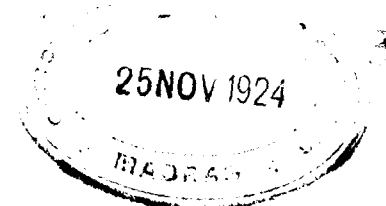


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THE JOURNAL

OF

The Madras Agricultural Students' Union.

OCTOBER.—1924.

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No. 10.

An Enquiry into the Manurial Problem in India.

By

M. R. BALAKRISHNAN, B.A., B.Sc. Ag.

Of late years the question of procuring sufficient and suitable manures for his lands has most engaged the attention of the cultivator. With the increase in population and the cry for more food the need has arisen of devising ways and means of tapping all the available sources and stimulating Mother Earth to increase her crop productivity.

The Agricultural and Trade Conference considered one aspect of this question rather elaborately in the session held at Madras in 1914. Among various points discussed was how far the Agriculture of the Presidency affects and is affected by the supply of manure. Broadly the scope of their discussion can be extended to the whole of India with benefit. Farming in India can be divided into three classes. (1) Dryland cultivation without irrigation. (2)

Dryland farming with irrigation otherwise known as Garden-land cultivation and (3) Wetland cultivation. The first makes little demand on the supply of concentrated manures, while in the last there are limiting factors which govern manurial treatment. The second is the system where the demand is most keenly felt and where relief is most imminently necessary. Herein lies a large and expanding scope for the introduction of concentrated manures.

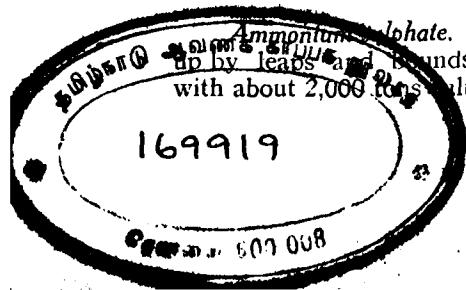
All concentrated manures available in India come under 3 or 4 distinct heads. The first that we shall consider are the mineral manures. At present these are not likely to meet the demand either on account of their insufficient quantity or their uneven distribution. Limestone, for example, is available in this Presidency in the Ceded Districts and parts of Coimbatore and Salem and it is a significant fact that the transport of this to hilly soils like the Nilgiris which are poor in lime is prohibitive on account of its cost. Mineral phosphates are available in quantity in the Trichinopoly District, but they are almost useless on account of their low grade quality as also of the difficulty of transport. Gypsum and Magnesia wherever they are found cannot be utilised except on a local scale inasmuch as only insufficient quantities can be obtained.

In view of these factors greater stress has been laid on the indigenous manures available in India and a number of factors crop up in considering their application and introduction. Such manures are bones and bone products, fish manure, ammonium sulphate, poudrette, saltpetre, oil cakes, green manure and farm yard manure.

Bones and bone products. An easily available manure in all parts of the country, this has in recent years gone out of use on account of the rise in prices. The increase has been brought about by the enormous quantities that are being exported to foreign countries. The aggregate loss to this country during the five years ending 1923-24 was 440,995 tons valued at Rs. 452,72,465.

Fish. A similar story has to be told about fish manure. The greatest quantity exported was in 1919-20 immediately after the war, when 35,969 tons valued at about 5 million rupees were sent from here. There was a fall after that to 9,000 tons in 1921 but it went up again last year to nearly 20,000 tons. The figures themselves indicate the necessity for bestirring ourselves.

Ammonium sulphate. The export of this manure has been going up by leaps and bounds during the past half a decade. Starting with about 2,000 tons valued at about 6 lakhs of rupees in 1916-17



the export reached a maximum in 1919-20 of 7,000 tons valued at 14 lakhs. The figures by themselves are discouraging; and investigation into the actual loss of manure based on their composition will make us realise how serious the situation is.

Oil cakes. A greater menace is the loss of oil seeds and oil cakes. The amounts of oil cakes and the different kinds of oil seeds that have been exported from our country for the past ten years are immense. On an average 2 to 3 million cwts. of oil cakes which may be valued at Rs. 13 to 14 millions are annually exported. Of the different oil seeds linseed contributes the highest proportion with an average of about 5 to 6 million cwts. per year. Groundnut comes next with an average of about 3 million cwts., while rape, sesamum and cotton seed, also have their moiety in the total dead loss accruing to us. Viewed at from its very essentials, apart from any other consideration, this export of oil-seeds has the gross value of Rs. 180 millions per year. The actual loss of manurial ingredients is immense. From the three million cwts. of oil cakes exported roughly 120 thousand cwts. of nitrogen and about a third of their quantity of phosphoric acid are lost to our country. From the oil seeds exported thrice this amount of manurial ingredients are lost. It is not this drain alone but the subsequent necessity to buy the same stuff from other countries at a higher price that makes the application of manures such a prohibitively costly problem in India.

