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PURE PADDY SEED AND HOW THE RYOT MAY KEEP IT PURE

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By R. O. ILIFFE.

For many years the Department of Agriculture, Madras has been distributing purified paddy seed, but the demand has almost always exceeded the supply. The Department is always blamed because it cannot produce enough seed, and is again blamed when, after a year or two, crops appear mixed. It would be better for those who complain to look further into their own side of the question of pure seed than blindly to throw the blame on to those whose labours are primarily involved in the provision of good seed stocks; and a little more attention to the care of the crop would make it possible for more cultivators to raise their own seed stocks and thus solve the difficult question of supply and demand.

1. Importance of seed purity

(*a*) Let us first examine the importance of seed purity. A pure strain of paddy, such as *G.E.B.* 24, *Co.* 3, *Adt.* 1, etc., is the result of many years of patient work. A minimum of five years is necessary to produce such a strain, and most of them have taken much longer. Inattention at any stage would upset the whole train of work; it is therefore very unlikely that the very officers who are concerned most with purity should be responsible for the " degeneration " and " reversion to type " that

are all too frequently complained of by cultivators who grow these strains.

(*b*) The maxim of the Department in raising seed stocks is absolute purity. This is, of course, impossible to maintain anywhere in the world, but counts of many samples have shown that the purity of the Coimbatore and Aduturai strains is over 99 per cent. Supposing a single seed of a foreign type were to enter a sample prepared for sowing. That seed might not germinate, but if it did it would produce a plant which might bear from 300 to over 1000 seeds. Taking the lower figure, there are 300 potential plants. Supposing only one-tenth of these to be sown, 30 plants would be capable of producing 30 times 300 seeds, or 9000 potential plants. Perhaps 30 plants in a field might escape the eye of a cultivator, but in the next season (again supposing only one-tenth of the adulterating seed were sown) 900 plants would be at once visible. The sudden jump from an invisible 30 plants to an easily visible number of 900 (27,000 in the following season) is the obvious explanation of the ryot's surprise when, from an apparently pure crop of one year, he finds his next crop badly mixed. Clearly it is not possible to lose any time in getting rid of the stray plants, or *rogues,* and the English maxim " One year's seeding is nine years' weeding " is as true of stray plants as of weeds. The war against stray plants that adulterate the sample and pull down the yield must be waged each season rigorously, or the impurities will multiply so rapidly as to get out of hand. This point is treated more fully later on —paragraph 3 (*c*).

(*c*) Another very important argument in favour of purity is that, if more cultivators were alive to the necessity of maintaining pure seed stocks, it would not be necessary for them to come back to the Department of Agriculture every year, or two years, for fresh seed. The Department of Agriculture will never be able to supply fresh seed to all those who apply, and if more people who have once had a supply would look after their own seed stocks more carefully, the Department of Agriculture would then be able to distribute its stocks to new people each year, and so the improved seed would spread more quickly. Thus ryots who make a habit of applying each year for fresh seed are thereby hindering other ryots from getting their supply.

(*d*) Pure seed means pure crops; pure crops mean uniform germination of a high order, leading to uniform growth (all the plants of a field coming up together, flowering together, ripening together). Attacks of disease or pest so common when patches of plants ripen one after the other are reduced to a minimum. Irrigation is made as simple as possible, and there is a minimum of loss at harvest because all the grain can be taken at once. Thrashing is made easier, as all the grains are at the same stage of ripeness. The resulting uniformity of grain commands a better price in the market. The ryot who follows the suggestions given below can sell his produce for *seed,* thereby commanding at every stage pure seed at an advantage, and the little trouble that is necessary in maintaining the purity is amply repaid.

There are many reasons why seed purity is essential to those who wish to get the best out of their lands, but enough has been said to show the importance of this side of the question, and we may proceed now to examine the stages at which impurities may creep in and see how far the dangers may be removed by methods within the scope of any cultivator.

2. Source of seed

(*a*) We may conveniently begin with the purchase of seed. Since the Department of Agriculture cannot supply fresh seed to every applicant each year, the best alternative is for the landlord to get seed from his own fields. Only then can he be satisfied that it has been freed from stray plants during growth, harvested at the right time and not allowed to get wet, properly cleaned and dried, and carefully stored. These, and many other details, are all important in dealing with grain kept for seed purposes. The next best source is a dealer who specialises in raising seed, or who buys up stocks from approved growers. Such men do not appear to exist in this country, and the landlord who finds himself short of seed, or who has suddenly to find other seed when his newly sown crop dies out through drought, has to depend on the merchant who is collecting grain to sell to the mills for food purposes. This grain has been collected from many sources, types being mixed if they look alike, the criterion of mixing being decided by the price the miller is prepared to pay. In other words the merchant collects his stocks for food and not for seed, and if they should subsequently be used for sowing, the crop is almost bound to be a mixture of types. But the argument that should appeal most strongly to the cultivator is that a loan has usually to be raised to buy from the trader whereas seed stocks kept from one's own fields need no such loan. Conditions being so variable in different parts of the Presidency, it is not possible to dilate on this point in this note.

(*b*) In cases where it is not possible for a cultivator in a small way to keep seed from his own stock, he is often prevented from going to his neighbour by a strong prejudice that makes him mistrust his fellow cultivators. This inherent mistrust is a great hindrance to the spread of "improved" seed, but it would naturally disappear if more cultivators could be made to understand the reasons why purity is important and how it can be assured.

3. Seedbeds

(*a*) These may be prepared either wet or dry. Although dry seedbeds offer certain advantages in some districts, and may even be essential, they offer a fruitful source of mixture of seed. Cattle are commonly tethered on ground intended for the dry nursery, and paddy straw is used as fodder. As this straw has, in the majority of cases, been cattle threshed, it usually contains odd grains, and these may easily establish themselves in the ground and come up with the subsequent nursery seedlings. As in some districts the cattle are kept only for the cultivation and threshing seasons, being either sold or sent elsewhere for grazing for the rest of the year, they must be fed somehow, and this is a sore problem in deltaic tracts having practically no poramboke land. But if the idea is to manure the nurseries, and there is nowhere else to tether the animals but on the fields, it would be better to choose a field intended for transplantation than a nursery, and to cart the manure to the nursery afterwards. The nursery would lose the liquid excreta of the animals, but it would be much cleaner. Contamination is more important in a nursery than in a transplant field. For, in the case of a transplant field, there is no movement of stray plants. Seedlings are put *into* the field from the nursery, but no plants are taken *out* to other fields. Consequently contamination from stray grains shed from the litter or fodder, if it occurs, is confined to the place in which it

occurred and any stray plants can be easily seen and removed if necessary. The case of the nursery is far different. If the cattle were tethered on a nursery plot and stray plants result, these may be taken with the seedlings raised in the nursery and so may find their way to any part of the holding at transplanting time. The labour of removing them from this wide area is then considerable, and may be impossible. Hence the importance of keeping the nurseries clean. Paddy straw intended for feeding on the fields should be stacked, as there is then the possibility that the vitality of any stray seeds may be destroyed by the natural heating of the stack. The practice of stacking paddy straw and sunhemp straw in alternate layers, common in the Godavary districts, is good in that the stack heats up to just the right extent and minimises the danger of stray grains sprouting. Referring back to the question of carting manure on to the nursery, the best practice—better than tethering—is to confine the animals to a definite spot where good cattle manure can be made. Fresh litter each day should be given to soak up the liquid excreta, and the mass of straw and dung allowed to consolidate and become well rotted. This makes the manure easily available when applied to the nursery and eliminates all risk of stray seeds germinating, as these are killed out by the heat.

Sheep and goats, which eat what they can find but receive no extra fodder, can safely be tethered on the fields, provided there are no late tillers of paddy bearing seed which may again be voided by them.

(*b*) Sweepings from the threshing floors are often added to the nurseries. Though the idea underlying this may be to increase the organic content of the soil and so to improve its texture and fertility, it is a bad practice. These sweepings are full of stray grains and probably contain weed seeds, seeds of other plants, diseased chaff, etc. They are much better burnt, and the ash may then become a useful manurial dressing.

(*c*) In the dry seed beds of Malabar, seeds of the first crop shed in one year are liable to remain and sprout in spite of all precautions. It is said that these seeds survive the immersion of the 2nd crop and sprout with the first rains after the second crop is harvested. This is a little difficult to explain, but if it is found to occur, the " voluntary " seedlings so produced should either be ploughed in, or collected and transplanted separately, (as there is a tendency to prefer these voluntary seedlings for transplanting owing to their better growth—possibly a result of their wide spacing). This is a difficult question as it is often impossible to obtain water in time for first crop nurseries, and dry nurseries become a necessity. Stray seeds of the second crop do not appear to cause trouble, and if the nursery for the first crop is laid down in a field that was growing the same variety in the previous year, there is no particular danger in the " voluntary " seedlings, as they are identical with the mass. The remedy here lies in using one nursery for the same variety, year after year. If this is done, much of the disadvantage of the dry nursery disappears.

(*d*) In deltaic tracts under canals or channels where advantage must be taken of the first flush, wet nurseries are commonly sown all over the tract at the same time. Usually corners of fields, or fields in compact blocks, are taken, and field-to-field irrigation is the rule. As every one is clamouring for water at the same time, no precautions are taken against washing seed from one field to another. If all the nurseries are of the same variety, the damage due to such washing away of seed may be slight;

but as all varieties may be sown together, in contiguous nurseries, mixtures are bound to occur. The remedy is easy if the disposition is planned beforehand. The position of the fields that can be used as nurseries is fixed in relation to the source of water, but what is usually at fault is a lack of system in separating varieties. Where nurseries are raised on a large scale and the seedlings are sold to other ryots at varying distances, the danger is minimised; when the nurseries are necessarily small, a little co-operation amongst the cultivators along the same channel could prevent any danger of mixture.

(*e*) In broadcasting seed for the nursery, or, where transplanting is not practised, for the main fields, the ryot usually likes to get into every nook and corner of the field and to sow each small field channel, and in his zealousness a little seed is blown over the bund or is washed along the drain into the next field. This is another common source of mixture, and the remedy, if purity is realised to be of importance, is to discard all seedlings in a band at least one yard wide all round the field. These border seedlings may be used for transplanting into fields that are not intended for seed, but for seed purposes only those seedlings from the centre of the nursery, which are beyond suspicion, should be used.

(*f*) In cases where several small plots of different varieties are sown in the same nursery field (an example of this is to be seen in many cases where small quantities of different strains from a Paddy Breeding Station are being tried) the little patches of different seeds are demarcated by clods of earth or twigs lightly stuck into the ground. These are easily moved or washed away and the confusion which results is a certain cause of mixture. Then there is a complaint that the seed stocks were impure! The same condition arises when surplus seedlings of different strains or varieties are transplanted in plots along with the main bulk. The plots are again demarcated by mud lumps. The remedy is to use some more permanent boundary, such as a field drain or a bund, and the importance of leaving a reasonable space between nurseries of different sorts of seedlings cannot too strongly be stressed. *It is not a waste of* space. *It is an insurance.* A space of two feet is quite sufficient in a nursery, with reasonable care, to minimise the danger of mixing.

(*g*) In many cases (particularly on the West Coast) deliberate mixing of seed of similar varieties goes on, as this practice is said to minimise seasonal effects and ensure at least an 8 anna crop in bad seasons. It may. But a maximum crop is never attained. Examples of this custom are *vettuvari* and *vattan* in palliyal lands (single crop), and *velutharika zhama* and *aryan* in double crop lands. Such crops should not be used for seed. Nor is it certain that the custom has much to recommend it.

(*h*) When seedlings have been pulled out for transplanting, the nursery is hurriedly cultivated and some seedlings are replaced. Stray seedlings may, however, persist, and if several varieties were grown in the nursery these may be a source of contamination. Cases where this occurs are not frequent, but in no case is it wise to use a nursery for the source of seed stocks, and the subsequent cultivation will have removed the danger in time for the next crop. As far as possible the position of the nursery should remain unchanged year after year when paddy follows paddy with no rotational crops. Not only will the fertility of the nursery block be maintained and built up thereby, but the risk of contamination

by stray seedlings is lessened by the extra attention that is given to nurseries.

