the vitality of the coffee tree decreases. About 10,000 to 12,000 tons of coffee are required for Indian consumption, and the balance of the production is available for export. India grows both *Arabica* (wild)

and *Robusta* (hard) coffees, the proportion of the mild variety being the greater. The Indian *Arabica* is considered to be one of the finest coffees in the world.

Lessons of experience

Before concluding, it is desirable to refer to some failures and sad experiences of the writer in the working of his estate in order that anyone who chances to read this article may profit by that experience.

The first is that during the greater part of his career as a planter he did not appreciate the large number of unprofitable trees on the estate. His vision widened when he read the article of Mr. W. Wilson Mayne on this subject, as also the article in *INDIA FARMING** relating to the large number of unprofitable fruit trees in the orchards of the Tarnab Research Station.

Secondly, during the last boom in coffee (1920-30) the cultivation and fertilizing programmes were so overdone and the consequential crops harvested were so disproportionately large that the very root system of the coffee trees suffered severely. The plantation as a whole received a setback and it took about five years for the trees to revive fully. One of the essential ideas to be grasped by an agriculturist is that overcropping in the case of perennial trees can be as bad as undercropping.

The third error of importance is that the reserves built out of favourable financial years were not kept in liquid or easily convertible form, with the result that the depression of 1939-40 brought out prominently the need of liquid or easily convertible reserves.

Experience is a great school—we always learn and the experience of the past can be utilized in the future.

*Vol. III, 1942, Nos. 3 & 4, pp. 137-40; 188-92.

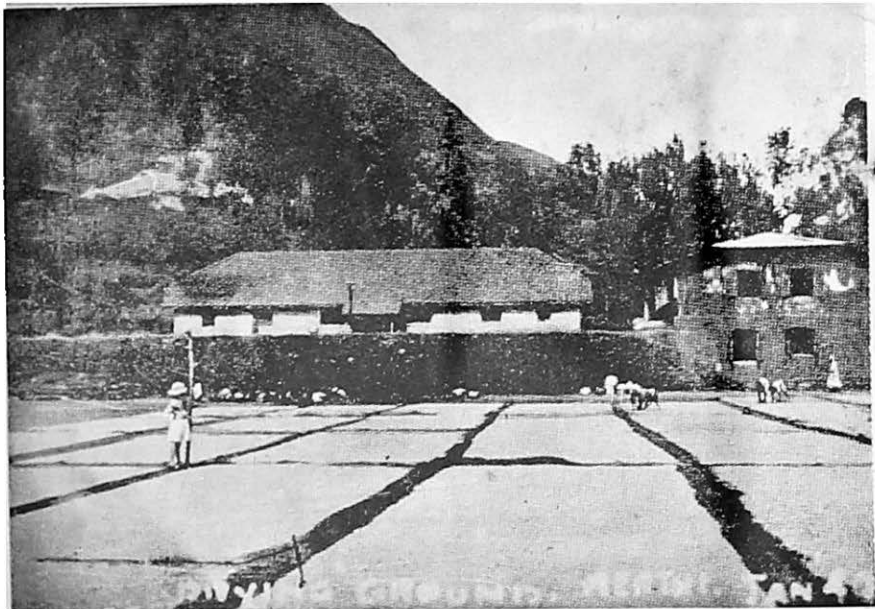


Coffee in blossom

PLATE 27

Washing coffee. Note the large vats

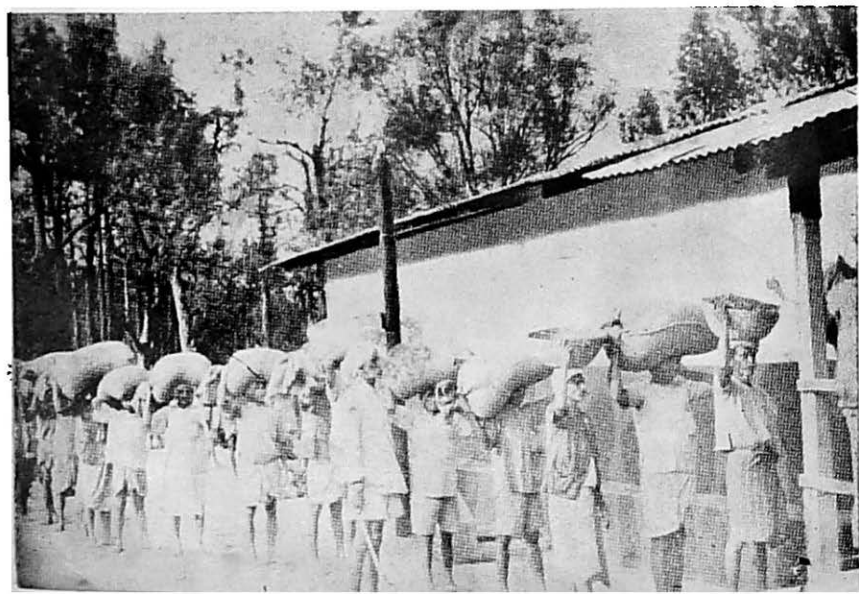




Drying grounds—Merthy. Merthy Parvatha is in the background

PLATE 28

The day's harvest coming in



THE PALAYAKOTTAI CATTLE FARM

By D. PATTABHIRAMAN, G.M.V.C., Assoc. I.D.L.
Superintendent, Kangayam Cattle Improvement Scheme,
Palayakottai, Coimbatore District

‘WE mention the Pattagar of Palayakottai,’ wrote the Linlithgow Commission, ‘because his was almost the only herd which was brought to our notice as an outstanding example of careful cattle-breeding.’ This careful breeding has resulted in the famous Kangayam cattle known all over southern India. The breeder is Rai Bahadur Nailathambi Sarkarai Manradiyar, popularly known as the Pattagar of Palayakottai. His farm is one of the biggest cattle-breeding stations in India and its activities have been publicly recognized for the last 40 years.

The Pattagar traces his ancestry to 1,000 B.C. In recognition of the help given to the Pandya kings by his forefathers, they were awarded the title of *Uthama Kaminda* as well as powers to settle social and religious disputes in their community of Vellalas and their sub-castes. The Pattagara is the religious head of his community: the title is hereditary and passes on to the eldest son.

The present Pattagar’s grandfather was the first to take an interest in cattle-breeding. His work was continued by his son, but he did not live long to enjoy the fruits of his labour. The present Pattagar, who was only seven when his father died, carried on the tradition, declining the advantages of an English education. So great was his concentration on cattle-breeding that he increased his herd from 100 to 2,000 head and established it as the Kangayam breed.

Cattle-breeding country

The farm is situated in Pudur village in the Dharmapuram taluka of Coimbatore district. The area is well suited to cattle-breeding. The soil is red-loam, full of

cauker gravel known as 'odai jelly' and is supposed to be the best land for rearing cattle. - Such soils are known to be cool and, though shallow, are retentive of moisture sufficient for raising pasture. It is, however, a dry tract where the cultivator has to depend upon the monsoon. In some parts there are wells used for irrigating garden lands; and to raise water from a depth of 30 to 60 ft. the farmers require strong and efficient bullocks. Moreover, on the break of the monsoons large areas of land have to be prepared and shown before the soil dries up and for this quick work efficient bullocks are very necessary.

Bullock power indispensable

Where small holdings are the rule and the use of machinery for agricultural operations uneconomic, bullock power is indispensable. Realizing this, the Pattagar took pains to develop his herd on a large scale and in a systematic and scientific manner.

The Pattagar is the largest landowner in the Coimbatore district, holding about 15,000 acres of which 5,000 acres are set apart for grazing the herd. To improve his land numerous wells were sunk at an enormous cost as the subsoil is rocky. Thus large areas were brought under cultivation. The crops grown are paddy, cotton, *ragi* (*Eleusine coracana*), *chulam* (*Sorghum vulgare*), chillies and sugarcane, chiefly irrigated by well water. During the monsoon *nadam cumbu* (*Pennisetum typhoideum*) and *chulam* are grown. The rest of the estate is leased to tenants on condition that a member of the family works on the Pattagar's farm for Rs. 100 per year and the midday meal. The estate is divided into a number of fields which are thickly fenced with *mullukiluvai*, a thorny shrub (*Balsamodendrum Berryi*) which is highly drought-resistant. This fencing is unique and is rarely seen outside the Coimbatore district. Each tenant is instructed to confine his animals within his own land, and at night they are kept in the fields for manure.