It was this state of affairs that attracted the attention of the Board of Agriculture as early as 1915; and after serious and systematic investigations formal resolutions were passed by the Board in 1919 urging upon the Government the necessity for the imposition of an "export tax" on oil seeds and cakes and the total prohibition of exports so far as bones and fish manure are concerned.

A further argument against the inadvisability of exporting oil seeds and cakes as against the export of bones, fish and other mineral manures is that most oil seed crops prove exhausting to the soil and there is no chance of returning even a little of the vast quantities of plant food that they might have removed. Thus there is continual drain on their fertility.

While bones, oil seeds, and fish are thus lost through export on account of ignorance or reluctance, we are not utilising other sources of fertilising materials available in our country. Of these poudrette and green manures are the most important. Indian night soil is not so rich as the European. It contains only about 0.07 per cent. of nitrogen, whereas the latter has 5 to 6 times that quantity. Still,

considering our total population and that we are the second most populous country in the whole world this should form a substantial supply of our manurial requirements. From table given on page 395 one can see that Japan has more than 10 per cent of her total land area under cultivation and one significant factor to be borne in mind about the country is, that they pay more attention to the storing of night-soil and preparation of poudrette in the proper manner. Speaking of France, Victor Hugo says that her salvation would lie in the attention that his countrymen paid to this. Even in this country stress has been laid on this by a number of eminent men, such as Sir Frederic Nicholson. But we have not yet learnt the proper way of preparing poudrette and in addition the fact remains that as in other matters our ideas of labour and prestige must pass through a purifying furnace ere we can confidently hope of poudrette being used as it ought to be.

While a false sense of dignity and cleanliness precludes the possibility of poudrette finding favour with the Indian farmers in the near future, ignorance of their value is responsible for green manures not being so much in vogue as they could easily and profitably be. They are all rich in nitrogen containing 0.5 per cent or more and being leguminous crops take this from the atmosphere. One of the cheapest and most efficient of manures under Indian conditions, green manures, as a class, suffer from unpopularity on account of the low standard of education that the majority of our ryots are endowed with.

Farm-yard Manure. We now come to the last in our list, the one which supplies us the bulk of our needs. The production of farm-yard manure and its availability in quantity depend certainly on the strength of the live-stock of a country. We are very poor in horses, mules and asses, which are the mainstay in other countries. The position of India as compared to other countries in regard to Horses, Mules and Asses is as follows. The number of acres of cropped land per animal and the number of persons per animal is 9 and 17 respectively in the United Kingdom, 22 and 16 in Italy, 15 and 15 in Germany, 16 and 12 in France, 8 and 5 in Russia, 15 and 4 in the United States of America, and 15 and 3 in Canada, while in India it is 55 and below 1.

This gives a very discouraging view, but the analysis of cattle strength will give us relief. In total strength of cattle, India stands first in the whole world with 108 millions, while United States, Russia, Argentina and the United Kingdom come next in order with 59, 50, 30 and 11 millions respectively.

Thus India contributes 25 per cent to the total world cattle.

The gratification one may derive at this total is short-lived, when one learns that after all we have only 60 cattle per square mile, while all the countries above mentioned are far above in the scale, the Netherlands coming at the top with 160 per square mile. The fact is India is not a beef-eating country nor does it export milk or milk products. India requires cattle mainly for draught purposes and for agriculture and it is not surprising that the density of the cattle population is low. She is not poor in sheep or goats either. Considered in the aggregate, there are 45 millions of the first and 28 millions of the second and the goat population, which is 24 per cent. of the whole world's, is the first in the globe. The total live-stock divided between bovine, ovine, and others, in 1920—21 and years following, as compared with that in 1911—12 does not show deterioration although the rate of increase cannot compare favourably with that in other countries.

Her total live-stock in 1911—12 numbered 178 millions. She had the maximum in 1916—17 when the strength of her animals was 210 millions, and this gradually declined to a little under 200 millions in 1920—21. All these years the ovine numbers contributed from 2/7 to 1/5 of the total.

From this one can readily calculate the total amount of manurial ingredients that can be supplied by our livestock. An average for the last ten years will put down the number of cattle at 200 millions and under existing conditions one may expect from these about 600 million tons of manure every year including that from sheep and goats.