(*i*) The danger of "voluntary" seedlings mentioned above in dry nurseries is not so great in the case of wet nurseries. If water is available the best method of cleaning up fields suspected of harbouring stray grain is to plough and let in water to soak the field for three or four days. As the water dries out the grain will sprout. Some grain will take longer and at an interval of at least a week should be allowed so that all seed has a chance to germinate, and then the plough should again be taken in. The seedlings will soon decay and the danger is removed.

4. Transplantation

(*a*) Fields to be used for planting should, where possible, be freed from shed grains by germinating the grain and ploughing in the seedlings just as for seedbeds (see last paragraph above). This may not be practicable over the whole area, but it is particularly important for the portions set aside for seed purposes.

(*b*) One nursery may be sufficient to plant up the holding, and seedlings from another nursery—and quite possibly a different variety—are frequently used to fill up fields without leaving any space or boundary. This is unfortunately, only too common in the initial stages of trying out strains from the Paddy Breeding Stations. So heavy is the demand for seed that applicants usually have to be content with only a portion of their order. This means that they must fill up their fields with other seedlings, but in the process the dividing line is not kept and the whole field is harvested together. The result is almost certain to be a mixture of types and again the blame for the mixed crop is put at the doors of the Department of Agriculture. The remedy is simple and consists merely in separating the different types by drains or bunds, and harvesting and threshing them separately.

(*c*) Another result of this mingling of types in the same field is the possibility of natural crossing occurring between plants where the two types meet. The seed of that generation will escape detection, but the plants of the next season will show a "degeneration" and again there will be an outcry that the seed was not pure. For food purposes a small amount of crossing is of no consequence, but for seed purposes (and even for food purposes if seed is kept year after year for sowing in the same fields) it must be avoided at all costs. The remedy lies in discarding (for seed purposes) a border of at least three feet in each type, i.e., a band of six feet where two varieties touch. The grain is saleable for food but the seed grain must be harvested and threshed separately. Although the amount of cross fertilisation that occurs naturally is very small, it is constantly going on all round us, and it is just as well that we should all know something about this rather technical subject, so that we may recognise hybridisation as a constant source of contamination (and generally, when uncontrolled, "deterioration") and see how it can be avoided.

An actual example will be the best explanation of the course of events. It must be common knowledge to all who deal with paddy that some plants pass from the green stage to ripening gradually, with merely a change of colour from green to straw, buff, brown, etc. Other plants show pigmentation of one or more parts (e.g. glume, axil of leaf, leaf sheath, node, stigma, etc). A field of plants tipped with purple is quite conspicuous and not at all uncommon. Consider what happens when such a field is growing next to a field of a pure green variety. As a rule, each paddy flower is closely self-pollinated, and by the time the six anthers and the two feathery stigmas are visible, pollination has been effected. The anthers may not, however, shed their pollen until five minutes after they appear, and in very unfavourable conditions, such as dull weather, the anthers and stigmas may be outside the glumes for much longer without pollination occurring. It is therefore obvious that there are distinct chances that pollen from one flower may find its way on to the stigma of another, and so effect a cross.

In our fields of purples and greens, if there are stray plants at the edges that have lodged and so become intermingled, it is quite possible for crossing to occur. Suppose pollen from a green plant has dropped on to the stigma of a plant with purple tipped glumes. There will be no external evidence. The grain will set normally. If it is sown in the next season the resulting plant will have purple tips, and will be indistinguishable in this respect from the pure purples. In the second year the case is quite different. The first generation (F. 1) plant may have produced 500 to 1000 or more grains. (On the Paddy Breeding Station, F. 1 plants have been grown bearing upwards of 10,000 grains). If 500 of these grains are sown and produce plants, there will be approximately 375 with purple tips and 125 green throughout. In future years there will be a constant splitting of the hybrid purples in the ratio of 3 purples to 1 green. It is therefore obvious that contamination due to such crossing may escape attention in the first year, but, once established, it is extremely difficult to arrest. As it may occur every year round the borders of fields, the remedy should be obvious—grain for seed purposes should always be taken from the centre of the field, away from all danger of contamination, and it must be thrashed separately and treated carefully at each stage to ensure purity.

The case of purples and green is very easy to detect. But other crosses are much more insidious and may go undetected for several seasons. The chances of such contamination being annually recurrent, this should be a sufficient argument in itself for a continued effort towards maintaining seed purity.

(*d*) The advantages of transplanting over broadcasting are many, but one that is not often thought of is that there is much greater control over the mixing of strains. If seed is broadcast in a field which already contains stray seed, both the broadcast and the stray seeds will grow up together and there will be no chance of separating the mixture (unless there are obvious differences at some stage of the crop which make a laborious hand picking possible). If, however, this foul field is used to receive transplanted seedlings, there will, from the start, be a difference between the seedlings already equipped with leaves and stray seeds that may eventually sprout, and therefore it is easy to destroy the stray seedlings. The extra space between seedlings of a transplanted crop makes this separation still easier.

(*e*) If a block of transplanted or broadcast crop dies out from any cause, e.g., a water pocket resulting from faulty levelling, crab damage, etc., and the nursery is empty, it is better to pull out seedlings from the same field to fill up the gaps than to take seedlings from some one else's

nursery about which little is known. Exchange of seedlings is very common in some of the larger deltaic tracts and is the cause of much mixing.

5. Growing Period

(*a*) The ryot naturally wants to use every square inch of his field and looks with disdain upon our " stupid " practice of walking into the fields and pulling out stray plants. It is all a question of view point. If the crop is for feeding only, a hurried glance at any bazaar stall retailing rice will show that a slight mixture of grain has but little bearing on the market value. Therefore there is no particular financial advantage in roguing food crops. But for seed purposes roguing is a first essential and neglect of this operation stultifies all our efforts at maintaining purity.

(*b*) It is equally important that roguing should be done by uprooting the whole plant and removing it from the field. Cutting off the vegetative portions with a sickle is of no use as the plants will send up secondary tillers (ratoons) which hurry through their growth and may mature with the main crop. The grain is thus included in the harvest and the work of roguing wasted.

(*c*) Roguing must be carried right through the growing period. It is not a difficult process and an intelligent cooly can be trained to do the work. There is no particular period at which roguing should be done as the difference of growth of stray plants may be more obvious at one stage than another. Thus a first generation hybrid may rush through its early stages and become obvious by its extra height and vigour in the first month. An early, short term variety will be obvious immediately it shows signs of flowering and may easily be spotted amongst the bulk of the rest of the plants that are still in the leaf stage with no sign of flowering. As a general rule the pre-flowering and flowering stages offer the greatest chances of noticing differences. A word of caution is necessary to stop the over zealous from entering a field in full flower. Natural crossing is not common, but the extra agitation caused by walking amongst the plants, and the chance of carrying pollen about on one's clothes greatly increase the danger.

(*d*) Generally speaking roguing need only be done on plots intended for seed. It is always better to do too much than too little and about one-fiftieth of the holding should certainly be treated and this must be done *every growing season.*

6. Threshing

(*a*) The threshing floor is perhaps the most obvious source of contamination. There is no need to advocate expensive floors of stone or cement as the ordinary mud floor can be made quite serviceable in the way common to the country—plastering with cow dung. The chief disadvantage of an earthen floor is that it develops cracks. These should be attended to at once, as they are a source of loss as well as of contamination. It seems unnecessary to enumerate all the good and bad points of threshing floors, but before going on to the less obvious ones, one or two of the more obvious ones may be briefly indicated. Thus a threshing floor should be level and should not be allowed to carry standing water; it should be large enough to allow each variety to be threshed independently of the other; even when it carries all the stacks of unthreshed straw, the space should not be cramped, as the ultimate stacks of threshed straw

will not be very much smaller than the unthreshed ones; it should not be subject to floods at harvest time, nor too much exposed to wind; it should have shade, as the strong sun, besides tiring the animals, is bad for fresh seed; it should not be far away from the fields and it should be watched at night; *above all it should be kept clean.* Cracks should be filled with earth and not with straw, as the straw commonly retains a little grain which then becomes added to that being threshed; but a further large disadvantage of using straw to fill cracks is that it becomes quite impossible to sweep these cracks clean between the threshing of different lots.

(*b*) In some tracts high land for threshing floors is very rare. An ordinary field is then used and this should on no account be put down later to a nursery or should seed bulks be raised on it. The dangers of using it as a nursery are that seedlings sprouting from stray grains are liable, on transplanting, to find their way to any part of the holding and so get hopelessly mixed in. The dangers as a plot for raising seed bulks are too obvious to mention. Such a threshing floor should therefore be chosen only in a field used for raising food crops.

(*c*) In these same districts, because of the shortage of high pieces, threshing floors are used by several ryots clubbing together, and these form a serious source of contamination. Different varieties are all threshed out on the same ground and mixtures, which must inevitably result, thus find their way into the grain of every ryot, and the owner of the field suffers most. It is impossible to stop this system, which is dictated by necessity, and the only remedies are to thresh out seed stocks separately, and to insist on perfect cleanliness (by sweeping after every lot is done, closing up cracks immediately with mud, and by giving the whole floor a further coating of cowdung).

(*d*) Grain intended for seed is often taken out of the bulk after all is threshed. This is a hopeless state of affairs. There are hundreds of agriculturally different types of paddy, but it is not possible to distinguish them all by their grains. Therefore it is not possible to separate them in the mass once they are mixed. The only way of ensuring purity is to stop them getting mixed in the first place. Thus there is only one satisfactory way of saving seed and that is to grow a special plot for that particular purpose. If only one quarter of the ryots cultivating paddy could be prevailed upon to grow special seed plots the difficulty of supplying enough seed to go round would soon disappear. Seed plots should be threshed *first* and, where possible, they should be hand threshed or trodden under foot by the women. In those districts where the seed sheaves are beaten on a board or bench, only the grains that come away with the first beating should be used. Whatever method is adopted, half filled grain, light seeds, etc., should not be used as seed.

(*e*) The threshing floor should be carefully swept and cracks filled up with mud after each lot is finished. This is not much trouble and would save a great deal of labour later on. It is especially important when seed paddy is handled.

(*f*) Winnowing should all be done in one place as far as possible to avoid the distribution of grains that may be light but would still germinate. In a high wind these may be blown about the floor, into the fields, into the heap of threshed grain, etc. Hence the importance of protection from high winds.

(*g*) In Malabar practically every cultivator has his own threshing floor and here the difficulty is not one of common ownership but rather that one man may deal with single crop, double crop, treble crop, and possibly dry paddy (modan) as well. All these varieties are threshed on the one floor, advantage being taken of snatches of sunshine, and with very little cleaning in between. The remedy here is obviously a closer attention to cleanliness. The case is very complicated at the Agricultural Research Station, Pattambi, where we deal with many more varieties than any single landlord or cultivator. Yet by judicious use of snatches of sunshine, and scrupulous attention to cleanliness of threshing and drying floors, we are able to prevent mixtures. We can do it. So can any one else. It is futile to say that it can't be done.

7. Seed drying

Frequently along the border of a roadside village one sees paddy spaced out on a mat to dry. This may be food paddy being dried for pounding, but is often seed grain. Undoubtedly the drying is necessary but the care taken of it bears no relation to its value. Two mats may touch or two piles may be spread on the same mat. Little or no care is taken to see that the fringes of two piles are kept distinct and mixture almost inevitably occurs, and this is helped by crows and inquisitive dogs, children, and passing vehicles. A properly cow-dunged floor with a certain amount of privacy offers better facilities than a mat in a public highway. The mat is likely to catch grains in its meshes and these grains may become a part of the next pile to be dried. The mat is considerably improved if it is washed over with a thick suspension of cow-dung before use, as this closes up most of the cracks and holes; but, whatever other precautions are taken, the grain should be kept away from public places where there are so many chances of contamination and loss.

