

with planting with grasses and babool trees. For lighter lands Kolaikattai is as good a grass as one could wish for and for heavier soils, Chengali, Marawalli and Hariali, may be recommended.

As regards care of the flock I have already referred to the points in which it is defective.

If these points are attended to, further improvement can be brought about by proceeding on the lines which we are now adopting. By limiting the size of the flock to the grazing area available, breeding from the best rams and discarding all poor stock rapid improvement can be brought about. One ewe which with fair treatment will give one lamb worth Rs. 6, is more valuable than 2 ewes, which with bad treatment will give 2 lambs each worth Rs. 3, because it does not eat so much as the two ewes.

And now one word as to the shepherd himself and I have finished. He is conservative, he is poor and some of his practices are bad, but there are among them men of intelligence who understand that there are possibilities of improving their flocks and we hope when we have got sufficient results to show them to get hold of some of these men and get them to make a start.

Improved Agricultural Implements.*

Ever since the various Governments in India decided to interest themselves in the improvement of Indian Agriculture the question of improved implements has bulked very largely in their programmes so largely indeed that in this respect one may say enthusiasm has run riot. But as you are aware, the attempt to introduce any of them into general adoption proved a failure and beyond a few dilapidated relics of some of these implements which one occasionally comes across in Government farms, there is little left to remind us of these attempts. But even though it was a failure and became a fit object for ridicule I

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cannot help thinking that the attempt was a move in the right direction. The failure was due to other causes, which need not be discussed at length here. For one thing there was a lack of knowledge. I mean, the knowledge born out of an intimate acquaintance with the agricultural conditions of the country and the ways of the Indian raiyat. Secondly the time was dominated by the idea that to effect improvements you must work from the top downwards; i. e., have a central farm, train English educated Indians and hope that enlightenment would travel into the interior to the village raiyat, an idea which is luckily going to the scrapheap in the way of some of those venerable implements. Above all there was sad lack of organisation, there was a lack of men and money, consequent on the belief in high quarters that you had only to import a few specialists from abroad to see a revolution produced in Indian agricultural methods. Fortunately for us, time has brought about a change in these conditions and what is more we are feeling the cumulative effect of various economic factors which in those days had just begun to operate. Continued peace, safety of person and property on the highways of trade, more extended and more rapid means of transport both by sea and by land, the increasing demand from foreign countries for all manner of Indian produce, these have raised prices to a pitch never heard of before and have turned peoples' attention to the value of tropical land and to the possibilities of its development. Under these altered conditions, those pioneer efforts in the matter of improved implements are being revived not to meet with ridicule but with the gratifying prospect of being welcomed and taken up by the raiyat. I have therefore deemed it opportune to discuss this matter of improved implements so that we may have the benefit of each other's experience on this important matter viz: *Improved agricultural implements.*

Our indigenous implements have no doubt the advantages of being cheap and simple in construction and fairly efficient; but most of them are exceedingly slow and wasteful. We shall examine these drawbacks a little further, taking the various implements in use at the present time.

Take the plough for instance. Owing to the peculiar V shaped furrow it cuts there are ridges left between every two furrows, which are inevitable even with the most careful ploughing. Under ordinary circumstances these ridges are very pronounced. To stir these ridges thoroughly one has to plough several times before the soil can be stirred well and throughout. Now this same work can be done very much better by a single ploughing with the improved i. e. the mould-board plough. This saving in time enables one to handle at least twice as many acres with the same pair of bullocks—a step directly conducive to the extension of cultivation.

Furthermore it is rarely that the raiyat is able to plough all his fields as well as he would like to in time for sowing; only a few of his fields which he sets apart for the growing of grain for his food are worked thoroughly and the rest are prepared anyhow because with his plough, the work is much too slow. The quickness of work implied by the mould-board plough will enable him to prepare all his fields well and in time and to increase his produce to the extent that this one factor may be capable of. Very often one is asked whether the raiyat really values time. I sincerely believe a more ignorant remark will be hard to find. Time is of the essence in agricultural operations and the raiyat fully realises it. If in spite of it his work is not up to the mark I think it is his poor implements and appliances which are to blame and not he.

The large demand that has now arisen in Mysore for the improved plough is distinctly due to the appreciation on the part of the raiyat of the superior advantages of quickness which this plough confers.