Grasses grown

Though the rainfall may not be sufficient to grow a cereal crop, it is generally sufficient to raise a crop of grass. The chief grass is *kolukkattai* (*Pennisetum cenchroides*). It is a thick, succulent grass which maintains its vitality during severe draught. It seeds freely and sheds seeds easily. Hence a few showers will make the pasture very green. Other varieties of grass found in the pasture are given below :-

LOCAL NAME	BOTANICAL NAME
<i>Kolukkattai*</i>	<i>Cenchrus ciliaris</i>
<i>Vennampul</i>	<i>Trachys muricata</i>
<i>Ottanpul</i>	<i>Setaria verticulata</i>
<i>Kurutupul</i>	<i>Chloris barbata</i>
<i>Cholapul</i>	<i>Chrysopogon montanus</i>
<i>Naripayathankodi</i>	<i>Phaseolus trilobus</i>
<i>Seppunerinji</i>	<i>Indigofera enneaphylla</i>
<i>Savarikodi</i>	<i>Merremia tridentata</i>
<i>Poonapudukukodi</i>	<i>Orotalaria globosa</i>
<i>Dadara</i>	<i>Borreria hispida</i>
<i>Hariali</i>	<i>Cynodon dactylon</i>

On the outbreak of the Monsoon the cattle are sorted out according to age in three classes : below one year, one to two years, and two to three years. They are also segregated according to sex and put into the grazing areas in batches of 20 to 50 according to the availability and extent of pasturage. Bulls ready for sale are given preferential treatment ; so also weak animals that do not thrive in a large herd are put in smaller batches of 10 to 15. The grazing areas are provided with wells which are sloped in such a way that the cattle can get into them and drink water freely.

Uses of the babul tree

An interesting feature of grazing areas is the wide prevalence of white *babul* trees (*Acacia alba*). They

*Two varieties are found, one with purplish spikes and the other with whitish spikes; the purplish variety is found to be more nutritious on analysis. It is known in North India as *anjana*.

provide shade for the animals at midday, and during the podding season supply pods for the cattle to eat. During the season the pods are collected and stored and used with concentrates much in the manner of sugar with coffee. The Pattagar believes that the feeding of the pods improves the coat and the milk yield of the animals. On analysis, it was found that they have good feeding value. The results of the analysis are interesting :

Moisture	...	7.33	per cent
Ash	...	6.84	"
Crude protein	...	14.86	"
Ether extract	...	1.67	"
Crude fibre	...	11.50	"
Carbohydrates	...	57.80	"
		100.00	
Lime	...	1.61	"
Phosphates	...	0.44	"
Insolubles	...	0.23	"

The pods can be powdered and fed along with concentrates in quantities of 1 to 2 lb. per animal.

The white *babul* tree has numerous uses for the farmer. It can be made to grow easily in waste lands, catchment areas, lake and field *tunds* and in grazing areas. It grows wild and no care is necessary. It is highly drought-resistant. The trunk provides timber for building furniture, agricultural implements and bullock-carts. Thorny twigs are useful for fencing the fields and small branches are used as pegs to tie up animals. The trunk is soaked in water for three months before being sawn into planks, and the longer it is under water the more durable it becomes. If the tree is not suitable for timber it can be used for firewood. The white *babul* tree grows easily on a soil with plenty of calcium in it. The value of a tree after 10 or 15 years is Rs. 10 to 15 and the farmer gets this for nothing.

Cattle left in the open

Manure is not collected in the grazing area and the land is ploughed once in four or five years and brought under cultivation and the grazing area is changed. By leaving the cattle out day and night for months in the grazing area they become hardy and can endure all kinds of weather. Within the Pattagar's experience there has not been a single case of snake-bite or other accident.

The Pattagar breeds horses and sheep as well on a small scale. He had a large number of horses, but with the increasing popularity of motor transport he had to reduce his stock. At present he has only 30 mares but proposes to develop this side of his activities. He has 2,000 head of sheep of the hairy mutton variety kept mainly for manuring his garden land. He recently started to breed wooly sheep and has a foundation stock of 30 wooly ewes of the Coimbatore variety and one Bikaner ram given to the Livestock Department. There is also a small herd of Amrit Mahal cattle bred separately from the Kangayam.

The Kangayam breed

It is with the Kangayam breed, however, that the Pattagar made his reputation. The breed derives its name from the Kangayam division of the Daarampuram taluka where this type of cattle has been in existence. In its purest form the breed can be seen on the estate of the Pattagar and at the Government Cattle Farm, Hosur. The Kangayam is a medium-sized animal although large specimens are sometimes seen.

*Measurements in inches of Kangayam Animals at
the Palayakottai Farm*

Particulars of Measurements	BULLS			COWS		
	Maximum	Minimum	Average	Maximum	Minimum	Average
Height behind hump	54	51	52	48	45	46½
Length from point of shoulder to pinbone	63	55½	60	56	50	53
Length from angle of hip to pinbone	21	18	19½	18	16	17
Height at angle of hip	54	50½	52½	50½	46½	49
Width between angles of hips.	20	17	19	18	16	17
Height at pinbone	49½	44	47½	46	41½	44
Length of tail	53	46	48	48½	37	43
Length of tail from end of switch to ground	8½	2	5	12	½	7
Girth	76	69	74	67	58½	12½
Height at point of elbow	30½	27	29½	29	27	28
Circumference of bone below knee	8	7	7½	6½	6	6
Length of face from occipital crest to upper edge of muzzle.	20	18	19	18	17	17½
Width of face above eyes	9½	9	9	8	7½	7½
Length of lower surface of ear	8½	7½	8	8	7½	7½
Width of ear	6	5	5½	6	5½	5½
Slope of rump	6½	3	5	6½	3½	5
Length of horns	18	13	15½	21	8½	17½
Thickness of horn at base	14	10	12	10½	8½	9
Length of tail up to the switch end	34	29	32½	31	26	29
Weight of an animal (calculated) lb.	1213	874	964	838	570	723

It is purely a draught type and is smart, active and brisk in appearance. It is the best draught breed in South India. It is a hardy animal, an excellent breeder and thrives on scanty rations. It has a good constitution and a fiery temper.

The Pattagar has 300 cows, all selected from good lines. They are never sold outside the estate. The cows are said to calve every year, and if there is any irregular breeder, she is sold to a tenant who uses her for work. The calvings average 12 and the maximum is 17, but there are no authentic records to prove the statement. The colour of the cow is grey or white with black markings just above the fetlocks, on the forelegs and in front of the forelegs. Some cows have dark grey markings on the body and the face which are not desirable but do not constitute a disqualification. Mature cows weigh from 700 to 800 lb. Kangayam cows are poor milkers; but good milkers are also to be found, giving 18 to 20 lb. at their peak. No milk recording is done for the Pattagar's herd; but a scheme financed by the Imperial Council of Agricultural Research is in operation with a view to improving the milking qualities of the Kangayam breed without impairing the draught qualities of the male. Cows are tied in open yards and milked both morning and evening. Calves are allowed to suckle their dams for two months, and as the calf advances in age milk is drawn from the cow. If the cow is a poor milker all the milk is left for the calf. Concentrates are fed twice a day, only when there is scarcity of grazing. The cow is taken to the bull when it comes into heat for the first time after calving, which is generally between 90 to 100 days. The price of a cow is from Rs. 250 to 500.

The Pattagar does not sell milk to the public. The daily output is 300 to 400 lbs. of milk most of which is used in the household and some converted into ghee.

Treatment of calves

Kangayam calves are generally red in colour at birth, with black markings over the coronet and fetlocks on all the four legs and sometimes on the knees. Inside the thighs and forelegs the colour is white. The red colour gradually changes into grey in three or four months. At birth male calves weigh 48 lb. and female calves 46 lb. on the average. No treatment is given to the umbilical cord of the calf and so far no cases of navel sepsis have occurred. For the first six to eight weeks the calf is allowed as much milk as it wants and is kept tied and muzzled. After that green grass is put before it, and when it has learned to eat, it is turned out to pasture along with other calves. The milk given to the calf is gradually reduced until it is weaned. In the case of promising calves and also when the calf does not get sufficient milk from its dam, milk drawn from other cows is fed to the calves by hand as it is allowed to suckle other cows. Calves do not get any concentrates until they are weaned. A male calf is worth Rs. 70 to 100 immediately after weaning.

The Pattagar keeps the herd pure by careful selection of sires from his own herd. He maintains four or five lines. Bulls fit to be issued for breeding are turned out in good pastures. Formerly only bullocks were sold. Now owing to the increased attention paid by the Government in grading up village cattle there is a good demand for bulls. The Pattagar issues nearly 100 breeding bulls every year to the Coimbatore District Board and the provincial Government for grading up village cattle.

The bull is grey in colour, with dark grey to black markings on the legs, head, hump, shoulders and quarters. After castration the black markings gradually disappear in three or four months and change uniformly into grey. The weight of a mature bull is 1,000 to 1,200 lb. Bulls are ready for issue at three years and are at stud for

four or five years afterwards. They are then castrated. The average price of a bull is from Rs. 250 to 500.

The heifers are mated only at three years of age. The Pattagar allows a bull to a batch of 30 heifers in the grazing area for three months : within that time it is presumed that all the heifers have been covered. The heifers are not sold, but the cost of a good heifer is from Rs. 200 to 400.