8. Seed storing

There are many receptacles called into use for storing seed. One may mention gunny bags, mud pots, mud bins, bamboo bins, wooden bins, *mudikattas* of straw twists, *pattarais* of straw twists, pits, granaries, etc. Each method has its merits and demerits. Thus, gunnies are convenient for filling and they hold a recognised quantity for sale, and are cheap. If care is taken to see that no stray grain has been left behind in the bag before it is used, the gunny makes probably the most convenient means of transport and temporary storage. It is not insect or rat proof, nor is it damp proof, and insects and damp are the worst enemies of stored grain. The gunny cannot be said to be a good receptacle for storage, and it has many disadvantages. But it is convenient, and is in such common use that it is unlikely that it will ever be replaced. Again, the maxim is cleanliness. If the grain is occasionally spread out on a floor open to the bright sun, much can be done to keep the grain in a good condition. Sun light is the best cure for storage ills. Mud pots and mud bins may be made insect proofs by a covering of cow dung. Storage receptacles (pattarais, etc.) made of straw twists are built up as required and dismantled after use, but their danger lies in the introduction of stray grains by half threshed straw of another variety. The large granaries of Godavari, like little houses, are usually kept very clean and each year before use receive a fresh coating of cow-dung inside and new thatching outside.

Kerosine tins are excellent for small quantities if kept away from changes of temperature. The usual method of opening a tin, by melting the solder from round the small cap in one corner, leaves quite sufficient space for introducing seed after the tin has been thoroughly cleaned. The hole may be re-soldered or replaced by a temporary plug, or a quantity of dry sand introduced over the seed. The crates sold with each pair of tins are useful in transport.

A good method advocated some years ago was a mud bin on a wooden frame. The top is sealed by a layer of fine dry sand and the seed is drawn off through a hole at the bottom. This is illustrated, along with other suggested methods, in the Proceedings of the 3rd Entomological Meeting, Pusa, February 1919, Volume II, Page 712. "Stored grain pests" by Fletcher and Ghosh.

9. Germination test

(*a*) Before any seed is sown it is an excellent practice to conduct a germination test. If, for instance, it is known that a sample will only germinate 50 grains in each 100, it is clearly necessary to double or even treble the sowing rate to get an even stand. As a matter of fact seed so bad as this should at once be discarded unless it can be improved by further exposure to the sun. But an 80 per cent. germination also needs more seed for sowing than a 99 per cent. germination. Bad samples are easily found out in this test. A sample of which the seeds germinate all together on the same day is good, but some samples will spread out over a number of days. The disadvantage of this in the field is obvious and may often be avoided by further drying.

(*b*) A simple germination test may be carried out on 100 grains taken at random and put between cloth or blotting paper which is kept moist. Examination at the same hour each day for three or four days will soon show the rate and amount of germination. Moist sand or earth may also be used, but it is better to do such tests in the dark in such a way that there are no sudden changes of temperature. A square unglazed tile (porous) divided into 100 squares and placed in shallow water so that it is always moist forms a very convenient germination plate, but it should be covered, as light has a definite retarding effect on germination. The method adopted at Coimbatore for paddy is perhaps beyond the scope of most demonstrators but may be briefly described as follows. A piece of blotting paper is ruled into 100 squares—10 each way—each to take a grain of paddy. The paper is placed on a tray of perforated zinc which, in turn, is enclosed in another zinc tray containing water. Strips of blotting paper are laid between the ruled paper and the first tray and these dip down into the water to keep the whole moist. A lid is provided and aeration is given by series of holes in the sides of the outer container and the inner tray. The complete set is placed in an incubator at a constant temperature, thereby simulating conditions of normal germination. Counts are taken daily and the seeds are removed as they germinate.

10. Conclusion

The purity of a crop can only be kept up by incessant care. The above notes touch on several points where contamination may easily

occur, but a little thought will extend this list greatly. Fortunately it is not necessary to apply these precautions to the whole of the crop. Few cultivators will require more than one fiftieth to one hundredth of their holding for raising seed for their own use, and attention should be concentrated on this. In any field from which paddy for seed purposes is taken, whether it is a special seed plot or an ordinary field, the borders should always be harvested separately and used for food; only the central portion of the field, about which there is no fear of contamination, should ever be taken for seed. At other stages, such as threshing, particular care is again needed for the seed paddy, though nothing has been advocated above that might not easily be applied to the whole crop with advantage.

If it could be said that, in each taluk, there were three cultivators in a fairly large way who could be relied upon to raise pure seed stocks each year, there would be no more difficulty in meeting all the many demands for good seed. The Department of Agriculture will never be in a position to sell seed to all who wish to grow our strains, and the most satisfactory way of making the supply meet the demand is to increase the indigenous supply!

GROW YOUR OWN SEED

STUDIES IN THE COST OF PRODUCTION OF CROPS

(*Continued*)

By D. G. MUNRO

IV

Name of Crop: Paddy.
Area: 4 Acres.
Locality: Seshanchavadi Village (Salem Taluk).

The paddy crop was raised in wet lands commanded by a tank. Irrigation was supplemented from wells. The ryot besides cultivating his own land cultivated the land of another landlord on *Varam* system. As usual the ryot's own cattle were used for mhoting purposes. For ploughing hired cattle were supplemented. Being a small landholder the maintenance charges of cattle were not high as the cattle were often grazed by the boys of the farmer. Extra ration, viz., concentrated food was given to the mhoting bullocks. Season was not favourable. A portion of the land was sown broadcast while the remaining land was transplanted with seedlings.

As there was no water in the tank the cultivation of a portion of the land was done solely with the help of the well water. One month later, the tank got supply of water, and the cultivation was started, and seedbed sown on 30th July, but the ploughing was started only after 45 days. The age of the seedlings was 60 to 65 days at the time of planting. All the fields in question had the benefit of the water from the tank for one month—two varieties of paddy were sown—each five and a half months in duration.

Details of cost of cultivation, etc.

Particulars	Men @ 6 as.	Women @ 4 as.	Pairs @ 4 as.	Amount Rs A P	@ 8 as.
Preparatory cultivation					
Irrigating for 40 days, ploughing and cross ploughing 6 times...	120	...	120	75 0 0	
6 ploughings with hired cattle ...	...	...	100	50 0 0	
Trimming bunds and guiding water ...	50	...	...	18 12 0	
Total ...	170	...	220	143 12 0	
Preparatory Cultivation—Total ...	...	...	...	143 12 0	
Seeds and sowing					
Preparing 1st seed bed and guiding water ...	9	...	9	5 10 0	
Manuring seed bed with 24 bundles of green leaves at 2 annas per bundle	...	...	...	3 0 0	
Trampling leaves at 3 pies per bundle ...	...	...	...	0 6 0	
Preparation of 2nd seed bed ...	18	...	18	11 4 0	
48 bundles of green leaves at 2 annas ...	...	...	...	6 0 0	
Trampling leaves at 3 pies per bundle ...	...	...	...	0 9 0	
Seed for the 2 seed beds—34 *vallams* and for the broadcasted field—6 *vallams*	...	...	...	15 0 0	
Total 40 *vallams* or 225 lbs. at 15 lbs. per Rupee ...	15	60	...	20 10 0	
Pulling seedlings and transplanting ...	...	...	...		
Total ...	42	60	27	62 7 0	

Details of cost of cultivation, etc.—Contd.

Particulars	Men @ 6 as.	Women @ 4 as.	Pairs @ 4 as.	Amount	
Manures and manuring					
Manuring with green leaves—600 bundles at 2 annas per bundle.	...	...	...	75 0 0	
Trampling leaves at 3 pies per bundle	...	...	...	9 6 0	
Total ...	...	...	...	85 6 0	
After-cultivation					
Weeding transplanted and broadcast fields	...	65	...	12 3 0	@ 3 as.
Irrigation					
Irrigating with tank water for 30 days. Rest of the days from well—4 pairs of cattle for 15 days	60	...	60	37 8 0	
Irrigating with 3 pairs for 25 days	75	...	75	46 14 0	
Irrigating with 1 pair for 30 days	30	...	30	11 4 0	@ 6 as.
Total ...	...	...		95 10 0	
Brought forward	...	...	...	...	
Harvesting					
Harvesting, bundling, carrying to threshing and stacking straw.	28 @ 6 as.	78 @ 3 as.	...	25 2 0	Wages given also in kind at 3 local measures for women and 6 for men.
Total ...				25 2 0	

Particulars	Men @ 6 as.	Women @ 4 as.	Pairs @ 4 as.	Amount	
				Rs A P	
Miscellaneous					
Interest on the purchase of cattle Rs 400 and for the cultivation expenses, viz., hired cattle, manure leaves, mhote buckets, etc., Rs 200 or total Rs 600	..	...	...	30 0 0	
at 12 per cent for 5 months ...	...	...	...	40 0 0	
Rent on the land for 3 acres ...	...	...	...	13 8 0	
,, ,, 1 acre ...					
Total ...	...	...	...	83 8 0	
Grand total for 4 acres ...	..	...	...	507 0 0	

Yield of paddy and straw

Grain	46 *khandayams* of 90 M.M. each or 10,350 lbs.
Average yield per acre	2,588 lbs.
Straw yield for 4 acres	350 bundles at 50 lbs. each or 17,500 lbs.
Yield for 1 acre	4,375 lbs.

Profit and Loss Statement

	Rs A P
Value of grain per plot at 16 lbs. per rupee ...	646 14 0
Value of straw—17,500 lbs. at 100 lbs. per rupee ...	175 0 0
Total ...	821 14 0
Value of grain and straw for 1 acre	205 7 6
Cost of cultivation for 1 acre	126 12 0
Net profit per acre	78 11 6

BELLARY ONIONS

By M. GOPALA CHETTI

Onion is one of those profitable crops which have always a ready market. It is an article of every day diet for the poor as well as for the rich. It is one of those crops which can be stored and kept for some time.

Onions belong to the category of spices and they may be broadly classified into two groups, the country variety—the small sized onions and the big sized Bellary onions. Of the latter there are two varieties the white and the red. The red variety is generally liked by people and it is about this that a short description about its cultivation, etc. is attempted below.

Bellary onions are commonly grown by ryots in the northern districts of the Presidency. In Bangalore it is very common. Now its cultivation has gradually extended to the southern districts, namely Salem, Coimbatore, Trichinopoly, etc.

Season.—Onions can be grown at any time throughout the year but the cold weather crop thrives and yields best. Nursery for the Bellary onion may be sown in September and seedlings transplanted in October. It is a five months crop including the period spent in the nursery.

Soil.—Bellary onion can be grown on any kind of soil excepting alkaline lands. However, as it is an irrigated crop and has to develop its bulbs underground a free working soil with good drainage is the best. Deep sticky soils are quite unsuited to the crop. Its cultivation should also never be undertaken in low lying lands where there is a likelihood of water stagnation during the rainy season.

Seed and Sowing.—The crop is best grown from transplanted seedlings. To plant an acre under this crop 2 lbs. of seed will be required costing about Rs. 8. The seed-bed must be carefully prepared. The land chosen for the nursery must be somewhat a high level ground with provision for good drainage. About 6 cents will be enough for sowing the seed necessary to plant an acre. The bit of ground should be dug out well with a mammutti removing all weeds, grasses, etc. completely. Clods should be pulverised and a fine tilth obtained. One to two cart-loads of well rotten farm yard manure may be put on and incorporated well into the soil by again working with a mammutti. The seed-bed should be levelled very evenly (which is very necessary) and laid into longitudinal beds, the width being conveniently put at 3 to 4 feet, the idea being to reach the centre of the bed easily from either side for subsequent weeding.

Having thus prepared the seed-beds, the seed which will go into each bed is obtained by dividing it by the number of beds prepared and it is taken mixed in a vessel with a good quantity of sand and strewn over the seed-bed four times either way the idea being to secure even sowing.