At the numerous ploughing demonstrations we have been holding in different villages this is the feature which most pleases and satisfies the raiyat. To those who have no means of extending cultivation, it has meant economy in bullock labour; for the same work is done more thoroughly with fewer bullocks. To indicate to what extent the improved plough is being taken up, I may say that the Mysore Department of Agriculture sold up to the end of last year over 800 such ploughs; during the current season 1,000 ploughs were ordered

and we are selling them as fast as we are able to fit them up. The most popular plough has been the Kolar Mission plough but any mould-board plough of similar construction would enjoy the same popularity. As the activities of the Department spread further into the Districts, I have no doubt that the number of these ploughs would leap up astonishingly in the course of a few years.

Another clear indication that the plough is appreciated is the fact that some of the local blacksmiths have been copying these ploughs; many raiyats are getting their own shares made locally notwithstanding the endeavours of the Department to cheapen shares by supplying slip-points and bar shares.

Coming now to other tillage implements I think we should strongly recommend a good type of cultivating tool. This is what I mean. After the land is ploughed once or twice the clods have to be broken and the soil brought into a fine tilth. Now in most parts of the country this work is done by the indigenous plough: exceptions may occur to you in the use of the implements called *Dodkunte*—a heavy bladed harrow and *Heggunte*—a three coultured cultivator; but their use is not so general as to affect the problem. Let us see what the use of the plough for this purpose of cultivating really means. The work of cultivation is very much lighter than ploughing and the bullocks are certainly not doing the work they are capable of. A cultivating tool with say four or six tines will cover at least as many times of the ground without in any manner straining the bullocks. At every journey from end to end of the field the country plough stirs only about 4" of space while a good cultivating tool will during the same transit cover about 4' of ground.

We have been recommending a cultivator with six shovels made locally by the Kolar mission, the *Dodkunte* (costs Rs. 7) and Disc harrow (costs Rs. 100) for this purpose. All are being sold but the preference seems to be decidedly for the six shovel cultivator. This tool costs Rs. 12/.

Before I pass on to other implements, I should just invite your attention to the aspect of the cost involved in the use of these impro-

ved implements. To prepare a seed-bed at all satisfactorily with a country plough, it would need certainly 6 ploughings, three of these being ploughings proper and three being in the nature of cultivating. At the rate of 12 as. per day for the hire of a pair of bullocks and a ploughman, the cost would come to Rs. 4/. Using the most costly of the improved implements, one could produce the same and perhaps a better tilth by once ploughing with an improved plough, twice discing with a 6' disc harrow lapping one half each time and cultivating it twice with a six shovel cultivator. This means 1 day plus 5 hours plus 3 hours work, say two days costing Rs. 2/ as an outside limit. So that you could do the work not only more quickly but more cheaply too, by the use of these improved implements.

Before closing this section I may refer briefly to the subject of power ploughing. This method of harnessing steam to the service of man exercises so great a fascination on peoples' minds that with many, improved agriculture is synonymous with the introduction of steam ploughs. Of course it is not necessary to pause and consider whether or not this is a correct view but it may be worth while to see if there is any scope for such outfits. So far as Mysore is considered I should answer yes, to a certain extent. In the black cotton districts, where as you are no doubt aware the field has to be dug once in five years or so to get rid of hariali grass, the conditions are very similar to those that are near Ranibennur in the Bombay Presidency where a steam ploughing outfit is now at work. The fields are very large indeed; fields measuring 10 or 15 acres are by no means uncommon. Even in the areas with the prevailing red loam type, the fields are remarkably large so that one objection at least to the use of steam ploughs may be said not to exist. (Of course I am not speaking of wet lands). Moreover in these black cotton tracts, it is found more and more difficult to get coolie labour for this digging work and even when found little more than an acre can be worked in a season; and the cost of this hand digging is more than even the maximum charged at Ranibennur for the work of the steam plough. So that for this special work at least, I may say that there is scope for the introduction of the power plough.

But the question arises as to the kind of outfit that may be serviceable. Shall we have direct traction or shall it be a Fowler's cable plough? Shall it be a steam engine or shall we have internal combustion engines? The experience so far does not seem to be favourable to the large and somewhat unwieldy double engine steam outfit now in use at Ranibennur. Compact blocks of large areas have nearly all been exhausted: the outfit has to be taken from field to field, much difficulty has been experienced in getting good water for the boiler and considerable expense is incurred in carting the water too. It is then a question for consideration whether a small direct traction outfit consisting of say four plough bottoms with a suitable kerosine engine will not suit this purpose better. Such an outfit will not have the above disadvantages and as only one engine is used the cost per acre will also be very much less.