Virtue of the bullock

Bulls that are not fit to be issued for breeding are castrated when they cut the first pair of incisors. At four teeth they are trained for ploughing and at six teeth for *mhote* work. The castration is generally done at the beginning of November every year, for the season is cold and plenty of grazing is available. In the past castration was by the country method—mulling—which is a painful operation. This has been replaced by the Burdizzo method and is carried out by the staff of the Veterinary Department. Soon after castration the ears of the animals are trimmed by the Pattagar himself or by his trained assistants. His view is that short, trimmed ears give an alert appearance to the animals. The Pattagar maintains about 120 pairs of animals for operations on his farm such as ploughing, *mhote* and cart work. About 100 pairs of work cattle are sold every year. The bullocks are grey in colour ; they are hardy and compact ; with thick neck, short and strong limbs and well sprung barrel. They have a working life of 15 years. The bullocks are in demand in the south for black-cotton soil cultivation and for *mhote* and road work. The Kangayam bullocks are sold at a premium, for they are good workers and thrive on scanty rations. They last 9 to 10 years at the *mhote*, whereas other breeds do not last for more than six or seven years. The weight of a bullock is from 1,000 to 1,400 lb. and the price of a pair of bullocks ranges from Rs. 300 to 1,000.

The Pattagar raises fodder crops *adarcholam*, i.e. close or crowded, as they are sown thickly so as to yield heavily and secure thin stalks. The fodder crops are raised in garden lands irrigated by wells. After harvest the straw of paddy, *cumbu*, *cholam*, *ragi*, etc. is stored for feeding the animals. No silage is prepared, but it will be from this year. A beginning has been made with the cultivation of lucerne, Guinea grass and maize. There have been frequent fodder famines in the area in which the Pattagar's farm is situated and large quantities of fodder have had to be imported from adjoining districts such as Salem and Tanjore and cattle have had to be sent for grazing to distant forests. Periodical famines have caused fluctuations in the size of his herds.

Concentrates used

During the grazing season concentrates are not fed to any of the animals except the breeding bulls. During the summer months when there is practically no grazing, concentrates are fed to cows in milk, bulls intended for sale and bullocks twice a day. The concentrates used are groundnut cake, rice bran, cottonseed, residue of grain crops such as *cholam*, *ragi* and *cumbn* soaked in water and white *babul* pods. They are crushed and fed with plenty of water in tubs. The tubs are made of stone and can hold feed for 60 animals at a time. There is one attendant in charge of two animals; he supervises them and sees to it that each gets its due share.

Black gram, horsegram and fenugreek are soaked and ground into a paste and mixed with concentrates and fed to the animals intended for sale. Gingelly seed mixed with powdered jaggery is also given, a handful to each animal. This special feed is said to improve the coat.

Cups and medals

As the animals are accustomed to semi-ranch conditions until three years of age, great skill and patience

are required in training them. First of all they have to be roped and nose-strung. There is a special enclosure of masonry walls, 10ft. high into which the animals are turned and then roped by an experienced attendant. They are then nose-strung and tied to a peg with a leading rope for a few minutes to start with as otherwise accidents are likely to happen since the animals resent tying up very much. Strong ropes are used and the pegs are firmly driven into the ground. In the course of a week the animals get accustomed to being tied up.

The Pattagar personally supervises the preparation of animals for cattle fairs. It is heartening to see all his animals tied up evenly in an open yard in straight lines in batches of 30, each 20 ft. apart and in rows of five to ten. The animals are washed daily, groomed and fed well. Even forced feeding is done to bring them into extra condition. There is a ready market for the animals at the Kanapuram and Tiruppur cattle fairs held in April and June respectively. The preparation of the animals starts about two months in advance and by the time they are taken to the fairs the animals attain show condition. The Pattagar's cattle exhibited at shows and fairs have earned high praise year after year. Invariably he wins gold medals and breed championship cups.

COTTON GROWING IN SIND

BY ROGER THOMAS

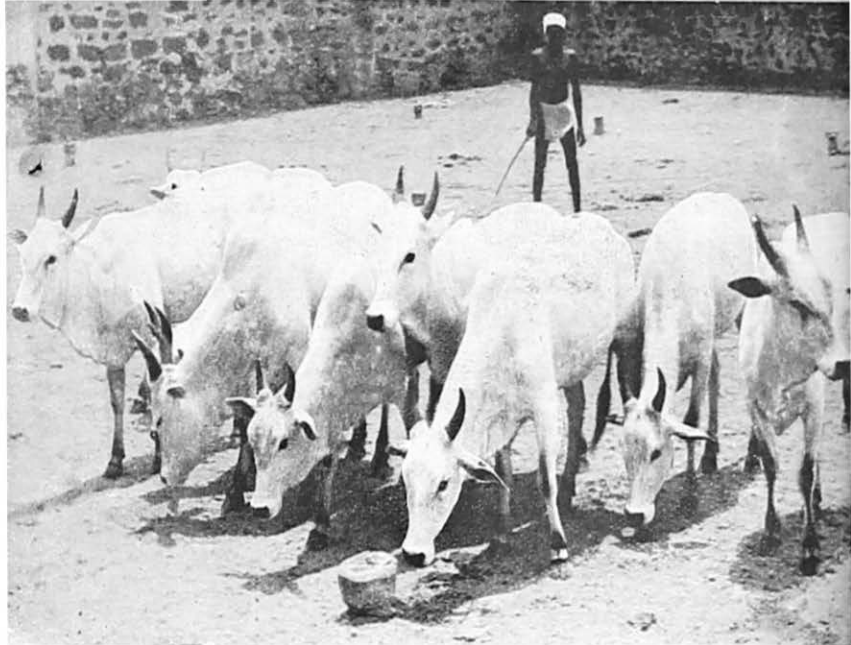
Sind Land Development, Ltd., Mirpurkhas, Sind.

PRIOR to the advent of the Lloyd Barrage on the Indus some eight years ago, Sind was renowned mostly for its inhospitable desert climate. Today the climate has not materially changed, but thanks to a comprehensive new irrigation system which covers some seven million acres, the province has embarked on a new lease of life. The success of this vast irrigation scheme depends on the profitable cultivation of two main crops, namely, cotton in summer and wheat in winter. This note will deal with some aspects of cotton growing only.

Severe climatic conditions

Without irrigation no cotton can be grown in Sind as the average rainfall is only about 4 in. and some years are practically rainless. The crop is sown from March to May and is harvested from September to January. In no cotton-growing country in the world has the crop to face such severe climatic conditions as in Sind and parts of the Punjab. At the time of sowing the maximum shade temperature is rarely below 100°F. and may be as high as 120°F. The sun, temperature in Sind may be as high as 160°F. The hot dry desert winds often tear the young leaves into shreds until the advent of milder weather during July and August when the plant makes very rapid growth. October is again hot and dry and the plant is forced into early maturity. Only special types of American and a very short-stapled Indian (*desi*) cotton will give good results under these climatic conditions.

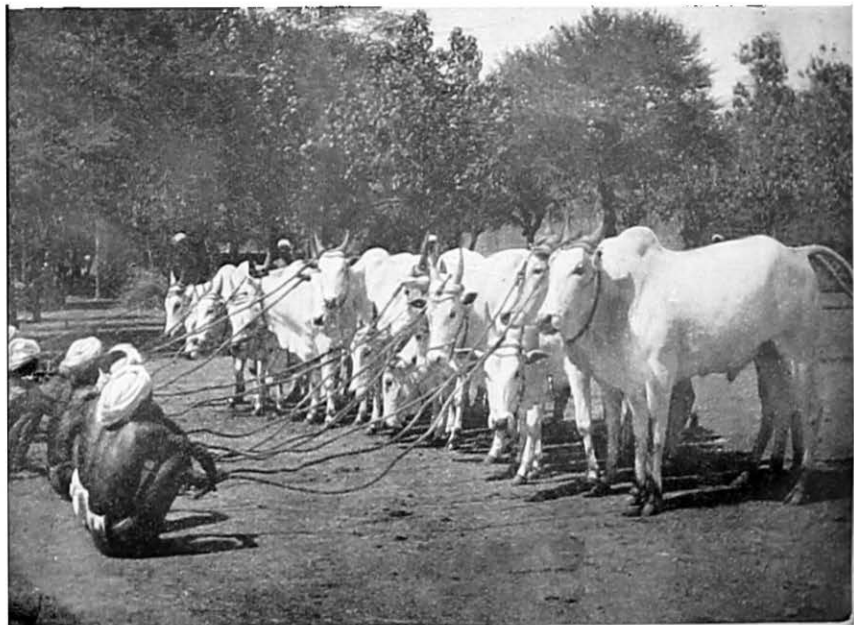
If the adverse climatic conditions were our only difficulties we would still grow beautiful crops of cotton, but we have other difficulties. Insect pests and diseases