We shall now see how far this amount of manure will meet the demand and what area of cropped land it will benefit. The total average area under cultivation for the ten years from 1911-12 to 1921-22 in India, was about 250 million acres of which the average area under irrigation was only 50 millions. Granting that the irrigated area requires manure essentially and the dry area requires little, we find that the 600 million tons of manure which on a liberal computation we reckoned on our animals giving, would portion out only 12 tons to every acre of our irrigated cultivation, that is a very poor supply as a minimum of 20 tons per acre must be applied to give any beneficial result. That means we have to look for an extra 8 tons or its equivalent, for every one acre of the 53 millions; that is to say we have to procure 400 million tons of farm-yard manure. This does not

include the manure required for the dry area. Even if we allow that 150 millions of dry lands require as much as the irrigated 50 millions we have still to look for another 600 millions. That means another 1000 millions. At present a little less than one half our manurial requirements is met by the cattle manure. If we could only have this extra amount of 1000 millions every year, the manurial problem is very easily solved and the progress of agriculture will go up by leaps and bounds.

Here stress must be laid on the point that there are chances of increasing this quantity by improving our methods of breeding and thereby increasing the rate of productivity of cattle. A more important point is the proper storing and preservation of the manure. As it is at present, the Indian ryot gets the benefit of only 50 % of the total manure produced, and consequently all activities in making the ryot realise the importance of the preservation of Farm-yard Manure according to scientific methods are highly commendable.

While this farm-yard manure supplies nearly a fifth of the demand let us see whether the other indigenous manures would make up the deficit. It has been already mentioned that 88 thousand tons of bones valued at about 9 millions of rupees were exported annually. Considered financially, this would just be equivalent to three million tons of farm-yard manure. This would make one think that the export of bones is not such a great loss compared to the 800 and odd millions of tons of farm-yard manure that we required extra, according to our former calculation. But our computing the quantity of bones exported, as being equivalent to so much of cattle manure, was on a wrong basis. The factor of equivalency should not be the cost price of the manures but their comparative effects on the soils. Thus a much smaller dose of bones will suffice where a heavier application alone of cattle manure will produce a similar result. Viewed from this stand point the export of bones is making our country the poorer by about a tenth of our manurial strength.

So far we have reviewed statistically and taken stock of the manurial situation in India. From the table given below, it will be seen that while in the total area of cropped lands, India stands second, Germany, Austria and United Kingdom easily beat it in the actual percentage of cropped land to the total land area. The reason is not far to seek. Specialisation in agriculture, as such, is a marked characteristic of these nations. Not only is all the available land made use of, but the manure that is procurable is utilised to the maximum advantage and to meet all demands.

Country.	Total area in millions of acres of cropped land.	Percentage of cropped to total land area.
China	400	40
India	280	25
Russia	250	19
Germany	75	50
Japan	10	10
Austria	75	41
United Kingdom.	15	24

Such an adjustment of the supply to the demand should also be possible in India. Three-fifths of our requirements is supplied by our livestock, horses, cattle, goats and sheep. Another fifth would be supplied by bones and fish if they were not exported. And another fifth by our oil cakes and seeds on the same conditions, and strengthened by our green manures, poudrette, and other manures, our position would then be second to none in the whole world. In view of these it behoves all interested in Indian Agriculture to remove the defects and to suggest the remedies. But it is not such smooth sailing nor is it so simple as what has been stated so far would seem to make it appear. A number of factors contribute to make this apparently simple question complex.

At the outset although on account of ages of experience the Indian ryot is most efficient in his methods; and although usually he takes to manures once he is convinced of their efficacy, in advocating the use of appropriate ones, one has first to dispel his ignorance of methods in vogue which have proved useful in other countries. As Tennyson so truly remarked in another connexion it is necessary "to disyoke his neck from custom and to make him leap the rotten pales of prejudice."

This is not all. The Hindu law of inheritance and caste system and the consequent fragmentary nature of most of the holdings in India as compared with other countries add to the difficulties in the extension of the application of indigenous manures. So far, fertilisers for any particular crop are not very much in demand except by the planting community. And then again, there is danger of adulteration growing rampant without any chances of being checked. It is here that the Legislature ought to interfere, to relieve the situation

on the lines advocated by John Ruskin in his discussion of Meristic Law. This treats of tenure of property and first determines what every individual possesses by right and secures it to him; and what he possesses by wrong and deprives him of it. The object of Meristic Law is not only to secure every man his rightful share (the share that is what he has worked for, produced or received as a gift from a rightful owner) but to enforce the new conditions of possession as far as law can conveniently reach.

As far as bones and fish are concerned these are indispensable to us and should on no account be exported. I am not blind to the argument put forward by a number of eminent men that such restrictions infringe upon the right of individuals to get wealthy; I would only appeal to their good sense and guarantee them reasonable worth for their labours within limits. At any cost Govt. should check export and they must in addition encourage the starting of a number of small factories for crushing bones and milling fish; for, though rich in phosphoric acid containing as they do nearly 25 per cent., bones are almost useless unless applied as a fine meal.