On the other hand such direct traction has not been found suitable for ploughing more than 8" or 9", a difficulty which perhaps may be got over by the use of disc ploughs. The whole question is however in the programme of the Mysore Department of Agriculture and action will no doubt be soon taken to test these matters.

Furthermore during a recent visit to Poona, I noticed that a Fowler Wyle's motor plough with two plough bottoms had been got out by the Bombay Department of Agriculture to test its suitability, so that before a year is over we shall be having much light thrown on this subject.

Passing on to seed-drills, you are aware that the Bombay Department is attempting to introduce a small American 4 coultered seed-drill costing about Rs. 60. It is doubtful in the first place whether improvements in seed-drills are so urgent as improvements in other implements, in any case I should think the price is decidedly against the new implement.

In the matter of interculturing tools, throughout Mysore the *Yedè kuntè* or small bladed harrows of sizes varying with the intervals of space between the rows of different crops seem to be quite efficient and I refer to them here only to notice a few peculiarities. In some

districts two or three of these are hitched to one long yoke so that with only one pair of bullocks and two or three men this number of rows is intercultured. I should think that this needs copying in other districts. We may note that the working of these interculturing tools shows how the raiyat can manage a two handled implement quite well without needing an additional man, contrary to what we frequently hear about the difficulty of using the 2 handled improved plough. These *yedékuntès* are so light that with the one handle with which they are provided they cannot be kept steady between the rows; in order to correct this tendency the raiyat uses a kind of stick called "*avé mené*" or Semi handle to press the *kunté* with, thereby using both hands at the handles. In the taluks of Chamarajnar and Gundlepet, the ryot uses two separate *kuntès* which are held closely together one in each hand. It is somewhat hard to believe how well the raiyat can use these wobbly arrangements, but practice has made him expert.

Next we come to harvesting tools. Even under the best of conditions labour at harvest time is both scarce and expensive. But under ordinary circumstances in most parts of the province raiyats are put to great inconvenience owing to want of sufficient labour and this notwithstanding that the whole force of available labour, men, women and children turn out for this work and earn handsome wages. This difficulty has become so great and so chronic in fact that a suitable improvement however slight it may be, will be welcomed. It is a far cry from the primitive little sickle which is our harvest tool to the self binder and the other monster implements of America. But we may perhaps start with the scythe, and the mowing machine with or without a raking attachment, similar to the Rajah and the Narbada reapers, said to be becoming popular in the Panjaub and in the Central Provinces.

In Mysore the problem so far as these reapers are concerned, is complicated by the fact that *ragi* is almost invariably grown mixed with a subsidiary crop (ordinary field bean) each row of which alternates with 5 to 11 rows of *ragi*. As the bean is not ready for harvest till after 45 to 60 days from the time the *ragi* is ready, you have to save these rows of bean and harvest only the *ragi*. In fact it was just

to this circumstance that a reaping machine got some years ago for the Hebbal Farm and which does very satisfactory work, was not recommended for general adoption. Still a smaller reaper with a narrower cut *i. e.* less than 3'6" (The Rajah is 4'6" and the Narbada is 3'9") is likely to find favour with our raiyats who may, in view of the great difficulty of obtaining labour, be persuaded either to grow a pure crop of ragi or plant the mixed crop at wider intervals.

For wet lands such as we are used to in Mysore such a machine is out of the question and perhaps a scythe may suit; but even here we are confronted with the difficulty that high class paddy usually lodges and renders a scythe impossible. For the stiffer strawed coarse varieties called *salu bhatta* in Kanarese, the implement would suit, while for the finer superior varieties we have still to use the time honoured sickle, unless indeed varieties are evolved combining the qualities, of high yield and superior grain with a stiff straw.