Young heifers

PLATE 29

Bullocks intended for sale

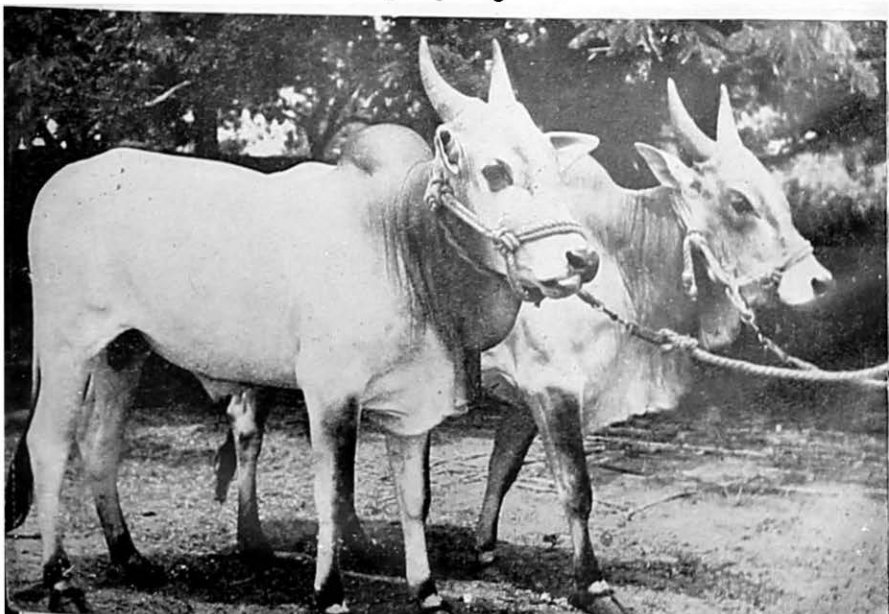


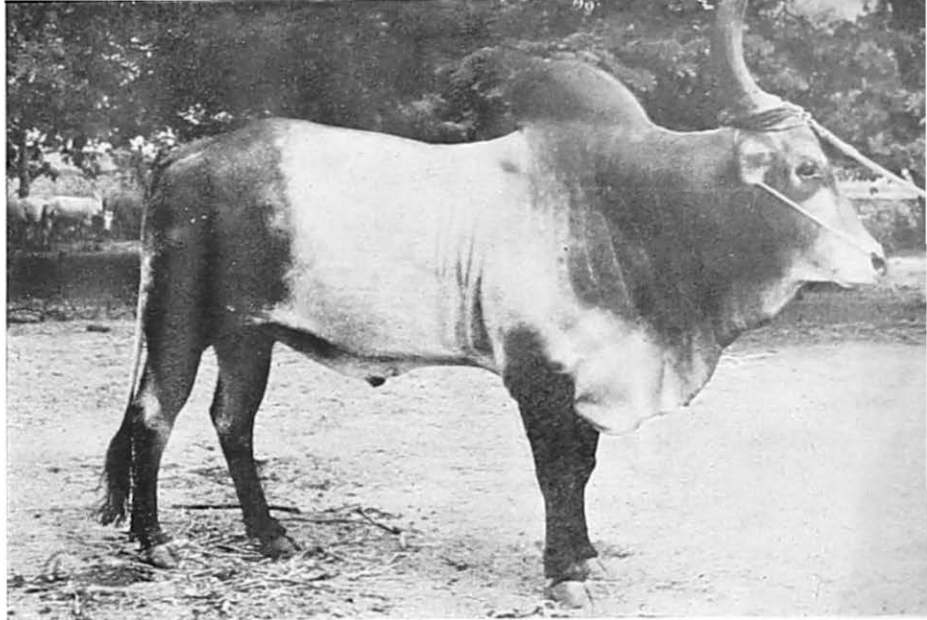


Visitors interested in an animal

Training of young bulls

PLATE 30

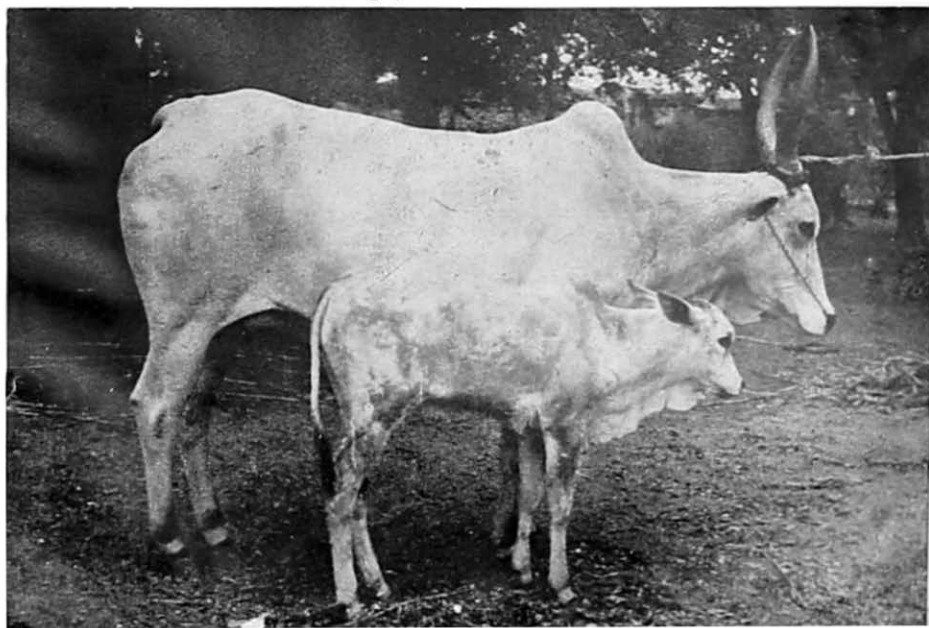




Kangayam bull

PLATE 31

Kangayam cow with calf



take serious toll of the crop. The accumulation of salt in the soil is an ever-present danger. The Sirdhi cultivator is averse to changing his wasteful methods of crop production. And the rains may come when they are not wanted.

The irrigated portion of Sind is an alluvial plain with a gentle slope towards the sea. The Lloyd Barrage, where it spans the Indus, is about a mile wide. Immediately below the Barrage at Sukkur are the heads of five large canals which, with their distributaries and watercourses, supply water to the irrigated area. The maintenance of this irrigation system in proper order is a matter requiring considerable technique and constant watching by the engineers so as to ensure that every field receives its rightful share of water. The water supply is so designed that a farm of 100 acres is enabled to grow about 28 acres of crop (mostly cotton) in the summer and theoretically about 50 acres (mostly wheat) in the winter. The supply is constant throughout the year except for a period in December when all the canals are closed to enable the engineers to attend to repairs and the clearance of silt from the canals.

Land development

I was attracted to Sind by the possibilities which must follow in the wake of a new irrigation system. I formed a company whose directors are myself, a Moslem and a Hindu—old associates of mine in Government service. So far the arrangement has worked well. We brought with us experience in other parts of India and in other cotton-growing countries. We were satisfied with prospects which justified our embarking on large scale farming of cotton and wheat. Today we manage about 30,000 acres most of which is on short leases, according to the provincial custom, but some of which is freehold land. On the temporary leases the improvements which we are able to introduce in the methods of farming are restricted owing to the short duration of the leases. But

on the freehold land we are able to put into practice that we preach. The results are gratifying.

Large areas of virgin land in Sind were first brought under cultivation on completion of the Lloyd Barrage project, eight years ago. For the first few years good average provincial yields were harvested in spite of the particularly low standard of cultivation. The tendency of the average provincial yields has been downward, due to depletion of soil fertility. Latterly, thanks largely to the propaganda of the Department of Agriculture, there is a noticeable improvement in farming technique as applied both to cotton and wheat, but the methods of cultivation continue to be uneconomic in many ways.

Customary practices

Some of the customary practices in cultivating cotton in Sind are briefly as follows :

Land reserved for cotton may receive a dry ploughing before irrigation but in many cases no preparatory cultivation is given to the land. The small 'Monsoon' iron plough is in fairly general use though the country (wooden) plough also continues to be used. Animal draught is all by bullock power. The cotton seed is generally sown broadcast on the unploughed wet earth after irrigation and covered by ploughing. Hand weeding of the crop is done once or twice by the more enterprising growers only. Thinning is rarely done. Normally about four waterings are given after sowing but it is the custom to give excessive water at each irrigation. The crop is picked on contract rates mostly by migrant labour from the adjoining unirrigated tracts. It is packed in bags made of sacking in which it remains until it is ginned. Each package (*bora*) of cotton weighs about 250 lb.

In general the system of farming in Sind is extensive as distinguished from the intensive system associated with irrigated lands elsewhere. The cultivator is not

happy unless he has about eight acres of cotton and an equal area of wheat. He tries to do all cultural operations to these areas with his own labour and with one pair of bullocks. He is only beginning to realize that in order to get good crops he must till the soil well and give back to it part of what he takes away from it. Most cultivation in Sind is done on the share (*batai*) system whereby the cultivator gives his labour and that of his bullocks in return for half the crop which he harvests. But there is an unfortunate custom in Sind which is a relic from pre-Barrage times, when large areas were cultivated by inundation (flood) water from the Indus. In those days no one could tell whether the floods would be adequate to sow and mature a crop. So the cultivator, before he started preparing land for the crop, insisted on cash advances which would enable him to meet his essential domestic needs in the event of the flood water failing to mature the crop. This custom continues.