The oil cakes and oil seeds require even better consideration. The oil pressing industry should be subsidised substantially and pushed to the fore and the export of oil made very easy. This ensures not only that more attention will be paid to expressing large quantities of oil, it will also mean incidentally the production of a superior quality of oil-cakes to be used in the country itself. In addition, an import duty on foreign fertilisers prepared from our raw goods must be imposed. As Ruskin says "No man can become rich by his personal toil. The work of his own hand wisely directed will indeed maintain himself and his family and make fitting provision for his age, but it is only by the discovery of some methods of taking the labour of others that he can become opulent". This is the real source of all great riches.

While special fertilisers are not in demand here, it is interesting to note how some advanced countries are trying to face a similar situation. It is only very recently we are trying to improve existing sources; but they are discovering new ones. Germany has taken the lead and, exploiting the atmosphere, has made attempts to get at the enormous amounts of the inexhaustive supply of nitrogen therein. The fixation of atmospheric nitrogen is the biggest boon in the scientific world lately, and Calcium Cyanamide according to some advocates has the brightest of futures before it. Whatever it is, it must be conceded that nitrogen can be obtained at a very cheap price hereafter.

Then, again, the enthusiasm of some American biologists to introduce prepared cultures into the soil and thus make it manurially richer by promoting bacterial activity is well known. In England, Russell and Hutchinson working at Rothamsted experimented on the sterilisation of the soil, and though this was done partially, a notable improvement in the yield of crops followed. India is not yet sufficiently advanced to undertake any such experiments. Though the majority of us cannot sufficiently appreciate the value of such experiments, attempts are being made at Coimbatore to produce Artificial Farm-Yard Manure. In view of the large quantities of apparently useless stuff available, like prickly-pear, groundnut shell, and so on, this should form a substantial source of supply in the future.

Salvation lies in my opinion in tackling the subject in a very comprehensive manner. No problem in agriculture should be viewed at independently. The question of manures involves a number of other agricultural factors and all of them must be satisfied. Better cultivation, scientific methods, more irrigation facilities, and other approved agricultural improvements, like an evolution of varieties and control of pests and diseases, must go hand in hand with a better system of manuring.

Composts of all sorts of stuff should be encouraged. Kitchen refuse can be utilised if the farmer lives on the farm itself. An interesting feature, in fact, of the Coimbatore district is, a system which nearly approximates to an ideal home farm and certainly here manure is made much more economical use of. "The farmer's foot is the best manure for his land" is well illustrated in the Tanjore District where absentee landlordism is the rule and where the wetlands are really deficient in phosphates.

One suggestion is that attempts must be made to increase the area under cereals and to decrease that under non-food crops. India wants more food, and she is not justified in commercialising her agriculture as other industrial nations are doing. With small areas at their disposal, agriculture becomes a business proposition with them and it is regrettable that she should imitate them and utilise her natural resources for the production of the raw material that does not benefit her. At least for some years to come her attention must be concentrated on food crops. That means export of raw foods will decrease. The local agricultural practices will improve and her economic situation will be bettered. There will be no danger of her losing custom or other countries competing, for, once she relieves the situation by bringing down the price of foodstuffs, she can command the world market again in a short time.

That is not enough. The education of the Indian ryot must be widened and bettered, so as to enable him to utilise the most unprepossessing of stuffs for the betterment of himself and humanity. In other words a really more scientific education that provokes the powers of utilisation of existing materials and opportunities will be the panacea for the defects. This assured, the production of artificial farm yard manure and such like in adequate quantities will also be assured, and it would be quite possible to visualise at no very distant date an agricultural India secure in its manurial supremacy.

EXTRACTS.

MODERN WHEATS.

Extracts from a paper read by Professor Biffen at the Farmers' Club.

By the beginning of the century, then, our position was that we were attempting to face the most intense competition from all parts of the wheat-growing world by producing wheat of inferior quality. Even then much of our wheat was often marketable with difficulty.

It is with the efforts made to remedy this state of affairs during the interval between the beginning of this century and the present date that I want to deal in detail now. During this period a considerable number of new forms of wheat have been placed at the disposal of the farmer. Those curious about such matters will find their names and their characteristics in the back files of various agricultural papers, or better still, in old seed catalogues. Some of these were produced by cross-breeding, some were said to be improved types resulting from a more or less mysterious process of selection, some were merely imported from the continent and given an English name at the time of their introduction. The claim was made for all of them that they were valuable improvements on the types then in cultivation, and in describing them stress was laid almost invariably on their out-standing cropping capacity.

But subsequent events have shown that these claims were not always justified. There is not the marked uplift in average yield which should have occurred had even a few of these new forms cropped appreciably better than those they were intended to displace.