The seed is sown similarly in all the other beds and it is lightly covered by passing fingers' ends over the seed-bed. The beds should be irrigated slowly. The force of the current may be lessened by providing some obstructing material like paddy straw, etc., at the entrance and the water let in slowly. This precaution is very necessary. Otherwise the seeds being very light will be washed off to one corner of the bed. For the same reason the beds also have to be quite even. In two to three days the seeds will germinate. Particular care should be taken to sow the nursery on a clear day, and when we do not expect heavy rains for about a week subsequently. If rainfall is apprehended at night, the seed-beds may be covered by mats, and the mats removed next morning.

The nursery may be irrigated twice a week. Ordinarily water should never be allowed to stagnate in the seed-bed. Otherwise the seedlings will rot and die. Two weedings will have to be given once a fortnight. The day before weeding, the seed-bed should be irrigated and the weeding done carefully without disturbance to the young seedlings from the bunds on either side of the seed-bed.

Preparation of Land.—As soon as nursery is sown, the land intended for transplanting should be given cultivation. Four to five ploughings should be given at intervals. The clods should be broken and a fine tilth obtained. Fifteen to twenty cart-loads of Farm Yard Manure should be used. The land is laid into ridges and trenches of convenient length according to flow of water. Ridge to ridge it may be 2 feet apart with trenches about 9 inches wide at the bottom.

Transplanting.—The seedlings are 35 to 40 days old when they are transplanted by which time they are about 6 inches high. The seed-beds are watered first and after a good soaking the seedlings are carefully lifted without breaking their tiny roots. Seedlings whose roots have been torn away should be rejected then and there. Water is let in the trenches and the seedlings are transplanted in the evenings in *single seedlings* on both sides of the ridge about 5 ins. to 6 ins. apart. Never make the mistake of planting in twos. The optimum width is found to be 5 to 6 inches but not further apart if maximum yield is to be obtained. All the seedlings take root and failures are usually uncommon and there is no necessity for filling up gaps. Single seedling: on both sides of the ridge: and 5 to 6 inches apart: these are the most important points to be borne in mind in the cultivation.

A light irrigation may be given on 3rd day and subsequent irrigations once in five days or so about a month till the seedlings get established. A good weeding and hoeing should be given after a month. Afterwards irrigations once a week and hoeing once a fortnight are all that are necessary.

Bulbs begin to form in the 3rd month or so after transplanting. They will be visible outside and they should not be earthed up and covered with soil. For their development they seem to like exposure to sun and air. Bulbs that are covered with earth while growing do not develop inside the soil and this has been found by experience to lessen the yield considerably. This is again another important point to be noted in Bellary onion cultivation.

Harvesting.—About four months after transplanting the crop matures and will be ready for harvest. The signs of maturity are the leaves turning yellow and beginning to lodge. The bulbs would be filled up and the outer coats getting dry and peeling off easily. Two to three days before harvest the crop may be irrigated. This serves to increase the weight of the bulbs, and also renders harvest easy. Harvesting is done by lifting the bulbs. If hand hoe is to be used particular care should be taken not to injure the bulbs for injured bulbs tend to show signs of rotting when stored. After lifting, the leaves are cut off from the bulbs. One acre of the crop yields on an average 15,000 lbs. per acre which valued ordinarily at Re. 1 per maund of 25 lbs. cost Rs. 600. Very good yields of 20 to 25 thousand pounds per acre have also been recorded under favourable conditions of season and soil. Sometimes when there is a good demand the price goes up to Rs. 1-4-0 per maund. The produce may be taken in lots to a good market near by and disposed off. Bellary onion keeps well for a month or so without appreciably decreasing in weight.

The best plants may be left for seed-heads to ripen and these seed heads may be removed in a week's time, dried and the seed collected.

To sum up, this crop requires clean cultivation. It succumbs to weeds easily. Timely irrigations should be given. Only single seedlings should be planted, not on one side of the ridge but on both sides of the ridge and not more than 5 ins. to 6 ins. apart. Bulbs when they are developing should not be earthed up. They should be left exposed as such. Bearing these points in view, the crop may be profitably cultivated. Profit per acre varies with season and locality.

Cost of cultivation per acre.

	RS	A	P
Cost of raising nursery to plant an acre	11	5	0
5 ploughings (12½ pairs)	12	8	0
15 cart loads of farm yard manure	15	0	0
Spreading manure—5 men			
Breaking clods and levelling, with Guntaka—½ pair 5½ men	2	1	0
Forming ridges and furrows—½ pair and 10⅓ men			
Pulling out seedlings and planting—12 women at 3 annas each	2	4	0
Weeding—10 women	1	14	0
Hoeing 4 times—40 women	7	8	0
Irrigations 20 including planting irrigation, 60 pairs and 60 men to guide water	78	12	0
Lifting bulbs, removing sheaves, carrying, etc., 16 women	3	0	0
Total ...	139	2	0

or Rs. 140.

Produce	600	Mds.	
Valued at one rupee per maund	600	Rs.	
Net gain per acre	460	,,	

If the ryot cultivates the land on *varam* system he will get for his share Rs. 230 as his profit.

THE INDIAN SUGAR PROBLEM AND ITS SOLUTION

An abstract of Sir Subrahmanya Aiyar's Lecture for 1930 delivered under the auspices of the Madras University

BY

RAO BAHADUR T. S. VENKATRAMAN,

Government (of India) Sugarcane Expert.

Looking at the surface of things one would wonder if at present there exists any problem associated with our sugar needs. On the other hand, the price of sugar has been going down sometime back and the world is faced with an over-production of this commodity, which recently caused a reference to the League of Nations. The real problem however presents itself when one realises the dependence of India on other countries for the bulk of the supply of this essential article of food. To-day India is dependent upon the outside world for more than 85 per cent. of her needs in sugar, costing sixteen crores of rupees.

Bad as the present position is, the future outlook is, if anything, worse. Now the bulk of India's needs of sugar and sugar products, viz., 75 per cent., is met by the indigenous *gur* or jaggery, which commodity had been enjoying a certain amount of protection in the religious sentiment of the people against the white sugar, in the manufacture of which bone-char was believed to be used. This sentiment is gradually wearing out. Secondly, the *per capita* consumption in India is much less than in America, Germany or England—less than a fourth in some cases; and it is safe to assume that in the near future our people are likely to go in for more sugar in their diet. The above two causes are likely to steadily increase our needs of white sugar in the future.

In considering our present dependence on the outside world for sugar there are two facts which are of importance. One is that we have in India nearly half the sugarcane area of the world and therefore an area greater than any other single country. The second is that it would appear very likely that India was the original home of the sugarcane and spread to other countries from us.

The reason for the anomalous situation of India in the sugar world is her low acre yields in sugar which are in certain cases less than a fifth of what they are in the other countries of the world. The low yields result from two causes, viz. (1) the poor class of canes grown over the bulk of the Indian sugarcane area and (2) the wasteful methods of manufacture.

In 1912 the Government of India started at Coimbatore a Sugarcane Breeding Station for improving the quality of the kinds of cane grown. The canes produced at this station and now spreading rapidly in North India have proved real improvements, the yields in certain cases being more than double that of the indigenous varieties. It can now be assumed that, in course of time, canes would be available in India of a quality comparable to those in the other parts of the world.

But an increase in acre yields alone resulting from improved canes and better cultivation methods would not solve the problem. At present there is considerable waste in the primitive indigenous methods of manufacture which are inefficient. It has been computed that, if the existing canes were all worked up in up-to-date factories, the whole of the supply of white sugar could easily be found within the country. It is significant that India with its about two and three quarter million acres under cane has only a little over 30 factories and refineries against the 170 factories in Java for a sixth of the Indian area.

The solution of the Indian problem lies therefore firstly, in the increasing of the acre yields through the adoption of better varieties and better cultivation methods and the starting of a large number of up-to-date sugar factories in suitable places for the working up of the canes into sugar in an economical manner.

'Live that you may learn'

" People are always thinking of education as a means of livelihood. Education is not a profitable business but a costly one; even the best attainments of it are always unprofitable in any terms of coin. No nation ever made its bread either by its great arts or by its great wisdoms. By its minor arts and manufactures, by its practical knowledges, yes. But its noble scholarship, its noble philosophy, and its noble arts are always to be bought as a treasure, not sold as a livelihood. *You do not learn that you may live, you live that you may learn.*"—RUSKIN.

From the *Journal of the Royal Society of Arts*, March 21, 1930.

College Day and Conference 1930

The 20th College Day and Conference will be held this year from July 15th to 18th. G. R. Hilson Esq., Director of Agriculture, Madras has kindly consented to preside over the Conference.

The following is the tentative programme:

Tuesday	*15th July.*	Sports. M.A.S.U. 'At Home.'
Wed.	*16th* ,,	Exhibition.
Thursday	*17th* ,,	Forenoon.—Exhibition.
		Afternoon.—Union General body Meeting.
Friday	*18th* ,,	12 noon to 4 p.m. Conference.

WHAT THE TREES SAY (March 1930)

A Lesson in Nature Study

By P. S. JIVANNA RAO

" The trees, like the longings of the earth,
Stand a-tiptoe to peep at the heaven."

Tagore—(*Stray Birds*).

The hot season has commenced in earnest with the maximum temperature going up to 99 degrees. The air is laden with dust and the grasses and weeds of the roadside have dried up. Water in the well has gone deep and the atmosphere is languid. The weary pedestrian lays his heavy load on the bear-weight and crows above are " silent on the Tamarind branches ". Tobacco and wheat were harvested some time ago and cotton is picking. The Cactus blooms and the Mexican thistle has its erect capsules full waiting to be delivered by the wind. With the demon of drought in the soil beneath and in the atmosphere above, the tree flora presents a mixed and unique aspect which is worth recording.

The Evergreens.—Best known of the evergreens is the mango which is in an advanced stage of flowering and the " fruits are secretly filled with sweet juice ". The Nim reigns in splendour as if defying drought and wastes its complete flowers. The hardy Morinda blooms in the night and pervades its fragrance till morning. Stately Polyalthia puts forth its bunches of flowers in the branches amidst luxuriant and wavy leaves and both Sirish and Rain tree flower extravagantly carrying loads of old fruits, leaves and flowers. Pongamia shows a similar tendency and Peltophorum flowers and fruits in an irregular and inconsistent manner throughout the year. The fruiting season is over in Tamarind and Cassia which undergo periods of rest and the Portia sheds its hollow fruits and buds.

Deciduous Trees.—Desperate among the deciduous is the Indian Elm which casts off its leaves thoroughly undergoing as it were a severe penance. Cordia and Odina behave likewise and the Cork tree stands aloft " seeking the solitude of the sky " with perchance a crow's nest at the summit. The Gul Mohr, the Coral tree and the Golden Shower shed variously in an interesting manner and are reluctant to part with their ripe pods. The Indian almond stands bare with outstretched arms and the Loranth-infested Peepul shakes off its " trembling " leaves quickly and clothes itself as quickly with new and tender leaves. More trees of a partly or wholly deciduous nature may be noticed in the garden.

It may be said in general that of the above trees the Nim challenges drought, the mango endures it, the Peepul gets over it, the Elm surrenders (its leaves) to it and other trees are indifferent to it. In none of them, however, the behaviour is quite absolute for each individual tree solves its difficulty in its own way in spite of a general periodicity which is characteristic of the whole species.

TWENTY-FOUR TREES

Name of tree	Common name	Notes
Acacia arabica ..	Babool ..	Leaves, old fruits and flowers.
Albizzia Lebbeck ..	Sirish ..	Old fruits, leaves and flowers.
Azadirachta indica ..	Nim, Margosa ..	New leaves and flowers.
Cassia Siamea ..	..	Old leaves and fruits.
Cassia fistula ..	Golden shower ..	Deciduous, old fruits.
Cordia myxa ..	..	Leafless, old fruits.
Delonix regia ..	Gul Mohr ..	do
Enterolobium saman ..	Rain tree ..	Old fruits, leaves and flowers.
Erythrina indica ..	Coral tree ..	Leafless or leafy, old fruits.
Ficus religiosa ..	Peepul ..	Leafy or leafless.
Holoptelea integrifolia ..	Indian Elm ..	Leafless with fruits.
Mangifera indica ..	Mango ..	Evergreen, flowers and young fruits.
Millingtonia hortensis ..	Cork tree ..	Leafy or leafless.
Moringa oleifera ..	Drumstick, horse reddish	Leaves, fruits and flowers.
Morinda tinctoria ..	Nona (Tam.) ..	Flowers and young fruits.
Odina wodier ..	Odiyan (Tam.) ..	Leafless.
Parkinsonia aculeata ..	St. John's thorn ..	Leaves, fruits and flowers.
Peltophorum ferrugineum ..	..	do
Pithecolobium dulce ..	Korkapille ..	do
Polyalthia longifolia ..	Asoka ..	Leaves and flowers.
Pongamia glabra ..	Pongam (Tam.) ..	Old fruits, leaves and flowers.
Tamarindus indica ..	Tamarind ..	Leafy or leafless with or without flowers.
Terminalia catappa ..	Indian almond ..	Leafless or leafy.
Thespesia populnea ..	Portia, Tulip tree ..	Leaves, flowers and fruits.