While on the subject of harvesting tools, I may refer to the case of a peculiarly difficult and expensive crop to harvest. I mean ground-nuts. I do not know what your experience is here, where such a large area is put annually under ground-nut; perhaps much of it is grown as an irrigated crop and the ground is softened a little before harvesting by giving it an irrigation. In Mysore the groundnut is a dry crop and the area is on the increase; but one obstacle is the expense and trouble of digging. It will be impossible on this account, for any raiyat to grow more than can be dug leisurely by himself and his family. Labour is scarce and even if obtainable about a third of the produce will have to be given as wages. In parts of the Bombay Presidency where much ground-nut is grown on the black cotton soil, I have seen a heavy bladed harrow with the tines set at wide angle used for digging the nuts. I do not see why when the ground is not too hard for a bullock implement an ordinary potato digging plough (Rs. 30 or 9 dollars) should not be used, I mean the plough with the mould-board replaced by prongs. If the ground becomes hard of course there is nothing for it but to dig and I have known extreme cases where the crop has been abandoned owing to this difficulty, on

the off chance of a shower of rain some time, when digging may be easier.

Now that we have finished harvesting tools, I shall revert for one minute to tillage tools again. A very good dry farming practice is as you know, to plough up your fields soon after harvest or a little later. Without going into the theoretical basis for this practice, I may mention that the value of such ploughing is recognized in Mysore. In some districts it is invariably practised and raiyats go to great pains in getting this ploughing done but in many more districts it is not. There are reasons for this neglect but I shall refer to only two among these.

Firstly the soil becomes too hard for the plough; this however is not a serious obstacle, for it is not necessary to plough as almost the same advantage can be derived by using a cultivating tool which may scratch the soil say 2 or 3 inches. If we can get the top soil soft enough to absorb the earliest rains we should have done much. I may add here that this autumn ploughing has made it possible for many raiyats to grow successfully an early monsoon crop like gingelly this year while those who began to prepare their fields long after the early rains have had to sow later and their crop is very much poorer. For this kind of work a disc harrow is an ideal implement. But a Rs. 100/- implement with 8 discs on each side is both costly and somewhat heavy. A lighter one with 3 or 4 discs on each side costing Rs. 50 will perhaps meet with a better welcome. After the last harvest, I sent round an agricultural Inspector to visit a large number of villages in the Bangalore Dt. with a disc harrow, with the gratifying result that several raiyats took advantage of the visit and had their fields disced.

Another reason is that at that time of the year all the available bullock labour is busily engaged at the threshing floor or at the cane milling shed. Unless this pressure of work is lightened by the introduction of improvements in threshing and cane milling methods, we cannot hope to get over this difficulty.

This brings us then to the methods of threshing grain and improvements therein. We know the present threshing methods too well to need description here. They are slow and tiresome and wasteful. But is there any object in replacing them by quicker methods? I have heard it said it is the slack season of the year. Why not let the ryots take their own time over it? Now let us examine this question a little closely. A good Mysore village usually has a fairly large tank, below which is an area of garden land and then further on a stretch of paddy and sugar cane fields. There is also a very much larger stretch of dry land close to and around the village, as far as where the fields of the next village may begin. Between the months of January to April, the Agricultural calendar for such a village will be the following.—

WET LAND:—Preparing and sowing Vaisak paddy.

Harvesting and milling sugar cane.

Preparing lands and planting sugar cane.

DRY LAND:—Bringing in and stacking the mixed crop.

Threshing and winnowing the Year's produce.

Dry land ploughing.

GARDEN LAND:—Preparing land and planting cold weather potatoes or other garden crops.

Or in the case of permanent garden of cocoanut or areca, miscellaneous work.

That this period is anything but slack can easily be seen from the the above statement. It happens further that the wet lands are in the possession of men who either do not belong to the cultivating class, or are too well-to-do to work in the fields. They are therefore let out to tenants, who take very little interest in the cultivation, their main interest being in the dry land, which they own, and whose produce Ragi forms the staple food. Consequently these men attend to wet land work only after all their threshing work is finished. Since this takes an inordinately long time, naturally wet land operations suffer, and the most valuable lands in the village are thus allowed to suffer neglect. It is for this reason that we want threshing methods improved.