Indeed, save in a few countries, where the average has increased a little, yield per acre is the same as it was a quarter of a century since. Further, the ephemeral existence of most of these new 'improved' forms has done more than anything else to show their real value. The mere fact of their disappearance whilst older forms still survive completely discredits the claims made concerning their enhanced yielding capacity.

Yet of merely all these wheats it may be said that for the first year or two of their cultivation they cropped well. Ordinary cultivation was not sufficient for the first stocks of seed, for which high prices were paid. They were grown well, and consequently over-average crops were produced. These served to further advertise the new forms, and induced neighbours to purchase seed, against yet higher prices than those of ordinary seed wheat, from the enterprising farmer, who had been confiding enough to trust in the description of the catalogues. A few years' cultivation under ordinary farming conditions, however, taught the growers that most of those novelties were no better than—if, indeed as good as—the sorts they already had, and their cultivation was abandoned.

How far the gains of the first few years compensated for the loss of crop when they were grown later on a more extensive scale cannot be estimated. But it is clear that the introduction of many of these forms has been of no service to agriculture, and that we should have been better without them.

2. We may leave those forms which have died out during this period in the obscurity to which their defects have consigned them, and examine in detail the few which have survived and which we have now in general cultivation here. Some idea of the relative importance of each of them—though at the best an obvious approximation—can be obtained from a numerical examination of the samples sent to the official Seed Testing Station for germination tests.

In attempting to assess their values, it is preferable to examine each of them from the plant-breeders' point of view rather than from that of the farmer for the latter almost invariably lays stress on yielding capacity to the exclusion of all other features. Without any question, the capacity to produce a big crop is a feature of fundamental importance, but it has to be remembered that a wheat may crop well and yet prove a dismal failure from the grower's point of view should the straw fail to carry it or should some fungoid pest take too great a toll of the crop, or again, if grain defects should make the produce unsaleable.

3. Turning, now, to another side of the modern wheat question, we may go on to consider some of the various problems connected with the improvement of the crop which have been under investigation during this period. The results in some cases are too complex to describe fully, and the most that I will attempt to do is to refer to them briefly.

One-noteworthy one is that the belief, that by "adding together successive small variations", as the exponents of selection have it, it is possible to effect improvements in any direction, has been shown to be incorrect. It is now admitted by most plant-breeders that all the process of selection can do is to isolate existing forms from a mixture, and that once these have been picked out and obtained in a stable condition further selection is powerless to alter them. In fact, they are as far as human efforts go, immutable. With the abandonment of this belief the most fruitful cause of synonyms, and the resulting discredit they have brought the plant-breeding industry, has practically disappeared.

Another result of great and increasing importance is the working out of far more accurate methods for the comparison of the yielding capacity of cereals and other crops than have hitherto been used. These methods have, I believe, already been described to you by Dr. Beaven, their originator. Using one of them, known to be capable of giving results accurate within about two per cent., a careful study has been made of the possibility of adding to the yield per acre by a process known as "regeneration." The idea underlying the process is that the continuous self-pollination which normally occurs in cereals is, in some way or other, bad for them, and that a cross with the pollen of another plant of the same kind adds fresh vigour to the enfeebled strain. If true, one might have expected that such an old form of wheat as Rivet would by now have been more or less completely worn out, instead of being, as it still is, one of the very best of yielders. After failing in a preliminary trial to find any appreciable difference in the yields of regenerated and ordinary stocks, it was decided to investigate the matter from the beginning, and so anticipate any possible criticism that the results had been in any way influenced by a change of seed from one set of soil and climate conditions to another. Plants of Square Head's Master were intercrossed, and yield trials made from the produce of each of the parent plants, as well as from the regenerated seeds. Again the differences between regenerated and normal seed were insignificant and within the margin of error of the experiment, indicating that as a means of adding to the crop, the process was of no value in this case.

4. But it is well known that the plant-breeder cannot make a new characteristic or even modify an existing one. If, then, a high yield per acre is in reality a unit character in the Mendelian sense of the word—and only indirect proof of this is available yet—the question arises whether there is any chance of obtaining better yielding forms. On theoretical grounds it looks as if the plant-breeders who hope to secure it are reaching out for the impossible, and that the purposeful elimination of different croppers, which has gone on for at least two centuries in this country, has brought us to the stage at which the maximum crops under our present conditions of farming are being obtained. At all events, if hybrids can outcrop either of their parents, surely amongst the numerous new forms of wheat, barley and oats raised during the past quarter of a century unquestionable samples should exist. It is difficult to point to them. But indirectly the plant-breeding can alter yielding capacity for the better by raising new forms which on the average crop better because they suffer no losses through the attacks of disease. This is a line of work which is proving fruitful with many crops, but it will lead to no great uplift in the yield of English wheat. Possibly an average increase of 5 per cent, will result when forms which the yellow rust cannot attack are in general cultivation.