EDITORIAL

The Recent Reorganisation of the Madras Agricultural Service

At long last, it is a great relief to see, that Government have been graciously pleased to pass orders in G. O. No. 504, Development, dated 10th March 1930, reorganising the Madras Agricultural Service—a subject which had been pending consideration since 1924. It may be remembered that in that year, in accordance with the recommendations of the Lee Commission, recruitment to the Indian Agricultural Service was stopped and pending further orders on the subject some of the posts in the Indian Agricultural Service were filled up either by promoting men already in the Provincial Service or by appointing direct recruits with European qualifications.

The Royal Commission on Agriculture subsequently made enquiries on this subject and made certain definite recommendations on the policy to be observed in the reorganization of the higher agricultural services.

Although the findings of the Commission were published with remarkable expedition early in 1928, no action was taken in matter till the recent orders issued, following closely in the wake of orders passed in regard to reorganisation in the Educational Department.

We are glad that after a long weary wait, during which the acting incumbents were kept in an agonising suspense without any definite *locus standi*, their position has now been cleared. We are sorry, however, that we must confess to a feeling of intense disappointment as the scale of pay and grades ordered in the case of the Agricultural Department compare extremely unfavourably with those of the new scales introduced in the Educational Department. In the latter Department, two distinct classes of Provincial Services—Class I and Class II—have been created and the rates of pay of Class I officers are the same or even better than the old Indian Educational Service. In the case of the Agricultural Department, however, not only are the annual increments and maximums fixed very much lower, but also there is only one grade both for controlling and subordinate officers, like the Deputy Directors and Assistant Directors in the Districts and Heads of Sections and their Gazetted Assistants at the Research Institute at Coimbatore. Even the selection grades included in the reorganisation scheme are conceived in an extraordinarily illiberal fashion and none of the existing incumbents can hope to get into the selection grade. The position thus is that Deputy Directors and Heads of Science Sections who are expected to scrutinize and direct the work of the Gazetted Officers under their control and in addition bear the responsibility of administering a Circle or a Scientific Section, have to draw the same scale of salary and allowances as the subordinate Gazetted Officers under their control. We venture to ask if more work and greater responsibility without any corresponding compensation is just and equitable to

the Officers who happen to be in controlling positions now and to those who will get into similar positions in future. Even the most optimistic and cheerful soul cannot but smart under a sense of injustice of this new dispensation.

We must count it a piece of singular misfortune that in ordering the reorganisation of the Agricultural Services the Government have apparently done what they evidently wanted to avoid. For, in paragraph 2 of their order, referring to the recommendations of the Royal Commission on Agriculture they say:

"The chances of recruitment of non-asiatics to Provincial Services are small and future recruits will ordinarily be from local men. The demand of the Indians in the past for high salaries was based on the claim that they should get the same salary as the majority of the service. Now that the Provincial Service will recruit few non-asiatics the scale of pay should be fixed so as to be suitable for the fields from which recruitment is to be mainly made."

The anxiety of the Government to avoid deferential treatment of Indians in regard to pay and prospects is clear, and yet by a curious irony of fate, differentiation has been made in the services of the Agricultural and Educational Departments both of which are on the transferred side of the Government. The following statement shows the position clearly.

	Educational Dept.	*Agricultural Dept.*
Officers of the rank of Deputy Director or Head of a Science Section	400–50–1,250 Selection grade 1,500–100–1,800	250–25–550–25–750 Selection grade 800–25–1,000
Officers of the rank of Assistant Directors or Assistant Experts in the Science Sections ..	250–25–550–50–800	250–25–550–25–750

The figures speak for themselves. We see clearly that the object of the Government is the introduction of economy in the services. We are entirely at one with the Government's view that Indianisation of Services must result in economy and agree that Indians should not grouse at reasonable economies effected in the pay and prospects of the services. But, how can members of the Agricultural Department view it with complaisance when their highest grades compare less favourably even with Class II service of the Educational Department, and when Government have taken a new line of action, quite against the recommendations of the Royal Commission on Agriculture and completely at variance with their declared policy that the Agricultural Services should be on a par with those of the Educational.

In G. O. No. 975, dated 26th April 1915, Government stated:

"We readily accept the proposition that the pay and prospects of the Provincial and Subordinate Agricultural Services, both on the Agricultural and on the Science side, should not be inferior to those offered in the

corresponding branches of the Educational Service, seeing that the development of Agriculture, with its direct effect on the well-being of the people, is no less important than the development of education. . . . . and we feel strongly that, if the right stamp of man is to be attracted, rates of pay must be offered analogous to those drawn by other Provincial Services . . . ".

Are we then to understand that the differences in the grades and prospects in these two Departments on the transferred side of the Government imply the existence of any definite inferiority complex in the Agricultural Department? We sincerely hope that it does not!

Again it is highly distressing to note, that the highest grades in the Agricultural Department compare unfavourably with even Class II grades of other Departments under the Madras Government as the following statement will show:

Service	*Scale of pay*	*Years to reach maximum*
Madras Agricultural ..	200–200–200–250–25–550–25–750	24
,, Civil ..	300–40–500–50–850 (1,000–100–1,200)	13
,, Judicial ..	do	13
,, Survey ..	do	13
,, Income Tax ..	300–40–500–50–900	14
,, Co-operative ..	300–40–500–50–750/850	11–13
,, Registration ..	250–30–400–50–500, 600, 700	—
,, Education, Class II.	250–25–500–50–800	17
,, Fisheries ..	250–25–500–50–750	16
,, Medical ..	250–15–350–20–450–500–50–950	—
,, Excise ..	325, 375, 425, 600–50–900, 1,000–100–1,200	—

It will be seen that in most of the Services the maximum is reached in 11 to 13 years while in the Agricultural Service it takes 24 years. Again, while in most of the Services the increment after the efficiency bar is Rs 50 per annum, in the Agricultural Service the increment is Rs 25 even in the Selection Grade.

The outlook is gloomy for all classes of men already in the Department and quite unattractive for future entrants of the right sort. Facts being what they are, even the most devoted lover of science being human, and human nature being what it is, we ask if this is real economy and if it is in the interests of Madras Agriculture.

NOTES AND COMMENTS

Egypts' fight against Locusts

"Moving swiftly in two columns from the Sudan and Palestine, respectively, enormous swarms of locusts are converging on Egypt" says a *Madras Mail* cable from Cairo, dated 7th April: "The Government has voted £50,000 and is mobilising all its resources to combat this serious menace. An Englishman, Mr. Ballard, has been appointed to command the operations in the Sinai zone."

Mr. Ballard who was Entomologist in Coimbatore is no stranger to many of our readers. We wish him and Egypt every success in this great struggle.—[Ed. *M. A. J.*]

The Madras Health Week Exhibition

The following occurs in *The Medical Practitioner* of March 1930:

"The best and most useful exhibition in the enclosure was that of the Government Agricultural Department.

The contamination, and the prevention of contamination of foodstuffs by bacteria and fungi, were illustrated in a very intelligent manner. Those who cared to enter these otherwise humble stalls would certainly be benefited and come out with useful impressions.

Their cheap but effective formulae to kill rats and cockroaches, and recipe to prepare fly papers, and liniments for preventing mosquito bite, are very useful, as they are cheap and could easily be made at home without the help of costly chemists and other vendors.

The organisers allowed stalls of patent secret remedies which attracted the masses and added to their ignorance. The money thus earned might well have been foregone in the interests of the movement."

News from Abroad

We learn from *Tropical Agriculture*, of February, 1930, that Viscount Willingdon, Governor-General of Canada, formerly Governor of Madras and Bombay, and Lady Willingdon, accompanied by his A. D.-C. Capt. R. J. Streatfield, visited the Imperial College of Tropical Agriculture, Trinidad on 13th December last and were shown round by the Principal. We hope they were reminded of their several visits to our College and Institute at the time while they were in Madras.

Factory for Agricultural Machinery in Russia

According to *Science* of January 1930, an Associated Press dispatch reports that seventeen Russian agricultural engineers arrived from Moscow on December 1929, on the *Nieuw Amsterdam* to study the manufacture of farming implements in the United States. They are reported to have said that the Soviet Government is planning to construct the world's largest factory for the manufacture of agricultural machinery and implements at Nijni-Novgorod.

Mr. T. S. Azizuddin Sahib

On the eve of retirement from service, Mr. Azizuddin Sahib was entertained at a tea-party on the 30th March, by the members of the

Principal's Section. Mr. Azizuddin Sahib is one of the diplomates of the Saidapet Agricultural College and has been in Government service for no less than 37 years. It is indeed an achievement, particularly so owing to the fact that he is still strong and sturdy and looks none the worse for such prolonged service. A resident of the College Estate for nearly twenty years, he had endeared himself to one and all and will be badly missed, particularly in the Botanical garden, in the management and improvement of which he took an abiding interest. He is a devout Mahomedan, always amiable and contented. We wish Mr. Azizuddin Sahib, one of the few Mahomedan officers of our Department, a long lease of life to enjoy his well-earned rest.

The Association of Economic Biologists

Mr. K. Ramiah, Secretary of *The Association of Economic Biologists* writes to us:

"An association called *The Association of Economic Biologists* has been formed with headquarters at the Agricultural Research Institute, Coimbatore. About 52 members have already joined the association. The following members were elected to the Executive Council for the year 1930:

Dr. T. V. Ramakrishna Ayyar	..	*President.*
Mr. G. N. Rangaswami Ayyangar	..	*Vice President.*
„ K. Ramiah	..	*Secretary.*
„ N. L. Dutt	..	*Committee Members.*
„ K. M. Thomas	..	*Committee Members.*

All persons interested in any branch of Applied Biology are requested to join the association and take part in its activities.'

[The rules of the Association and a form of application are given as a supplement to this issue. [Ed. M.A.J.]

GLEANINGS

Cleaning Glassware

The standard bichromate "cleaning mixture" of the analytical laboratory has long since deserved to be displaced. It is dangerous, destructive, and inefficient. Trisodium phosphate as a possible laboratory detergent has been investigated exhaustively and has much to recommend it. A 15 per cent. solution, heated to about 70°C., can be used for cleaning burettes and other volumetric glassware with very satisfactory results.—*The International Sugar Journal*, February, 1930, p. 99.

Research Pays

Mr. H. Atherton Lee, Research Director, Philippine Sugar Association, recently stated that with a budget of only $37,500 he calculated that results had been obtained by the Association representing an actual accrued value to the Sugar industry of more than $1,500,000. For example, the

discovery that some districts required phosphoric acid as fertiliser, while others needed nitrogen alone had resulted in enormous savings. Some 2,000 acres of refractory soils had yielded to a treatment of potash, supplemented by bagasse ash and filter-press mud. Further in many districts the Research Bureau had been able to increase yields over 75 per cent.—*The International Sugar Journal*, February 30, p. 99.

Vitamins in Tomatoes

Experiments recently conducted at the United States Bureau of Chemistry and Soils have shown that tomatoes which are allowed to stay on the plant until they are ripe are superior in vitamin content and food value to those picked green and then treated with ethylene gas to give the fruit the colour characteristic of the ripe fruit. The ethylene treatment, however, apparently has no harmful effect on the vitamins already present in the green fruit.—(*Indus. Engin. Chem.* Nov. 1929.) From *Tropical Agriculture*, March 30.