The average yield of cotton in Sind is about 7 mds. (575 lb.) of *kappas*, i.e. seed cotton per acre, but on good lands which are well farmed the average yield may exceed twice this amount. Our freehold lands were virgin soil when we bought them seven years ago. They then gave us an average of about 12 mds. of cotton per acre as compared with a provincial average of about 8 mds. in that year. We have so improved their fertility that in the sixth year the average yield rose to 15½ mds. per acre. In the seventh year the yield fell to 8½ mds. per acre because of the defective water supply over which we had no control. In that year we were able to give some of the crop only one watering and the remainder of the crop only two waterings after sowing and, be it noted, in the complete absence of rains. It was because we had maintained our lands in 'good heart' that the relative failure was not more disastrous.

Improvements introduced

We believe in introducing only such improvements in

the technique of farming as can be easily adopted by the cultivator without drawing unduly on his time or his labour. Below are enumerated some of the improvements which we adopt on our freehold lands.

The land is thoroughly prepared before sowing with the main object of destroying all weeds and producing a fine seed-bed. Sowing of all our cotton crops is done by a primitive drill in lines about three feet apart. Our cotton seed drill is a very efficient but simple device consisting of a galvanized tube to which is fixed a funnel costing about 6 as. This is tied by a string to the ordinary country wooden plough, which then acts as a seed drill. The lines may not be very straight but we do not worry about that. All our cotton is properly thinned and at the right time. The crop is thoroughly weeded by shallow intercultivation with light draught implements. This practice was unknown in Sind until recently. We withhold water after sowing for as long a period as possible in some cases for three months, with the main object of making the grow plant hard, leathery leaves which resist jassid attack.

We grow those varieties of cotton which we find are best suited to our local conditions. These cottons are of American type. They combine the characteristics of heavy yielding, high ginning out-turn, good staple and early maturity. Our early sown varieties are unfortunately not very resistant to jassid attack, so we defeat or dodge the jassids in part by modifying our agricultural practices. Our late sown varieties are specially resistant to jassids. We do not grow any *desi* cotton. We preserve the purity of our seed by ginning the *kapas* in our own factory. The same applies to the cotton which we market.

Keeping cotton clean

Cotton as picked in Sind is renowned for its dirtiness. This is very largely due to the pickers' custom of placing their small heaps of picked cotton on ground covered with the dry fallen leaves of the cotton plant. On removing

the small heaps most of the dry leaves stick to the cotton. A series of three or more cleaning machines have to be installed in the ginning factories to remove this refuse. Much of it goes through to the spinning mills and it detracts from the value of the cotton. The remedy is simple, provided close and constant watch is kept in the field. Our field supervisors are instructed to see that the ground is thoroughly cleared of leaves and trash before depositing any heaps of picked cotton on the ground at the time of picking. If supervision is strict then the pickers soon change their custom as it involves little extra work.

We give back to the land a reasonable share of what we take from it by growing green manures to the maximum extent having regard to the spare water that may be available at any time. Most of our green manure crop is *guara* (*Cyamopsis psoralioides*) sown in summer with the aid of water which is surplus during the period which elapses between the final sowing of cotton and the first 'delayed' watering of the cotton crop. The green manure is not given any more water. If any monsoon rains fall then the crop will still be big enough to do some good to the land at the time it is ploughed in.

Compost of village refuse

All village refuse is composted and decomposition of the hard woody tissue is hastened by adding sulphate of ammonia to the compost heap. We do not bother about any complicated technique for compost making. All we do is to throw all refuse and farmyard manure into pits and occasionally water the pits and turn over the compost.

We ensure that the bullocks of our cultivators are always in good condition by allotting ample land for green fodder crops both in summer and winter seasons. All the work cattle on the estate are inspected once yearly and weaklings are replaced. We are fortunate in having at hand a very desirable type of draught bullock in the Thar-

parker breed and the cows are moderately good milkers. Epidemic diseases amongst our cattle are promptly attended to by the Government Veterinary Department. Rinderpest is the most serious of these diseases but so far we have been able to keep it in check by inoculation. Foot-and-mouth disease is a 'hardy annual'. Cattle suffering from this disease are rested until they recover. Casualties are rare.

We cut all cotton stalks as soon as possible after the crop is removed so as to kill all insect pests and especially the cotton bollworm which is a serious pest.

On our freehold lands we reserve a few hundred acres as our 'Home Farm' where all our improved methods are applied. The 'Home Farm' is worked by paid labour and with our own bullocks. It acts as a demonstration to our share-cultivators whom we find to be willing learners so long as our improved methods are simple. We encourage our paid labourers to become share-cultivators after they have gained adequate experience of our technique.

We have a large vegetable and fruit garden which we use to meet the requirements of our cultivators and our staff at nominal prices. It was an uphill job to get the Sindhi cultivator to eat any vegetables other than chillies, onions and *bhindi* (*Hibiscus esculentus*). We have our own dispensary and farm doctor who attends to the ailments of our cultivators and staff. We supply our cultivators at cost price with cheap woollen jerseys to protect them from an attack of pneumonia during the cold weather. We facilitate petty financial transactions with our cultivators by issuing our own 'chits' which have the same value as an Indian currency note. These chits may be presented for encashment either at our farm office or at the village shops.

Village water supply

Our village receives its domestic supply of water from a specially constructed tank where the canal water is

filtered through layers of sand and charcoal. Water is then drawn with hand-pump. This arrangement helps to preserve the health of our villagers and is greatly appreciated by them.

Our share-cultivators and labourers are provided with huts made of mud walls with mud plastered *chattai* roofing and a spacious compound. The ventilators in the huts are blocked by their occupants in the winter months because they believe that still air is safer than cold air. We lack cheap roofing material as both iron and imported wooden rafters are expensive. So we are experimenting with various types of trees both Indian and foreign in the hope that we may find a good cheap substitute for the costly Kashmiri *balli*.

In short, successful crop production under conditions of farming in Sind depends very largely on the contentment of the cultivator and the proper care of his bullocks.

Successful farming

The greatest single factor which contributes towards successful farming in Sind is the economic use of the water supply which is strictly limited by Government regulations and controlled by the Department of Irrigation. We aim at growing the maximum area of each crop having regard to its optimum water requirements during its growth and development. We realize the danger of excessive watering with consequent rise in the subsoil water-table and the accumulation of deleterious salts in the surface soil. By reducing the quantity of water applied at each irrigation we are able to increase our cropped area and at the same time we reduce the risk of water-logging and salt accumulation.

We find that the more enterprising of our neighbouring zemindars are now freely copying many of the improved practices introduced by us on our lands. This gives us

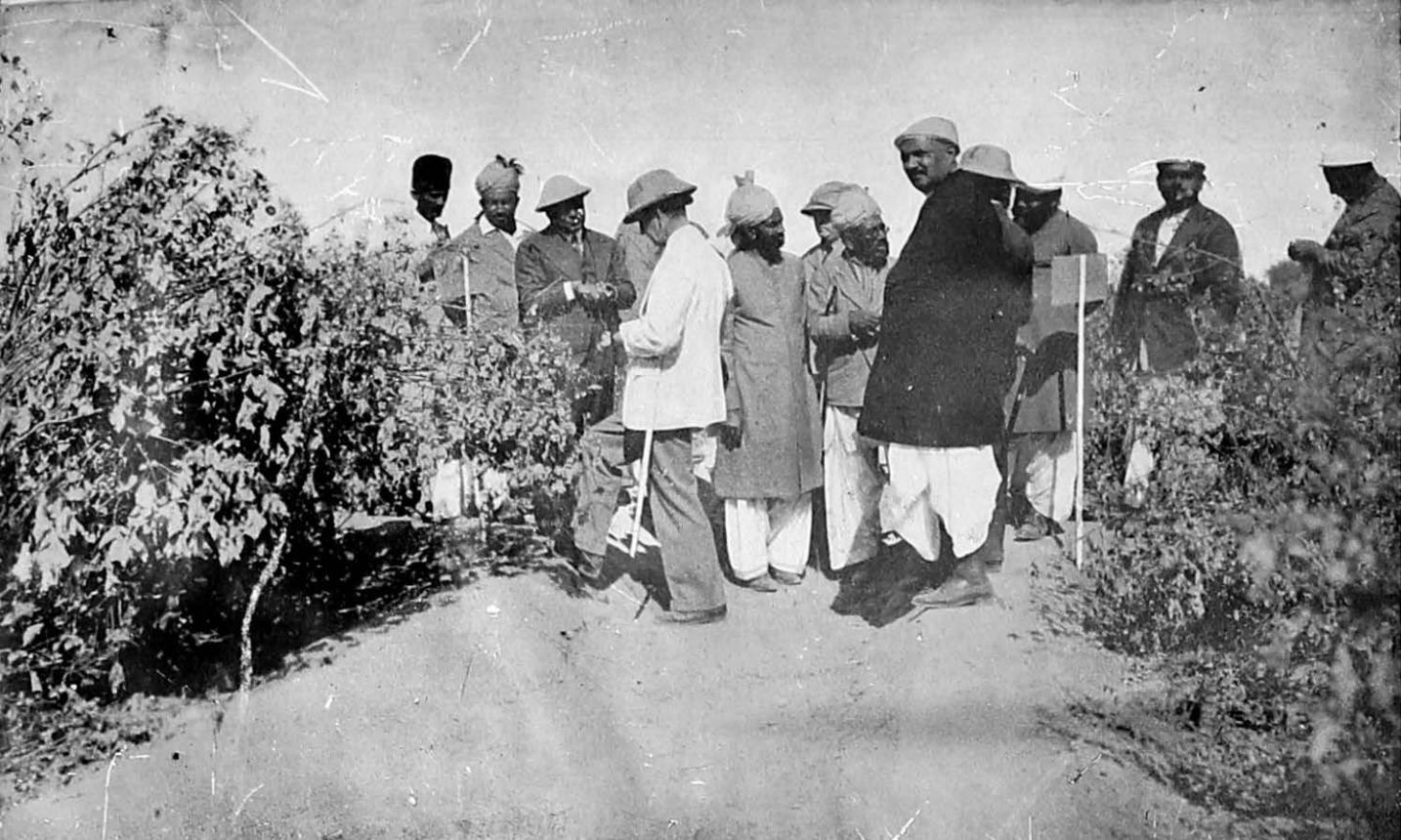
the mental satisfaction of knowing that we are working on the right lines.