The production of wheats with better straw will not necessarily result in higher yields under ordinary conditions. But given such forms the resulting possibility of growing for a larger crop, once the danger of lodging is reduced, will tend to increase our home supplies. But the point to be emphasised is that it is the grower who makes actual crop not the plant-breeder. The man who produces a thirty-two bushel crop can produce a forty-eight-bushel crop with the same form of wheat by slight changes in the routine of his cultivation. No plant-breeder can hope in the present state of our knowledge to make anything like this difference in yield. He can play his part in doing so unquestionably, but for the moment his efforts should be concentrated mainly on the production of better quality wheats.

"The points mentioned are similar to those found or experienced during the various systematic attempts at Sugar-cane-variety breeding in the West Indies and British Guiana-(J. B. H.)"

(*The Journal of Board of Agr. of British Guiana*, Vol. XVII No. 2.)



REVIEWS.

"Manual of Dairy Farming"—B. K. Ghare. B. Ag., Aryabhushan Press, Poona, Rs. 3.

So far as we know this is the first attempt made by an Indian in writing a manual of this kind. Leaflets, pamphlets and bulletins on Dairying and closely allied subjects are not rare, but no serious effort has hitherto been put forth to bring to the notice of the lay public a readable book on a subject which would interest most people in this country. Mr. Ghare's knowledge as a teacher in the Agricultural College, Cawnpore, has rendered him eminently fitted to write on this important subject with an authority denied to ordinary 'book-makers'.

The manual is divided into four parts, each following a natural division of the subject, which Mr. Ghare's well thought-out analysis of the contents discloses. Part I deals with the rudiments of agriculture a knowledge of which no one engaged on Dairy Farming should go without. In this portion, Mr. B. K. Ghare treats of the soil manures and cultivation in a way which shows the prime importance of this preliminary to a Dairy Farmer. Cattle management forms the subject of the second part. Suited to the needs of the country, Mr. Ghare discusses the question of housing, feeding, and management of cows and calves and gives useful hints and necessary details. In the third part, is dealt the question of milk and its products. A simple account is given of the udder, the (visible) fountain source of milk, the constituents and properties of milk, how its quality and quantity are affected, how it is separated, and what processes are adopted in converting it into the several by-products.

This naturally leads to part IV with which the book ends, wherein principles of Breeding are explained in a very lucid manner. Methods of judging cattle and short accounts of the wellknown North Indian breeds bring the subject to a delightful close. The book is written in a colloquial style and gives information of a kind equally sought after by an Agricultural student and an amateur farmer. We commend this unpretentious but excellent manual to all students of Dairy problems.

A. U. M.



"Report of Preventive measures adopted in 1923-24 by Pattambi Co-operative Union for suppressing the Arecanut disease called 'Mahali'—Calicut—1924".

How very helpful co-operation has been in checking the spread of Mahali disease on arecanut trees in Malabar is vividly described in the "Report of Preventive Measures adopted in 23-24 by Pattambi Co-operative Union". The report describes how, making its appearance in a few arecanut plantations in Malabar about 60 years ago, the Mahali disease slowly but steadily spread its tentacles over a larger and larger area, till in 1907 it arrested the attention of the local authorities and the Government. Action was taken immediately. Affected localities were inspected and spraying suggested. The creation of the Government Mycologist's post in 1910 gave scope for extended investigation. Work was, however, not started until 1912 owing to the existence of more urgent problems elsewhere. In 1912 and 1913 a campaign was undertaken in reported localities, the efficacy of spraying demonstrated and the work entrusted to the circle staff, but through indifference on the part of gardeners and the receipt of very heavy rains during recent years, the disease spread in all taluks and showed itself sporadically all over the district. The year 1923 witnessed a whole-sale attack on 30 lakhs of trees, resulting in a dead loss of 15 lakhs of Rupees to the owners in Ernad, Walluvanad and Ponnani taluqs alone. Spraying was recommended by the Government Mycologist, and it is gratifying to note that, convinced of the utility of this method of reducing the loss, a few enthusiastic co-operators met in Kumaranallur in the Ponnani taluk on 23-9-23 and resolved to purchase necessary materials and sprayers for a vigorous campaign, to organise societies and to request local Co-operative Unions and the Malabar District Co-operative Bank to interest themselves in the matter. Further they resolved to "institute enquiries to ascertain the method of preparation and disposal of arecanut produce with a view to eliminate the profits of middlemen". It is pleasing to learn that in this attempt of the people at stamping out the disease, Messrs. V. K. Menon, Secretary District Bank, Calicut, Raman Nair, Assistant Co-operative Registrar, M. Govinda Kidavu, Deputy Director of Agriculture, and S. Sundaraman, Government Mycologist rendered material help. We read that, through the whole-hearted efforts of Mr. V. K. Menon, 11 tons of copper sulphate, 4 tons of resin, 3 tons of soda and 250 sprayers were obtained direct from Europe and sold to cultivators. The number of trees operated thus last season is reported to have been 18,413,122 and the cost of chemicals for spraying 100 tons came to As 12 as against Rs. 1-2-0 previously. We understand this voluntary combination of the plantation owners, sympathisers and officials for Co-operative purchase has resulted in a reduction of 10% in the