High Frequency Radio Waves Affect Insect Activity

Headlee and Burdette in their article on "Some facts relative to the effect of high frequency radio waves on insect activity" in the Journal of New York Entomological Society, 37, (1929), No. 1, pp. 59-64, report that in work at the New Jersey Experiment Station insects were found to be killed when exposed to high frequency waves of 24 metres and 12,000,000 cycles per second with the ammeter reading about 1.75 amperes. This lethal effect was due to the development of an internal heat of lethal degree.

"Nervous re-action speeds up at the rate of producing this internal lethal heat, and the more specialised the nervous tissue the greater is the increase in speed of reaction. All organic chemical compounds with which the writers have worked and which are more or less characteristic of living tissue show ability to increase in internal heat when subjected to the above high frequency waves, and of all these organic compounds with which work has been done *cholesterol* stands out pre-eminently in this respect. Cholesterol is characteristic of nervous tissue."—*Experiment Station Record*—Vol. 61, No. 7, 1929, p. 655.

The Vitamin Content of Grass Seeds in relationship to Manures

Two similar plots of ground in the same field were sown with grass seed. One was manured with dung from pigs which were fed on barley meal, "middlings", and "Vitameale", a preparation containing "Bemax" residue, which has a high vitamin-B content. The other plot was manured with artificial manure, i.e., basic slag, kainit, sulphate of ammonia. The grasses were cut and the seeds separated by hand. The chemical analyses of the seeds were practically the same. The seeds of the grasses were added to a standard B-deficiency diet. In the preventative test three rats added to a standard B deficiency diet. In the preventative test three rats on "dung" seed grew 134g., as against 68g., grown by the three rats on "artificial" seed. In the curative test the rats, having been on B deficiency diet, were put on 25 per cent. "dung" seed and rapidly recovered.

The rats put on "artificial" seed became so ill after three days that they had to be put on "dung" seed, when they immediately recovered. The conclusions drawn were that the plant can absorb vitamin-B from the soil, and the vitamin-B content of the plants depends on the amount of vitamin in the soil.—(*Chem. and Ind. Journal*—Vol. 48, No. 52.) From *Tropical Agriculture*, Vol. VII, No. 3, p. 81.

Extinct Dwarf Elephants

According to Mons. Raymond Vaufrey, a species of elephant ranging in height from 3 ft. to 6 ft. existed in prehistoric times in some of the islands of the Mediterranean Sea, such as Sicily, Malta, Sardinia, Cyprus and Crete. The fossil bones are found in deposits in caves and rock-fissures. The fossils show clearly that the dwarf species of elephants found in these islands were but races of the larger extinct species of European elephant—Elephas antiquus—which roamed freely over the plains of Europe in Pleistocene times. It is believed that these islands formed part of the European mainland in those early times and that the elephants became cut off when the Mediterranean sea region became submerged and the islands became separated and also that these elephants gradually grew smaller in size owing to the effects of isolation in insular areas. As bones of man are not to be seen among the deposits, it is inferred that these species became extinct before prehistoric man reached these islands.

In this connection, it may be mentioned that the giants among elephants—viz., the Mammoths—reaching 13 ft. in stature also lived and roamed over the huge ice-covered plains of Eurasia in Pliocene and Pleistocend times.—*Nature*—January 18, 1930, p. 82.

Plant disease Inspection, Belgium

By a Royal Decree, dated 13th May 1929, a chief inspector and a number of assistants are appointed to carry out a special phytopathological inspection service in Belgium, with the right of entry to nurseries, etc., and of examining the plants therein, especially those destined for export. The importation of nursery stock showing the presence of any injurious plant or animal parasite is forbidden. No nursery produce may be exported except from areas recognized by the inspection service as free from injurious parasites. The Minister of Agriculture may require nursery produce destined for export to be accompanied by a certificate stating that it is free from diseases and pests before being exported. The owner of any nursery, etc., where the inspectors find any injurious animal or vegetable parasite to be present must arrange for its destruction. Arrangements can be made for voluntary inspection of plants not destined for export.—*Review of Applied Mycology*, February 1930.

Leaf-Scald of Sugarcane

A review of a Report by D. S. North on "Leaf Scald Disease of the Sugarcane and its Control"—Agricultural Report No. 9 of the Colonial Sugar Refining Co., March, 1929—has appeared in the *International Sugar Journal*, for February, 1930, from the pen of Dr. C. A. Barber, Cambridge.

The disease is said to be a destructive one and was first noticed in Australia and Fiji, but it has since been recorded also from Mauritius, and it is possible that it may be discovered in other countries also.

Leaf-scald is said to appear in two phases—the chronic and the acute. The *Chronic* phase is shown by odd, stunted canes with shortened, stiff, upward curling leaves, withered at the tips; some leaves being white (chlorotic), and side-shoots sprouting from every bud. Straight, narrow, whitish leaf streaks appear, many running the whole length of leaf-blade and leaf-sheath. Frequently one, two or three canes in a stool show these characters. The leaf-streaks present the best symptoms of disease and should be looked for. The *Acute* phase is seen when whole stools or parts of them suddenly wilt and die; and sometimes this occurs in whole fields, as if their roots had been cut off.

The *Causal agent* of leaf scald is an extremely minute bacterium, at present unnamed, but differing from that causing *gumming*. It occurs in countless numbers in the reddened vessels of the stem-fibres and under the leaf streaks. The vessels may be destroyed and the surrounding tissues invaded. In the affected vessels, a wound gum is formed which blocks the cavity and cuts off the water-supply. The *spread* of the disease in the plantations is said to be brought about in three main ways and possibly in a fourth: by planting diseased material, by using infected knives, and by some means at present unknown but suggestive of an insect carrier; and, also apparently, from root to root to adjacent plants.

For further details, our readers are referred to the review itself or to the original report.

Apparently the disease is still unknown in India and this is one of the ills that one should beware of introducing by careless importation of foreign varieties.

World Distribution of the Chief Industrial Minerals

The following information as to the main sources of the chief minerals of industrial importance will serve to show how interdependent the various countries of the world are in regard to supplies of the basic materials on which the structure of modern civilisation is built.

" China supplies about two-thirds of the World's needs of Antimony. The British Empire produces about 90 per cent. of the *Asbestos* supplies and about 63 per cent. of the *Chromite*. Canada and the Belgian Congo share practically the whole output of *Cobalt*. The United States produce half the World's supplies of *Copper*. More than half the production of *Gold* is South African. Of the *Pig-iron* produced, over three-quarters is smelted in the countries bordering the North Atlantic. Over one-third of the *Lead* is raised in the United States. India and the Gold Coast between them produce one-third of our supplies of *Manganese-ore*. India and Brazil share about equally the output of *Monazite*. Canada produces 90 per cent. of the supplies of *Nickel*. The United States raise seven-tenths of the petroleum supplies. Adjoining fields in Germany and France produce over 90 per cent. of our *Potash*. About one-half of the *quick-silver* is obtained from Spain. Nearly half the *tin-ore* raised is from British Empire sources, one-third being from the Malay States. Of the one and

two-third million tons of *Zinc* obtained in 1926, over half-a-million tons came from the United States, and nearly one-third of a million was British in origin."—Sir Thomas Holland,—The Trueman Wood Lecture on "International Movement of Mineral Products in Peace and War "—*Journal of the Royal Society of Arts*, February 14, 1930, p. 378.

The Rabbit in Australia

Just 140 years ago the first rabbit was seen in Australia, writes *Queenslander*. Five rabbits were included in the inventory of livestock with the First Fleet, and of this number three belonged to Governor Philip. They were kept in hutches, and probably died in the severe drought which visited the colony the following year. In 1791 some Cape Colony rabbits were introduced, and for several years breeding in hutches was carried on; but as far as is known, there was none living in a wild state. Tasmania in 1824 was already suffering from the effects of these rodents. The *Hobart Colonial Times* of May 11, 1827, recorded that the "common rabbit" was running about in thousands on some large estates. This is the first mention of wild rabbits in any Australian State. In Victoria the rabbit came with the early settlers, probably with Fawkner and Batman. At various periods more rabbits were imported into Victoria and New South Wales, but the Australian menace may be attributed to the importation in 1859 of 24 rabbits by Thomas Austin, of Barwon Park, near Geelong. He turned them out on to his land, and in less than three years' time they had become a pest. Six years later he killed 20,000, and estimated that there were 10,000 left.

From Barwon Park the rabbit spread in all directions, and towards the end of the 'seventies they found their way over the Murray river and established themselves in the Riverina district. In 1878 they were seen in South Australia, and in the following year it was officially reported that they were spreading fast on the Lower Murray and the Murrumbidgee. It now became imperative for the settlers to fight this pest, and from that day to this war has been waged against them. Within a few years thousands of square miles in New South Wales had been infested, and it became only a question of time when Queensland would be reached. The Queensland Government, however, was alive to the danger, and took effective steps to prevent their crossing the border.

The rabbit pest has proved a serious handicap to the Commonwealth. Millions of pounds have been expended in fencing, netting, poisoning, and digging out, and when we add to this the loss in livestock, output of wool and food crops, the cost is beyond calculation. In ten years, from 1915 to 1924, 157½ millions of frozen rabbits were exported from Australia, of which 124½ millions came from New South Wales. In the same period there were exported 717,086,184 skins of which New South Wales sent 539,687,880.

QUERIES AND ANSWERS

I. Q. Is the draught of a plough increased by lengthening the hitch?

A. There is no truth in this theory provided that the plough is adjusted to work at the same depth as it did when it was hitched closer to the source of power. If no pole angle adjustment, or clevis adjustment in the case of short beam ploughs, is made, the longer hitching will, of course, cause the plough to go deeper and the draught will be increased. A longer hitch is a distinct advantage particularly in connection with bullock draught implements where the line of draught is so steep due to the high yoke. The longer the hitch the less the angle of the line of draught and the greater the horizontal or useful component of the pull. There are limits, of course, to the length of hitch which can be employed, but, on ploughs for bullock draught particularly, it should always be as long as possible. The limit to the length of hitch, which the usual length of plough pole imposes, is one of the objections to the pole method of hitching.

II. (*a*) What makes *super phosphate* "eat away" the gunnies in which it is stored? On what other articles does it also act?

(*b*) How does the deterioration of P_2O_5 take place in the super? What is the rate? In how many days or months does super get "useless"?

Is there any method of overcoming these difficulties?

Please furnish any other information regarding super phosphate.

(*a*) Damage of Gunnies:

1. Although all super phosphates are dried and exported, this drying while diminishing the 70 per cent. of moisture, increases their percentage of free phosphoric acid and of hydrofluosilicic acid. In such conditions, whilst appearing dry they have the property of attracting moisture and attacking the canvas of the bags.

2. If in the manufacture of super phosphates a mixture of Hydrochloric acid and Sulphuric acid is used, then the resulting super may contain free Hydrochloric acid which rot the bags and a mixture of these two acids attack metals.

3. Steeping the bags in gum kino extract is found in Australia to render manure bags rot-proof.

(*b*) *Deterioration of Super phosphate*:

The phosphoric acid of the super begins to retrograde (reduce) if the raw phosphate from which it is manufactured is not pure or if it contains more than 2 per cent of sesquioxides or if mistakes are made in its manufacture.

The direct and predetermining causes seems to be the heat and pressure of the super phosphate heap. Stored super phosphate forms packed layers and as the thickness of the layer increases the substance compresses in virtue of its own weight; afterwards depending upon the length of contact the particles are glued together to form a very compact mass. There is thus established between each an exchange of chemical energy which

means decomposition. These changes are more rapid in moist hot super than in dried cooled super. Thus heat and pressure combined with moisture appear to be the cause of deterioration of super phosphates. When deterioration starts, it pursues a very rapid course; but it can be prevented from further deterioration by drying it as completely as possible, storing it cold, shortening the storage or preserving it in a thin layer. Addition of 1 per cent. bone dust to the super containing free acids may be done to prevent deterioration or to reduce the attack of gunnies.