We cooperate with the Irrigation, Agricultural and Veterinary Departments of the province, and we carry out numerous field experiments in collaboration with the Department of Agriculture to our mutual advantage.

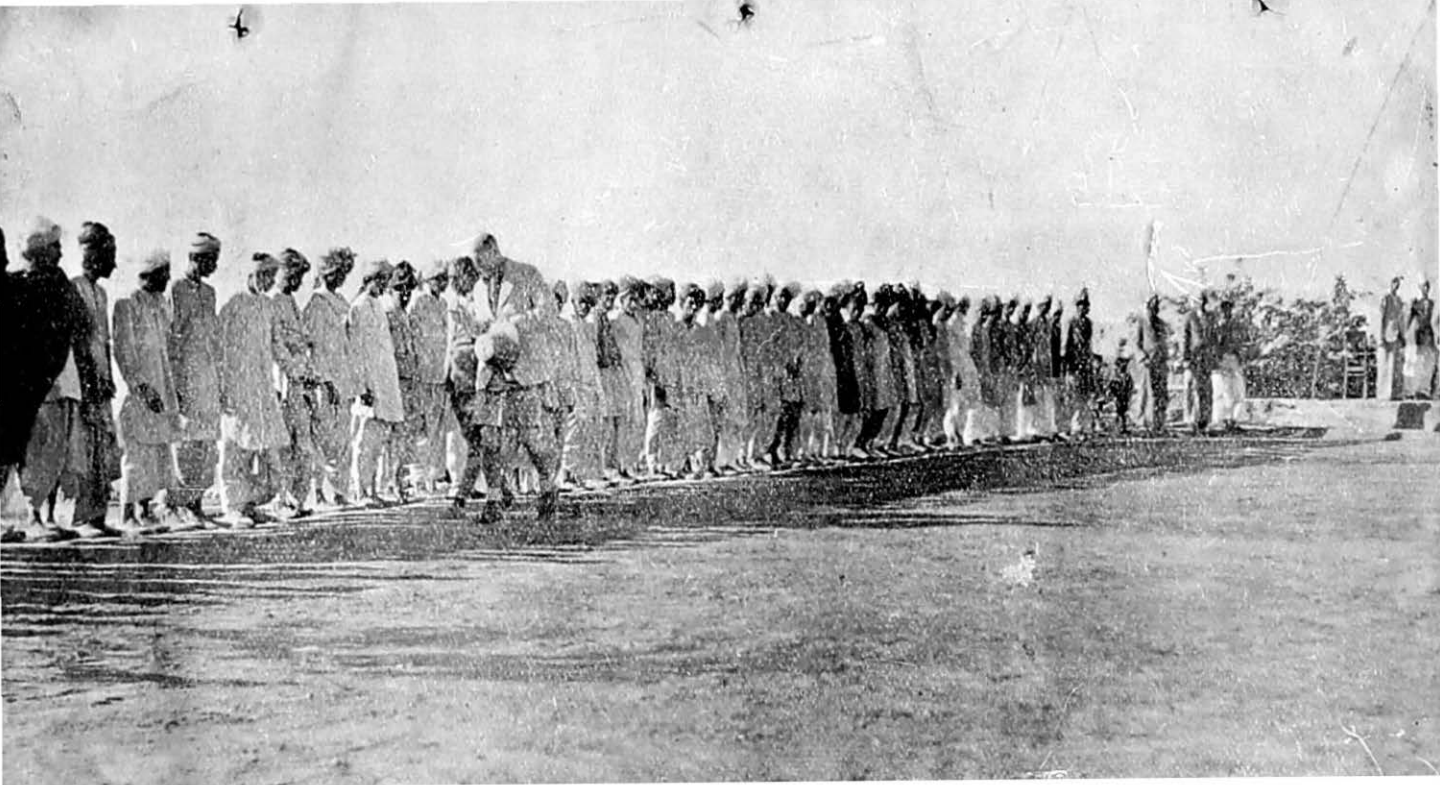
The reader may well ask: 'Does cotton farming in Sind pay?' Our answer is: 'Good farming always pays.'



His Excellency the Governor of Sind laying the foundation stone of the King George V Institute of Agriculture, Sakrand



His Excellency the Governor of Sind, with prominent zemindars, inspecting the cotton crop at the Agricultural Research Station, Sakrand



Share cultivators at Bodar farm, Sind Land Development Ltd., Sind, on occasion of visit of His Excellency Sir Lancelot Graham, K.C.I.E., Governor of Sind



View of the Lloyd Barrage on the river Indus at Sukkur, Sind

PADDY GROWING IN COORG

BY A. C. THIMIAH, M. A. (CANTAB.)

Green Hills, Virajpet Coorg

FOR the paddy cultivator the agricultural season starts on the outbreak of the first rains immediately preceding the monsoon, but its logical start may be traced to the end of the agricultural operations in the first week of February. February heralds the beginning of the hot weather which, but for a small break in March, will last till June—the end of May if the gods are propitious. The prudent cultivator analyses his takings in the light of the impending season. He has to face four hard months when water is scarce in a land devoid of irrigation, when fodder is of the poorest and cattle are doubtful cases between disease and starvation. Rain expected in March comes at the end of April; his emaciated cattle fall an easy prey to disease; his manure deteriorates; and even his health is menaced by an inadequate supply of good water for domestic use.

Having managed to struggle through the first three months, the cultivator prepares, at the beginning of May, for the imminent season. He looks over his cattle, which if still alive may be quite unserviceable. Tenant cultivators borrow the money to purchase fresh plough cattle from their landlords if necessary.

Disappointing animals

Plough cattle are the most vital factor in the agricultural system. These cattle are normally imported and consist at most times of diseased and ill-conditioned animals that neighbours have rejected. The few animals that are good are priced exorbitantly. To the single weekly market buyers may travel as much as 50 miles to and fro; and rather than repeat the journey and the disappointment they will purchase what is available. Prices are increased by the habit of local buyers cornering the best animals for resale. Reluctantly, the ryot will

pay out his money, and drive home his pair. The skin and bone he has bought may have cost him between Rs. 20 and 30; but he hopes to put them into shape before the monsoon breaks. His chances are fair unless disease intervenes. In the absence of any veterinary examination before purchase, there is a possibility—in times of distress amounting to a certainty—that these imported cattle are diseased. A good pair of animals costing about Rs. 50 may last with care about eight seasons; a bad pair, besides failing within the season, may leave a legacy of disease to the local animals.

Government has tried to improve the livestock by presenting valuable stud bulls for local purposes to well-established farmers; but experience has shown that very few of the ryots have availed themselves of this facility. The reason is hard to find; but it may be traced to a psychological fear whether anyone will look after their cattle as well as they do even for the limited time when they are sent for covering. They may also reflect on the fact that few of the people who have had the services of these Government animals have been able to improve their stock. The cow itself may be already diseased; and even otherwise the calf has diminished chances when it mixes with animals which are already diseased. Improvements of livestock is only possible when steps are taken to prevent further deterioration.

Best manure

Cattle manure is the finest fertilizer for paddy cultivation. Mixtures of artificial manures such as sulphate of ammonia, superphosphate and niciphos give large yields but result in far too rapid soil deterioration. These manures are beyond the means of the ryot. Eight cartloads of cattle manure augmented with green leaf are sufficient to maintain the fertility of one acre of land.

According to necessity the cultivator may plough from three to six hours daily, starting from 6 a.m., and in an emergency ploughing till 12 noon (with a half-hour break

at 9 a.m.). The afternoons are used to clear *bunds* and drains and to repair the ravages of crabs and rats.