total cost of spraying materials calculated at the market rate. We congratulate the Pattambi Co-operative Union and Mr. V. K. Menon and all concerned in the splendid work done during the year—and wish continued success to similar unions that may be started in the future.

A. U. M.

GLEANINGS.

Cotton Growing in Kenya—The Convention of Kenya settlers at a special session, has decided to urge the Government, before it further encourages Native Cotton growing, to appoint a Commission to enquire into its general effect. The Convention believes that it is likely to be ruinous to the farmer and also detrimental to the morale of the Natives. (*Reuter's Special service* 18-10-24).

G. N. R.

To Destroy Weeds on Paths. To destroy grass or weeds on gravel paths or on chip tennis courts an arsenic mixture (1 lb. of white arsenic with $\frac{1}{4}$ lb. of caustic soda dissolved in 4 gallons of water) is frequently used, being both cheap and effective. A fairly concentrated solution of common salt applied hot is also effective, and so, too, is spraying with crude residual oil, such as is obtainable from gas companies.—*Agric. Gazette of N. S. W.* Vol. XXXV. Pt. 6.

T. S. V.

The Danger in Ratooning Cotton.—In Egypt and some other countries where the boll-worm is rife, it has been found necessary to introduce legislation prohibiting ratooning, and enforcing the destruction of old crops by a given date. Such measures were absolutely essential. After many years of slovenly methods, coupled with indifference to the advice offered by scientists, the very existence of the cotton-growing industry was threatened, and nothing but drastic action by the Governments would save it. It is obvious, of course, that where ratooning is practised the most important preventive measures against insect pests cannot be as thoroughly carried out as is possible where cotton is an annual crop. Growers who are obliged to ratoon, therefore, must concentrate on those operations that can be carried out; they should cut down their plants as early as is consistent with the welfare of the crop and see to it that no cuttings, leaves, or plant refuse of any kind are left on the land. Commonsense is much better than legislation.—G. P. Symes, in the Rhodesia Agricultural Journal.

Agri. Gazette N. S. W. Sept. 1924.

Potash from Sunflowers.—In spite of crop failures and famine at home, Russia has within the past two years been exporting considerable quantities of potash. The Russian product is extracted from the rich soils of South-Eastern Russia by burning the stalks of sun-flowers, which are extensively grown there. Last year more than half a million acres were devoted to this purpose, the yield of potash being from 160 to 190 pounds to the acre. The Russian potash is purer than the German, which is mined from the earth, and, before the war, was successfully sold in Germany in competition with the local product.—The American Fertiliser.

Agr. Gazette, New South Wales, Sept. 1924.

Milk Recording in Denmark :—In 1895 the first Danish Milk Recording Society was formed by thirteen farmers, who owned together just over 300 cows, and who combined to employ a man to record the yield of milk and the contents of butter-fat from each cow on their farms. Other groups of farmers followed suit as the practical value of the information obtained and its importance in cattle-breeding became recognised. Now there are in Denmark 825 recording associations, dealing with 25 per cent. of all the cows in the country, or upwards of 300,000.—*Scottish Journal of Agriculture.* (Extracted from the *Agr. Gazette of New South Wales, Sep. 24*).

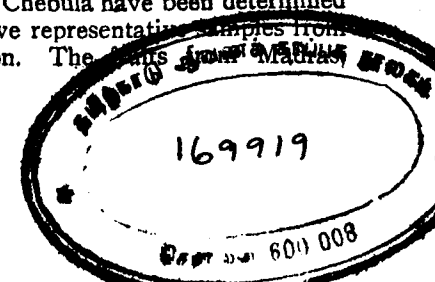
Terminalia Chebula-Kadukkai :—In the Reports of recent investigations at the Imperial Institute the following conclusion on *Kadukkai* are arrived at. "From the results of investigation it is clear that the fruits of *Terminalia Chebula* from different districts of India may vary widely in quality, the amounts of tannin present ranging from about 20 to 49 per cent in fruits containing 10% of moisture.

In view of these marked differences and the fact that the highest percentages of tannin found are much above those recorded for commercial myrobalans, it would appear desirable to determine the varieties of *T. Chebula* represented by the specimens in order to ascertain whether these varieties can be correlated with the amounts of tannin in the fruits. The question whether the differences depend to any degree on the locality in which the trees grow or on other climatic causes might also be considered.