CORRESPONDENCE

Studies in the Cost of Production of Crops

The Editor,

Madras Agricultural Journal.

Dear Sir,

I was very pleased to see from the February number of your Journal that you are devoting a portion of your space to the study of crop production from the costing side. There are many reasons why an accurate account of the cost of producing a crop can be of value, not the least important of which is, as you mention, that it makes it possible to see in which direction improvement is possible.

You ask for an expression of opinion as to the amount of detail which should be given. You have two points of view to consider, the critic's and the point of view of the man who wishes to learn what his brother farmers are doing in order to see whether he cannot improve on his own methods. In both cases it is necessary to give so much detail that your readers can get all the information they desire. For example under preparatory cultivation in the second study of sugar-cane, it is not possible to see what was done or whether it was done economically.

I have examined with interest the studies which have appeared in this number and the March number. It appears to me that before we go further we must agree on the manner in which we shall arrive at the cost of certain constantly recurring items and also on what items no charge should be made. In the March study, paddy, I note under preparatory cultivation that 45 men and 45 pairs of bullocks are entered in the accounts, that the standard rate quoted against each is 8 annas but that the total amount taken into account is only Rs 22-8 and not Rs 45. Alongside I note the remark "Own cattle used" I gather from this that because the cattle used belong to the farmer himself no charge against the crop should be made. Lower down however I note that under irrigation, 150 men and 150 pairs are entered in the accounts, that only Rs 112-8 is charged for this instead of Rs 150. Alongside this item is the remark "At 10 annas

per pair including men". The 10 I take it is a clerical error for 12. There is no indication that the cattle used do not belong to the farmer himself. I am therefore somewhat puzzled and do not understand why the cattle should not be charged in both cases. I therefore suggest that we should first of all decide on how we shall show the cost of bullock power used.

In those cases where the cattle are hired there is no difficulty. Where the cattle are maintained by the farmer himself the case is not so simple but as they cost something to keep, it is not fair not to take this into account when endeavouring to work out the cost of producing a crop. We must therefore decide in what way we shall show the cost of bullock power and how we shall arrive at this cost.

To my mind the most satisfactory way of showing the cost of bullock power is as the cost of a day's work per pair. I arrive at his figure from the following data:

(i) The cost or value of the bullocks, when purchased or brought into work,

(ii) The length of their working life,

(iii) Their value when sold,

(iv) The amount spent on food, attendance, medicines and veterinary attendance, and

(v) The cost of shoeing, if shod.

The first item gives us the capital expenditure on which interest, at 6 per cent. should be charged. The first item minus the third item and divided by the second item gives us the charge for annual depreciation, the sum which must be set aside every year in preparation for the purchase of a new pair when the old pair are done. Items four and five are current expenditure. None of these items present any great difficulty. The cautious man enters the first item as accurately as possible, the second at a little less than real expectation and the third as nil. It is a good example to follow. The cost of food presents no difficulty when the food is purchased, it is only in dealing with food produced on the holding that any difficulty arises. This I think is best met in this way. When the food consumed is a bye-product such as cotton seed, straw of paddy, cholam, ragi, etc., grown for grain no charge should be entered in the food account. When the crop is grown for the express purpose of feeding the cattle the cost of the food should be worked out and entered in the food account.

The sum of these items, interest, depreciation, cost of food, attendance, medicine and shoeing for the year gives us the total cost of maintaining a pair of bullocks for the year. If this is divided by the actual number of days on which the animals worked we get a figure which tells us the cost of a days work per pair of bullocks. Having worked this out it can be made use of in working out the cost of any operation in which bullocks are used. It is a useful figure to have as it is of a revealing nature. If it is high it attracts attention to the items of expenditure, if

these are all right then it points to there being too little work for the animals which may mean that too many are kept or that the holding is too small.

I am,
Yours sincerely
G. R. HILSON.

Madras, 1—4—1930.

[We welcome this frank criticism from Mr. Hilson and invite similar criticisms from our readers.—ED. M.A.J.]

The Editor,

The Madras Agricultural Journal,

The Association of the Upper Subordinate Officers.

Sir,

Recently, in advertisement in the Madras dailies, the Director of Agriculture has invited applications from persons possessing British, German or American degrees for filling up five vacancies in the Subordinate service of the Agricultural Department. Though this was not unexpected, the Upper subordinate officers, however, feel that this will be a step in the wrong direction if these appointments are likely to jeopardise the interests of the members of this association. The Committee therefore took up the matter at once and has sent in a strong representation to the Government urging the recruitment of foreign-qualified men, only to the V grade of the Upper subordinate cadre as laid down in the G.O. regulating the recruitment of officers to this cadre, published in the *Fort St. George Gazette* of the 3rd September 1929. It is hoped that the Director will take a sympathetic view of the situation and with a view to avoid further stagnation in the lowest grade will kindly desist from recruiting men directly into any of the intermediate grades of the Upper Subordinate service. The Committee proposes to arrange a deputation to wait upon the Government next July, after the College Day and Conferences, to represent matters suitably for improving the pay and prospects of this service. The Committee earnestly hopes that the Director will be pleased to depute as many of the subordinates as possible for the College Day functions and also permit many others to attend at their own expense.

Yours sincerely,
S. V. DORAISWAMI,
Secretary,
The Association of the Upper Subordinate Officers.

College News and Notes

University Examinations.—April witnessed unusual activity at the College, for the University Examinations were in full swing and both students and staff had a strenuous time of it. With the closing of the college, a lull has set in and the lecture halls have come under a spell of silence.

Visitors.—In connection with the University Examinations, the residents of the estate had the pleasure of meeting several old acquaintances who acted as external examiners. Dr. Narasimha Ayyangar, Dr. Kunhikannan and Mr. Yegnanarayana Ayyar from Mysore, Mr. Sabhesan from Madras, Mr. Raman Menon from Trichur and Mr. Rajagopalaswami Mudaliar were the external examiners in their respective subjects.

Mr. George Kovoor, Agricultural Officer in the Andaman Islands, who was on a tour in South India visiting the chief agricultural stations in Madras and the Southern States, spent a few days at the Agricultural College studying the agricultural conditions here. Mr. Kovoor gave an interesting *Conversazione* at the Officers' Club on "Life in the Andamans".

Dr. Gilbert Fowler and Mr. Ferguson visited the activated sludge plant now under construction, in connection with the fitting up of the machinery.

Captain Daniels and Mr. Henry of the Imperial Chemical Industries, Madras, were on a visit to Coimbatore to discuss with the Government Agricultural Chemist on matters relating to the manurial problem of South India.

German Classes.—At the request of several officers of the Agricultural Colony, Mr. Amrita Rao of the Indian Institute of Science, Bangalore, has come down to Coimbatore to give them a course in German. Nineteen officers belonging to the several sections of the Institute and the Imperial Sugarcane Station are undergoing the course in right earnest. Mr. Rao is a linguist *par excellence* being a master of 40 languages. It is hoped that his interesting and masterly elucidation of the intricacies of the German language will equip his pupils with a working knowledge of that tongue and spur them on to the task of unearthing a mine of information from German Scientific Literature now lying buried in the shelves of the Institute Library.

Weather.—Coimbatore had a fair share of the heavy rains experienced throughout the Presidency during the second week of May. Five inches were recorded in four days and the temperature was brought down to the monsoon average. Standing crops have benefited considerably, the parched up lawns have again put on a green appearance and the dust nuisance has abated for a while. Fortunately, we were out of the path of the cyclone and barring the 'wash out' of the cucumber crops in the tank beds, Coimbatore has no tale of woe to tell.

The College Dairy.—Information has been received that the College Dairy which was under the control of the Deputy Director of Agriculture, Live Stock will be handed over to the Principal, Agricultural College as from 1st June, 1930.

Ladies' Club.—Through the efforts of Mr. P. H. Rama Reddi, our popular Principal, a site for the Ladies' Club has been selected. A proper housing for the Club has been a long-felt need and it is hoped that ere long, the Club will be in possession of a habitation of its own.

Hygiene Classes.—For the benefit of the ladies of the Agricultural colony a weekly hygiene class is being run by Mrs. P. D. Karunakhar. Several ladies on the estate are attending the classes at which the theory and practice of domestic and social hygiene are being discussed aided by demonstrations.

College Selection Committee.—Government have appointed the following gentlemen to serve on the Committee for the selection of students to the Agricultural College:—The Director of Agriculture, Madras, Dewan Bahadur B. Muniswami Nayudu, Dewan Bahadur M. Ramachandra Rao, Mr. Khalifulla Sahib Bahadur and the Principal of the Agricultural College.

Hill Recess.—Messrs. P. H. Rama Reddi, R. O. Iliffe, N. G. Charley and G. N. Rangaswami Ayyangar have so far availed themselves of the hill recess.

Weather Review

APRIL 1930

Rainfall Data

Division	Station	Actual	Departure from normal
Circars	Gopalpore	1·8	+1·0
	Vizagapatam	0·2	—0·5
	Cocanada	nil	—0·6
	Masulipatam	nil	—0·6
Ceded Dists.	Kurnool	nil	—0·6
	Bellary	0·5	—0·3
	Anantapur	0·2	—0·2
	Cuddapah	0·2	—0·2
Carnatic	Nellore	nil	—0·4
	Madras	nil	—0·5
	Cuddalore	nil	—0·6
	Vellore	nil	—0·9
Central	Salem	0·6	—1·2
	Coimbatore Town	1·4	...
	Coimbatore Research Institute	1·4	...
	Trichinopoly	0·3	—1·4

South	Negapatam	nil	—0·5
	Madura	1·3	—0·7
	Pamban	3·0	+1·4
	Palamcotah	0·6	—1·9
West Coast	Trivandrum	4·5	·0·
	Calicut	0·3	—1·9
	Mangalore	0·9	—0·4
	Cochin	4·2	...
Mysore and	Bangalore	1·9	+0·6
Coorg	Mercara	1·4	—1·2
Hills	Kodaikanal	2·5	—1·7
	Coonoor	5·2	+0·9

Summary of weather conditions

Pressure distribution was of the Cold Weather type from the beginning of the month till the 22nd with an area of high pressure lying to the north-east of the reporting area, and an area of low pressure to the south of Ceylon. This induced a flow of Northerly winds and lower temperatures than usual over the greater part of the Presidency. Hot weather conditions first appeared on the 22nd, a brisk rise in the temperature followed in the Ceded Districts, and pressure distribution was typical of the hot weather, thereafter, with gradients running from south-west to north-east and determined southerly winds into the interior, and consequently thunderstorms became very frequent and general in the south. Rainfall was however not frequent, except on and near the Hills.

Temperatures were high in the Ceded Districts from the 22nd and Cuddapah reported the highest maximum for the season up to date of 109° on the 27th, 108° on several other days. Temperature fell generally over the reporting area on the last two days of the month with a flattening out of the gradient of pressure.

Rainfall was below normal over the greater part of the Presidency, the defect being most marked in the Central districts and in the parts of the south division. No rain was recorded on the Coast from Cocanada to Negapatam. Rainfall was locally in excess at Gopalpore, Pamban, Bangalore and Coonoor.

The usual convectional movement of winds, following the establishment of normal hot weather conditions and inducing an indraught of sea winds, began on the 23rd, and southerly winds become general. Prior to that northerly winds were general except in the extreme north.

Report for the Research Institute Observatory

Absolute Maximum in Shade	100° · 0
Do Minimum in Shade	69° · 8
Mean Maximum in Shade	96° · 3
Do Minimum in Shade	73° · 2
Total Rainfall in month	1 ·35 inches
Heaviest fall in 24 hours	0 ·63 „
Total Number of Rainy days	3
Mean Daily wind velocity	2 · 9 miles per hour
Mean 8 a.m. wind velocity	2 · 1 miles per hour
Total Hours of Bright Sunshine	249 · 8 hours
Mean daily of Bright Sunshine	8 · 3 „
Do Humidity	69 · 5 % of Saturation.