I have tried various ploughs, but I find the old wooden plough with the metal shaft most satisfactory. A motor plough, which I have experimented with, besides being unusable in heavy slush, was not satisfactory. The iron plough is too heavy for the cattle, though it is superior to the wooden plough. Where fodder is scarce and of poor quality, only medium-sized animals can be maintained and these, however sturdy they might be, cannot bear the weight of the iron plough continuously. Good results can be obtained with the normal wooden plough. For the success of the operation lies far more in seeing that the field is ploughed completely with overlapping furrows than in insisting on the technical excellence of the machine. The fields are ploughed five or six times till the mud is running pulp. Seed is left in a nursery to germinate from 21 to 40 days—varying with altitude, manure and quality of soil. Each cultivator keeps his own seed, while prudent landlords supply their tenants with seed.

Better price for clean paddy

Before transplanting, the fields must be clean. All traces of weed must be removed, *bunds* repaired, drains cleared. Steps must constantly be taken to prevent either water stagnation or water scarcity. The seed takes $3\frac{1}{2}$ to 5 months to yield. When the time for harvesting arrives the water from the fields is drained out and the paddy is cut.

After it is allowed to dry in the fields for two or three days the paddy is stacked. Bit by bit the paddy is threshed and the straw trodden over by cattle. The straw is then removed and the paddy cleaned. I find the winnowing machine most useful for cleaning paddy and removing all foreign matters. Well cleaned paddy has always a better market value.

The cultivator has now to face the problem of marketing. Tenants do not normally come within this problem. They pay the landlord in kind and the surplus covers their normal expenses. If there is still anything to spare, it will be disposed of locally. Large-scale tenancies are rare.

Owners are helped by grain societies, but the mistake made is in being content to control conditions locally. For example, the ultimate market for Coorg paddy is on the Malabar coast; and it is here that the societies are handicapped. Belief in their own powers makes them dispense with commission agents; false economy makes them dispense with warehouses; cost of transport (by motor) to the market is heavy and merchants there know that once the paddy is on their doorstep it will sell to them quickly. The experience of our family for over 25 years has made me trust in a reliable commission agent to get the best value for my produce.

Landlord and tenant

Most of the cultivation is carried on personally by the owner and his family. This method is successful where holdings are small. Cultivation by means of coolies is successful where the owner puts in continuous personal supervision. Tenant cultivation, though workable, is seldom a glowing success. Either the tenants try to squeeze as much as possible out of their landlord (to whom they are often heavily indebted) in the shape of help, and having thus more or less hypothecated the crop, give the land the minimum of attention; or else the landlord insists on his rights but leaves the tenants to shift as well as they can.

The problem of indebtedness and its palliative—co-operation—has come in for close scrutiny. At present we seem to be perched perilously between the Scylla of a money-lender's debt and the Charybdis of improvident borrowing from a cooperative society. It is generally felt that no society should be encouraged to lend money

to an agriculturist until it knows his existing commitments.

How paddy pays

Paddy cultivation is a sound commercial proposition in most times, even during depression, I have found it to pay.

The expenses on 50 acres of fairly good land total Rs. 1,900—i.e. Rs. 38 per acre. This includes provision for depreciation on implements and livestock at 20 per cent and eight cartloads of cattle manure per acre at Rs. 16 delivered on the land:

The normal return is 1,200 *butties* of paddy, i.e. 80 cartloads. Normal prices are Rs. 3 per *butty* (80 seers), thus giving a net profit of Rs. 1,700. Even when prices reached their lowest (Rs. 2 per *butty*) there was a small margin of profit, assuming that the yield was still the average. Present prices would put the profits still higher.

Agriculture is a stable industry. Dividends are seldom spectacular but a net loss is improbable. It needs hard work, close supervision and a belief in the productive capacity of the earth

RECLAMATION OF *USAR* LANDS AT BILANDA

By BISHAN MANSINGH, B. A.

Bilanda Farm, Fatehpur, United Provinces

SOMEHOW the term '*usar*' has come to be applied to every kind of unproductive land, and many large tracts of land which could be made productive with a little effort and expenditure have been left as hopeless. One characteristic common to all kinds of unproductive land is that it has become impermeable and very hard on the surface by being beaten under the feet of countless hungry cattle roaming over them for ages.

Usar land, as generally found in our province, is made up of deep layers of stiff, heavy, poorly aerated clays, devoid of all humus and containing salts in injurious amounts with the result that no vegetation can thrive on it.

Very bad *usar* land is covered by a brownish-white substance known as *reh*. Such land are found mostly in the canal tracts due to the effects of perennial irrigation. Another kind of bad *usar* land is found covered by black incrustations. My method of reclamation is the same for all kinds of *usar* land. The worse land of course takes longer to improve.

The first step

In order to make *usar* land fit for the growth of vegetation the injurious salts should first of all be removed from the soil. The strong solution of salts in the soil draws water from the plants instead of passing it on to them and under such conditions the plants naturally die of drought.

After reducing the injurious quantities of salts in the soil, the land should be opened up to a depth of from 6 to 8 ft. made permeable and friable, and sufficient quantities of humus added to it. In the absence of humus in the

soil the bacteria which collect nitrogen from the atmosphere cannot thrive and no regular supply of nitrogen in the soil will be available for the growth of the plant or any vegetation. In order to ensure the presence of bacteria in the soil, a few basket-loads of dry earth from arhar¹ and gram fields should be scattered on the area proposed for reclamation. Humus brought down by rain-water and the dried roots of the vegetation over the area will provide food for bacteria.

The only cheap way of opening up the soil to a depth of 6 ft. and more is to plant trees or shrubs having tap roots such as *babul*,² *madar*,³ *jharberi*⁴ and *kans*.

The following history of the Bilanda Farm will clearly show how this method of *usar* reclamation was carried out there and what are the results so far.

Accidental discovery

It was in the late nineties of the last century that my father, the late Rai Ishwar Sahai Bahadur, started cattle-breeding in his Habeeb Farm with a dozen good *desi* cows and a Hissar bull imported from the Punjab. When the herd began to grow, he felt the necessity for cheap fodder and a regular grazing ground for the herd. In order to provide these he utilized *usar* land. About 1903 he selected a fairly big plot of *usar* land in his village, Bilanda, entered in Government village papers as *ghsir mumkin*⁵, about one square mile in area, dotted here and there with a few fields of very poor soil. First of all he surrounded the selected plot with a low embankment only 1 ft. × 1 ft. more with the object of demarcating the selected area than for holding rain water as till then he had no idea that the presence of salts in injurious amounts in the soil

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1. Pigeon pea : *Cajanus indicus*.
 2. *Acacia Arabica*.
 3. *Calotropis* sp.
 4. *Zizyphus jujuba*.
 5. Waste land.

would not allow any vegetation to thrive on it. Nevertheless, the presence of low embankments partially served the purpose of washing away the injurious salts from the soil. The low embankment was as frequently repaired as it was broken by the cattle. Gradually grasses of various kinds and perennial weeds, *kans*, *kusi*¹ and *jharberi*, began to flourish along with *babul* and *madar* plants. I do not remember how *madar* plants appeared there, but my father encouraged extension of this plant on the area as wherever it existed good grass surrounded it to the extent of 3 to 4 ft. on all sides. Grazing was regulated so that the grasses might thrive and the fodder be available for the cattle for a longer period.

Babul seeds were sown regularly during the rains every year, but the rate of mortality was excessive among plants of all ages. We could not account for the cause then (although now I can say that it was due to the presence of salts in injurious quantities in the soil), but we persisted in planting them year after year with the result that in about ten years we had a good *babul* plantation with a good undergrowth of grasses of various kinds and perennial weeds, which opened up the soil.

Protection from cattle

The land adjacent to *madar* plants quickly improved with good grass over it and the germination of *babul* seeds was also much better on the patches close to the roots. *Babul* seeds collected from the droppings of our herd germinated much better than the ordinary seed obtained from the trees.

Due to protection from indiscriminate grazing various kinds of useful trees are germinating and thriving on the farm without any effort on our part to introduce them. *Neem*² and *sheesham*³ plants have developed on patches under the branches of *madar* plants and inside *jharberi*

1 A variety of weed very similar to *kans*.

2 *Melia azadirachta*.

3 *Dalbergia Sisso*.

bushes. There are over 500 *neem* and 50 *sheesham* plants on the farm now. Their seeds were either brought by the wind or by the wild birds from the trees on the Grand Trunk Road which runs through my farm.

Jharberi, *kans* and kindred grasses steadily spread over large tracts simply because they were protected from cattle. *Babul*, *madar*, *jharberi* and *kans* are deep-rooted plants and their roots break open the soil to a great depth and thus expose the subsoil to the action of the sun and the air and make the adjacent land permeable.

Before 1916, while I was at college, my interest in this reclamation work was that of a keen observer, but from July of that year, when my college education was over, I began to work as an assistant to my father in all his agricultural activities.