Already ryots are of their own accord taking more largely every year to the stone threshing roller, because it does threshing work much quicker and with considerably less worry. To those favourably situated, the question for consideration is if a power threshing outfit should not be used. In Mysore we are popularising these outfits. There are two fairly large outfits owned by private gentlemen, and the department owns four. During the last threshing season, we worked the departmental outfits in ten villages, and threshed nearly 41000 seers, charging a fee at the rate of 6 annas per 100 seers of ragi. If we had more men and more outfits, we could easily have served several more villages, for the demand was very keen. The outfits we have been hiring out consist of an oil engine of about $3\frac{1}{2}$ H. P. and an American threshing machine called Pennsylvania, manufactured by Heebner & Sons Lonsdale Pa.

Now I must bring this account to a close. If time permitted a similar case may be made out for several other improved appliances as well, such as power canecrushing mills, pumping machinery, chaff cutters, butter churns and so on. That the ryot does appreciate a saving in time and worry is thus amply evident from the large demand for ploughs, by the astonishingly rapid increase of the threshing roller and by this growing popularity of the threshing machine. I shall add yet another instance of the same tendency, for one of my chief objects in reading this paper is to impress this point. In the *jola* tracts you are aware that ryots put up very large stacks of *kadbi* (dry stalks). The usual practice in building these stacks is to hand up the sheaves along a number of men sitting one above the other on a ladder—a kind of human elevator. Somebody replaced this method by erecting what may be called a *seesaw* or *picotah hoist*.

This is simplicity itself and means a great saving in time and labour. The use of this hoist is spreading every year solely by the force of example. Before concluding, I may be permitted to point out that side by side with the introduction of these improved implements, we should have an eye to the possibility of manufacturing them locally in the country. In regard to at least one implement viz. the improved plough, I think the time is ripe for opening a good 'Plough Works' in

South India. There is an increasing demand springing up, and naturally we should see that our country profits by it and not the foreign manufacturer. More than that, unless there are facilities for prompt and cheap repairs, and for obtaining spare parts close at hand this movement with such great promise of usefulness will be greatly hampered.

Secondly in the case of the costlier appliances like threshing machines, disc harrows, butter churns etc., co-operative ownership should be encouraged. Ryots may not club together in making joint purchases or sales, and the sight of the ryot or his wife walking miles to sell a pot of curds and a pint of ghee, or a basket of vegetables rather than commission one man to take the total produce of the village to the market is common enough, probably because each man believes himself cleverer than his neighbour in cheating a customer. But these same men help each other and lend each other their plough and bullocks in most farm operations. So in the matter of introducing these improved implements on a basis of joint ownership, theoretically at least, the conditions seem to be favourable. So far, only those individuals who can afford to own such outfits by themselves have taken to them. Possibly when people become more familiar with the advantages of cooperation co-operative ownership may naturally come in. But from my experience of the ryot I cannot help remarking that he seems to welcome improvements which would make him independent of his neighbour.

Where he cannot afford to own an implement, he would much rather take it out on hire from somebody who owns it than own it jointly with him. Let us hope however that this is mostly a passing phase, for if the increased efficiency implied by an improved implement reaches him through the door of co-operation, he will gain a double advantage.


In conclusion let me observe that a larger use of suitable improved implements such as we have discussed above will directly result in the extension of cultivation by helping the ryot to cover a large area, in the increase of produce by helping him to attend to all agricultural

operations in time, and where there is scope for neither of these improvements, in the lessening of the expenses of cultivation and consequent increase in his net profit. Since these three objects cannot be nearly all that is meant by the improvement of agriculture, I am sure that a concentration of effort in this direction will bring about a great measure of agricultural improvement.

Iron Plough—A defence.

The Department of Agriculture has been for many years past experimenting on the use of improved ploughs especially to suit the various conditions of land in this country. Though many ryots visit the different agricultural stations with the idea of judging the merits of the improved implements and introducing them in their estates the realisation of the result of such visits has been slow indeed.

In the Central Farm ploughs of various patterns have been tried successfully and the ryots visiting the farm note their efficiency keenly enough and as a result there has been a fairly large sale of monsoon ploughs but they could have been much more had it not been for their wrong conception that the ploughs are too costly to be purchased and their work demands the ryots to maintain more costly cattle and skilful labour and so on.

The ryots do not also understand that an ordinary country blacksmith can do the repair to the plough if ever it requires any. Besides, these iron implements do not require frequent repairs and do not  easily.

Therefore, I shall attempt to show in the following lines how it is more economical and advantagous to use improved implements in preference to the ordinary country implements, in the supreme utility of which, the ryot has a blind faith. A good