Pressure was high at the beginning of the month and after a small fall between the 5th and the 10th rose to the maximum on the 15th, and thereafter made rather rapid movements and reached its minimum on the 27th and rose again very rapidly on the 30th, when a rise of 0.996 in. was registered. These rapid movements seem to be associated with unstable atmospheric conditions during the transition periods, and seem to be correlated with the formation and movements of local storms, since each fall in the barometer was followed by a local storm after which the barometer recovered rapidly, a phenomenon not observed during the monsoon periods.

Temperatures ruled high almost throughout the month and maxima of 100° were recorded on two occasions—17th and 27th.

Rainfall was rather scanty and a total fall of 1·35 inches was recorded. The heaviest fall in 24 hours being 0·63 inch on the evening of the 8th. Thunder and lightning was recorded on 15 days, and on the 27th and 28th nights the lightning was particularly vivid and continuous.

P. V. R.
B. S. N.

The Ramasastrulu-Munagala Prize 1930

1. The Prize will be awarded in July 1930.

2. The Prize will be in the form of a Medal and will be awarded to the member of the Union who submits the best account, of original research or enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages type-written on one side.

4. Intending competitors should notify the Secretary of the Madras Agricultural Students' Union not later than the 15th June the subject of the paper which they propose to submit and the paper should be sent in so as to reach the Secretary, Madras Agricultural Students' Union not later than the 1st July 1930, with a covering letter showing full name and address of the sender. The author's name should not be shown on the paper but should be entered under a *nom-de-plume*.

5. Four type-written copies of the essays should be sent in.

6. The name of the successful competitor will be announced and the prize awarded at the time of the Conference.

7. Papers submitted will become the property of the Union and the Union reserves to itself the right of publishing all or any of the papers.

8. All references in the paper to published books, reports or papers by other workers must be acknowledged.

Any further particulars may be obtained from the Secretary, Madras Agricultural Students' Union, Lawley Road P. O., Coimbatore.

Departmental Notifications

First Circle: Mr. T. Paramanandam, Manager, Agricultural Research Station, Samalkot, leave on average pay for one month from 16/5/30; Mr. A. Ramamohan Rao, Manager, Agricultural Research Station, Samalkot to be in charge of the office of the Manager, Agricultural Research Station, Samalkot during the absence of Mr. M. Narasimhan; Mr. A. Ramamohan Rao, Manager, Agricultural Research Station, Samalkot, leave on average pay for 23 days from 23/4/30 with permission to prefix the Easter holidays; Mr. T. Paramanandam, Manager, Agricultural Research Station, Samalkot to be in charge of the office of the Manager, Agricultural Research Station, Samalkot during the absence of Mr. A. Ramamohan Rao; Mr. I Kurma Rao, Assistant Farm Manager, Palur, leave on average pay for one month from 5/4/30 in continuation of leave already granted; Mr. B. P. Papaiah, Assistant Farm Manager, Anakapalle, leave on average pay for 10 days in continuation of leave already granted; Mr. K. Suryanarayana, Assistant Agricultural Demonstrator, Anakapalle, leave on average pay for 15 days from 2/5/30; Mr. R. N. Narasimhan, Manager, Agricultural Research Station, Samalkot, medical leave for 28 days from 23/4/30 with permission to prefix Easter holidays.

Second Circle: Mr. S. Kuppuswami Ayyangar, Farm Manager, Agricultural Research Station, Guntur, extension of leave on average pay for two months from 17/4/30 and transfer to III Circle on expiry of leave; Mr. A. Venkobachari, Assistant Agricultural Demonstrator, Atmakur, transfer to Livestock Research Station, Chintaldevi, as Assistant Farm Manager.

Third Circle: Mr. K. Balaji Rao, Assistant Agricultural Demonstrator, Adoni, leave on average pay for 8 days from 23/4/30 with permission to avail of Easter holidays, extended by one month and one day; Mr. C. Subba Rao Naidu, Assistant Agricultural Demonstrator, Allagadda, extension of leave for four months from 22/2/30; Mr. B. Venkataram, Assistant Agricutural Demonstrator, Markapur, posted to II Circle on relief by Mr. S. Kuppuswami Ayyangar, Farm Manager, A. R. S., Guntur; Mr. K. Hanumanta Rao, A. A. D., Rajampet, leave for one month from 5/5/30 or date of relief.

Fourth Circle: Mr. N. Krishna Pillai, Agricultural Demonstrator, Tiruvettipuram, leave on average pay for ten days in continuation of Easter holidays; Mr. C. S. Seshagiri Ayyar, Demonstrator, Gudiyatham transfer to Vellore; Mr. P. Janakirama Iyer, Agricultural Demonstrator, St. Thomas Mount, extension of leave on average pay for two months from 5/4/30 in continuation of previous leave.

Fifth Circle: Mr. T. R. Venkasami Rao, A.D., Tiruvalur, leave for fourteen days from 8/5/30.

Seventh Circle: Mr. T. Gopalan Nair, Agricultural Demonstrator, Cannanore, transfer as Farm Manager, Central Farm Coimbatore vice Mr. K. M. Jacob posted to VII Circle; Mr. C. S. Madiah, Farm Manager, Taliparamba, leave on average pay for two and a half months from 1/5/30; Mr. P. K. Kannan Nambiyar, Assistant Farm Manager, Nileswhar on return from leave (on average pay for one month and twelve days from 10/3/30) to relieve Mr. B. Narasimha Pattathan at Pilicode transferred to Coondapoor; Mr. K. M. Chakrapani Marar, Farm Manager, Nileswhar, leave on average pay for fifteen days from 8/5/30. Mr. P. Abdulla Haji, Lower Subordinate, promotion to IV Grade from 1/4/30.

Eighth Circle: Mr. T. A. Rangaswami Ayyangar, Assistant Agricultural Demonstrator, Rasipuram, leave on average pay for two months from 22/4/30 or date of relief, with permission to prefix the Easter holidays.

Curator, Botanical Gardens: Mr. P. Govindakutty Kurup, Agricultural Demonstrator on probation, leave on average pay for nineteen days from 24/3/30; Mr. K. G. Sankappa Bhandari, Farm Manager, Agricultural Research Station, Nanjanad, leave on average pay from 1st to 21st May, 1930.

Live-Stock Section: Mr. A. Venkatarangam, Farm Manager, Live-stock Station, Hosur, extension of leave on average pay for one and a half months in continuation of leave for two months from 6/2/30 and transfer to II Circle after expiry of leave.

Millets Specialists' Section: Mr. G. Ramabhadran, Assistant, leave on average pay for one month from 10/3/30; Mr. P. L. Narayanaswami Nayudu is appointed as Upper Subordinate V Grade and posted to Millets Section; Mr. N. Krishnaswami, Assistant, leave on average pay for 8 days from 23/4/30; Mr. C. Vijiaraghava Acharaya, Assistant, V Grade, promotion to IV Grade from 1/4/30; Mr. M. A. Sankara Ayyar, Assistant, leave for 15 days from 5/5/30.

Government Mycologist's Section: Mr. C. Krishnan Nair, Assistant, leave on average pay for one month from 14/4/30; Mr. C. S. Gopalaswami Rao, Assistant, leave on average pay for 3 months from 10/4/30; Mr. P. V. Somayajulu, Assistant, leave for 19 days from 6/5/30.

Government Entomologist's Section: Mr. R. Narasimhachari, Sub-Assistant, extension for fourteen days; Mr. N. Krishna Menon, leave on average pay for one month from 23/4/30 with permission to prefix the Easter holidays: Mr. T. V. Subramaniam, promotion from II Grade to I Grade; Mr. J. A. Muliyil, provisionally promoted to I Grade from 1/4/30.

Government Agricultural Chemists' Section: Mr. M. R. Balakrishnan, Assistant, leave on average pay for two weeks from 23/4/30 with permission to prefix Easter holidays; Mr. B. S. Narasimha Iyer, Assistant, promotion to IV Grade from 1/4/30; Mr. Kasinatha Iyer, Assistant, promotion from III Grade to II Grade, from 1/4/30.

Paddy Specialist's Section: Mr. S. Ramanujam, Assistant, Agricultural Research Station, Aduturai, leave on average pay for seven days, from 10/4/30 with permission to suffix Easter holidays; Mr. C. V. Sankaranarayana Iyer, Sub-Assistant, leave on average pay for twenty-two days from 23/4/30 with permission to avail Easter holidays; Mr. R. Subbayya Gownder, Sub-Assistant, leave on average pay for ten days from 23/4/30 with permission to avail Easter holidays; Mr. S. Dharmalinga Mudaliar, extension of leave on average pay from 17/4/30 to 15/5/30; Mr. C. M. John, Assistant, Agricultural Research Station, Pattambi, promotion from V Grade to IV Grade, from 1/4/30.

Cotton Specialist's Section: Messrs. M. Ramayya Shetti and L. Neelakantan, officiating assistants appointed as Upper Subordinates V Grade on probation from 1/4/30; Mr. K. L. Ramakrishna Rao, Officiating Superintendent, Cotton Breeding Station, Coimbatore, leave on average pay for one month and fifteen days from 3/5/30; Mr. R. Govindarama Iyer, Farm Manager, Cotton Breeding Station, Coimbatore, leave on average pay for twelve days from 23/4/30 with permission to prefix the Easter holidays; Mr. V. K. Subramania Mudaliar, Assistant, Koilpatti, promotion from V to IV Grade.

Latest Notifications—

The following promotions are ordered in the Upper Subordinate Service (Agricultural Section), with effect from 1/4/30. *From II to I Grade:* Messrs. T. Bhudavideya Rao Nayuda and M. Kunhambu Nambiyar. *From III to I Grade:* Mr. M. U. Vellodi. *From III to II Grade:* Messrs. M. Viraraghava Rao Nayudu and R. Swami Rao. *From V to IV Grade:* Messrs. T. G. Muthuswami Ayyar and S. R. Srinivasa Ayyangar.

UNIVERSITY EXAMINATION RESULTS

The following is the list of successful candidates in the B.Sc. (Ag.) Degree Examinations held in March—April 1930.

Part II. (Final Year)

1. Abraham, M. C.
2. Achyuthan Nayar, K.
3. Achyutharama Raju, D.
4. Damodara Prabhu, M.
5. Gopalan, M. K.
6. Gulam Ahmed, A.
7. Hanumantha Rao, D.
8. Hanumantha Rao, K.
9. Kalyanasundaram, N. V.
10. Kolandaivelu Naicker, R.
11. Krishnamurthi, R.
12. Kochunni Kuttan Achan, P.
13. Lakshmanan, T. S.
14. Muhammad Abbas.
15. Narayanan Nayar, K.
16. Nataraj, T.
17. Palaniswami, P. K.
18. Rayappa Pillai, M.
19. Sankara Ayyar, C. B.
20. Satyanarayanamurthi, M.
21. Seshadri, C. R.
22. Subbiah, M.
23. Venkoba Rao, M.
24. Venkatakrishnan, G.

Part I. (Second Year)

1. Anantha Rama Rao, H.
2. Appaji Gownden
3. Bhagiratha Rao
4. David, M. J.
5. Balakrishna Menon, K.
6. Jagannatha Rao, V.
7. Kesavan Unni Warriar
8. Krishnamurthi, S.
9. Krishnamurthi, G.
10. Krishnamurthi, T.
11. Krishnan, L.
12. Krishna Rao, D. V.
13. Lakshmanan, P. G.
14. Lakshminarayanan, K. S.
15. Kuppamuthu, K.
16. Muddanna Shetty, M.
17. Narahari, C.
18. Narasimham, K. M.
19. Narasimhaswami, B. L.
20. Narayanan, N. G.
21. Narayanan, O. K.
22. Raghava Menon, P.
23. Rajarathnam Chetty, S.
24. Ramachandran, C. K.
25. Ramaswami, K. R.
26. Saptharishi, L. S.
27. Somayajulu
28. Syed Mohamed
29. Thangavelu, T. K.
30. Veerabhadra Rao

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