Short-cuts to success

Though the reclamation of *usar* land by means of planting *babul* trees and regulated grazing was a complete success so far as fodder and grazing ground were concerned, it took a very long time and therefore we continued our efforts to find some short-cut to success. On one or two occasions large tracts of the farm were ploughed by inversion ploughs after the break of the monsoon, but it did not prove very useful. I am afraid it was otherwise as the breaking up of the surface of the soil interfered with the quick rising up of the injurious salts from inside the soil when it was under water.

By 1930 the waste land had apparently improved so much that we were encouraged to grow cereals over an area of 40 acres in the centre of the farm; but here we failed, because *jharberi*, *kans* and kindred grasses would not let any crop grow on the land demarcated for cultivation.

By this time the drying up of grown-up *babul* trees had considerably decreased: still quite a large number of them used to dry up every year. The growth of self-grown *neem* trees was not good although they did not dry up. At one

time we thought that the drying up of *babul* trees was due to *kankar* in the subsoil and had the subsoil dug up to a depth of 8 or 9 ft. at several places where *babul* trees had dried up, but we found no *kankar* underneath.

Importance of bunding

The most remarkable improvement came about 1934 when I introduced strong embankments with the object of washing away injurious salts from the soil and for holding rain-water for paddy cultivation over the area on which cereals had failed on account of over-abundance of perennial weeds.

A ditch 10 ft. \times 2 ft was dug on three sides around the whole area under reclamation and the excavated earth was thrown on the outer side of the farm so as to make a strong *bund* to hold rain-water. During the early part of the monsoon, i.e. up to the middle of August, collected water when slightly sticky was allowed to run off twice or thrice through a deep cut made into the *bund* and the *bund* was well repaired as soon as the stored water had escaped.

The fields were heavily manured with farmyard manure and paddy cultivation proceeded along with the washing of salts. Before puddling operations in paddy fields began, *kans* and *jharberi* plants were removed from the surface by means of large sickles called *jhabaus*. When water remained in paddy fields for long periods at a stretch, air could not reach the roots of *kans* and other weeds and they died of suffocation.

When the harvest was reaped in late October and early November, the yield was found to be very good, perennial weeds had quite disappeared and wide cracks were left all over the cultivated area. As a matter of fact all the land in the farm which was under water for any length of time was cracked rather deeply and thus opened up for the action of the sun and air. It is not necessary for me to emphasize their importance for the growth of plants and crops.

The following year I cultivated *jowar* and *arhar* crops on a few fields the surface of which was comparatively higher. The size of the plants and the yield were quite satisfactory. In 1938 I grew sugarcane over this reclaimed land, but the crop was only fairly good. This year too we have sugar cane on two fields. This is not satisfactory owing probably to the bad monsoon. Besides this I could not manure sugarcane crops with cakes and chemical manures.

*Dhansu*¹ (a kind of spice) crop does very well on some fields.

In 1938-39 the monsoon was very good and I obtained a second crop of barley, gram and wheat after harvesting paddy crops and the yield was very encouraging. Last year the yield of paddy (*bukka*, a local coarse variety) reached 50 maunds per acre on some fields, but the yield of paddy this year was badly affected by the scanty rainfall. *Jowar* and *arhar* crops are excellent this year.

Compost used

As I have got a large herd of cattle on my farm I manure my fields very heavily every year with farmyard compost manure mixed with a light quantity of slaked lime to make the soil friable.

I observed another advantage of holding rain-water. It is that on low-lying areas *kans* and other coarse grasses that shoot up in luxuriant growth in the yearly part of the monsoon are slowly but steadily disappearing, giving place to very good quality of *wkar* grass which appears very late almost at the end of the monsoon and attains maturity by the middle of December. This grass is relished both by cattle and horses.

In 1936 I observed that in most of the *jharberi* shrubs regular *ber* plants had developed. The fruits were no doubt of very poor quality, but in great abundance. This fact suggested to me that plums would grow very well on

¹ *Coriandum Sativum*.

this reclaimed land. I therefore cut down some of the old trees, leaving an inch of stem from the ground. When the new shoots appeared I selected the most vigorous ones and removed the rest. On these shoots I put on the buds of good quality *bers*. I have now over 200 plants of these grafted *bers*. The fruits are as good as of those from which buds had been obtained. They begin to fruit in the second year after grafting.

In 1937 I started a guava plantation on a commercial scale and now I have over 500 plants. The vegetative growth of the plants is very satisfactory and the fruits have good flavour.

Last year I planted about 60 grafts and 40 seed mangoes and so far they are doing very well.

Profit from trees

From 1917 we used to sell *babul* trees worth Rs. 500 on an average every year and in 1938 I sold all the big *babul* trees for Rs. 13,750. I hope the existing *babul* trees will now develop more rapidly and fetch an equal amount of money after 10 or 15 years.

With so much cultivation and plantation the farm provides fodder and grazing for herd of over 100 head of cattle.

Out of a total area of about 300 acres I have brought only 50 acres under crops and fruit, because I believe that the need for pasture-land is much greater than for land for cultivation. It is much more economical and paying to obtain heavy yields from a small area by better cultivation and manuring to have large areas under crops of poor yield.

Our existing fields are getting less and less productive for want of sufficient manure and irrigation facilities. Without enough pasturage we cannot even properly maintain our livestock, not to speak increasing it, and if the cropped area is extended without proportionate increase of our pasture our limited supplies of manure and

water will have to be distributed over a still longer area with the result that in our attempt to increase our cultivated area we will do just the reverse, i.e. we will turn our existing economically productive land into unproductive.

EXPERIENCES OF AN AMATEUR FARMER

BY C. H. PARSONS

Bikrampur, Estate Bazpur, Naini Tal

IT was in the summer of 1936 that we opened our agricultural farm, taking 1,000 acres from the Government of the Terai and Bhabar Estates on a sub-lease.

I had had many years' experience of sugar-cane cultivation and of rotation crops such as wheat, oats and barley; but I had never planted paddy, oilseeds, *dhals*, etc. and this I have had to learn on this farm. The land was mostly virgin, and partly old cultivation, which had reverted to a virgin state due to lack of ploughing. Most of it was covered with *kans* grass which has proved a hard enemy to conquer; in fact, it is not conquered yet.

Struggle with *kans* grass

We purchased an American-made, heavy type tractor and the necessary plough, harrow and rake. We have found, however, that deep ploughing does not eradicate the *kans* but helps its germination. We have tried burning followed by ploughing at intervals but with mild success. The district is a well-known grazing area. Cattle come in thousands for the winter months from the neighbouring districts. We have encouraged the herdsmen to settle large herds on various fields of ours, and after six months of heavy manuring by the cattle, we have found that the *kans* does not germinate again. It is replaced by *dhub* grass which being short does no harm, whilst *kans* is tall and thick.

We have to manage completely without irrigation — this prevents us planting many crops. We however, plant 'dry' paddy. This is just broadcast on the prepared ground, and harrowed in. The success of this crop depends entirely on the monsoon. The late rains of 1941 have done untold harm. We have found from experience that oilseeds are most paying. They are cheap to cultivate, do not need very good conditions in soil and weather;



Bikka paddy crop grown on reclaimed *usar* plot at the Bilanda Farm, Fatehpur

The author standing in a field of barley on recently reclaimed *usar* land.
This is a second crop after paddy

PLATE 36





Mr Bishan Mansingh, owner of the Bilanda Farm, standing beside one of the grafted *ber* (*Zizyphus jujuba*) trees bearing excellent fruit.

PLATE 37

Herd of cattle at the Bilanda Farm.



also they ripen at the time labour is cheap and plentiful for harvesting; they are, moreover, quick to thresh.

Control of wheat smut

Wheat grows well and gives excellent returns, but is at times attacked by frosts, and the growth is affected if it does not get rain at a certain stage. We have had so far a small percentage of smut in our wheat. This I put down to the yearly planting of fresh seed purchased from a reliable source. We have noted with interest the article in the August number of INDIAN FARMING on the treatment of smut in wheat and plan to try it next season.

We have had some exciting experiences with fires. Herdsmen set the grass alight for the new green shoots to appear. These fires sweep up with speed and fierceness, and have done damage to crops and buildings. Besides the tractor we have buffalo power for ploughing and carting. We find buffaloes do better than bullocks in this district. They give more work and need less fancy feeding. They graze where they can, else they are fed on cane tops in the season, *jowar*, Indian corn plants, also wheat and paddy straw.

Farmer's ups and downs

Sugarcane is the main crop here, and for these few years we have supplied it to the nearest sugar mill. This last season, however, due to the sugar quota, we had to crush the cane and sell the juice at a very low rate to *kansaliers*. These contractors make *rab* which is later turned into country sugar. There was no profit in this to us, and we hope that after this coming season, the quota may be lifted.

Farming has its ups and downs, especially in these un-irrigated lands, but all said and done, I would choose the same way of living if I had my choice over again. The open air life is conducive to good health, and there is that pleasure which only farmers can experience on looking over their lands green or gold with crops and saying 'This is all mine'.