After the botanical varieties of *T. Chebula* have been determined in India, it would be of interest to receive representative samples from various localities for further investigation. The plants from Madras

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and particularly those from the Salem Division which contained the highest percentages of tannin, are worth special investigation, as it may be possible to obtain a superior quality of myrobalans from these districts.

Further samples of mature and immature fruits from the same tree will also have to be examined in order to decide the stage at which the largest amount of tannin is present.

G. N. R.

Bees help in breeding of clover:—The humble bee is now employed in a plant breeding garden at Slough to fertilise red clover which is self-sterile. The plant breeder having spotted his bee among the lupins or delphiniums, for which the species has a preference, places an empty match-box upside down swiftly over the insect, closes it and the bee is a prisoner. Placed in a tube, the captive is bathed in water sun-heated to the temperature of the bee's body, and after being cleansed of all alien pollen, is dried on blotting paper under a tumbler. About a dozen bees are needed to pollinate the two plants which are enclosed in a device like a meat safe. Thither the bees, each under his own tumbler, are carried on a tray and released inside. Whether it is because they are hiveless, without a bed at night, or are lonely the bees usually die in ten days or a fortnight, or even less. In that case relays of fresh bees arrive to complete the fertilisation of the plants.—*"Daily News", Aug. 4th.*

G. N. R.

Agricultural Education in Scotland:—The report has been issued, says the *Scottish Farmer*, of the committee appointed with Lord Constable as Chairman "to enquire and report with regard to the position of agricultural education and research in Scotland." The Committee examined 62 witnesses, including representatives of the departments controlling agricultural education in the United States and Sweden, and has made recommendations of which those that interest us in India are

(1) The Supervision of the Colleges should remain with the Board of Agriculture.

(2) Close relations should be maintained between the Colleges and the Universities.

The Committee thinks that, in the interests alike of efficiency and economy, it would be a mistake to divorce the Colleges from degree

teaching. *Association with the college tends to prevent University teaching from becoming too academic, while association with the University helps to maintain the status of the College and Scientific character of its teaching.* [We would add *and of the right ideal in Education*].

(3) With reference to financial position of the colleges, the fees imposed should be made more commensurate with the cost of instruction provided and the authorities should be careful to see that no young person who is qualified for attendance at the Colleges should be debarred therefrom by reason of the expense involved.

(4) There is an urgent need for an allround development of agricultural research, for, says the Committee, no industry depends more intimately than agriculture on the results of scientific research not only for its progress, but for its maintenance.

A. U. M.

The Alsatian Potash Mines. The limits of this deposit, so far as ascertained to date, comprise an area at the foot of the Vosges mountains in France extending over 75 square miles, or about 50,000 acres. It is computed to contain 2,000,000,000 tons of raw salts which would yield 300,000,000 tons of pure potash. At the present rate of consumption this quantity would be sufficient to supply the potash requirements of the world, excluding Germany, for 300 years.

There are two beds of potash minerals in the basin of Alsace, the upper being about 4 feet thick, and at an average depth of 2060 feet; the lower varying in thickness from 8 feet to 16 feet, lying at an average depth of 2140 feet. The salts consist chiefly of sylvinite (which is chloride of potash mixed with common salt). The seams of pink or reddish coloured sylvinite are interspersed with layers of grey-coloured rock-salt and shale. White crystals of sylvin (pure muriate of potash) are met with in the sylvinite. The deposits are practically free from magnesia salts. The upper bed contains 35 to 40 per cent. of muriate of potash; which is equivalent to 20 to 22 per cent. of pure potash. The lower bed contains from 23½ to 32 per cent. of muriate of potash equivalent to 14 to 18 per cent. pure potash.

For Agricultural purposes the following grades are put on the market:—French kainit, 14 to 16 per cent. potash; French extra kainit, 20 to 22 per cent. potash; French Potash salts, 30 to 32 per

cent. potash ; French muriate of potash, 50 to 60 per cent. potash ; French sulphate of potash, 48 to 50 per cent. potash. The muriate and sulphate are prepared from the crude minerals.

(*The Scottish Farmer*, "7th September 1924")

A. U. M.

Efficiency of Sulphate of Ammonia in Mixed Fertilisers:—Sulphate of Ammonia is more efficient in mixed fertilisers than when it is used singly. Experiment Station tests show this. The reason behind it is linked up with nitrifying bacteria of the soil. High-Grade nitrogenous materials, especially when used in large quantities allow such rapid and intense accumulation of ammonia that the nitrifying bacteria are injured and their activities decreased.

Meyerhof demonstrated that it is free ammonia, and not the ammonium salt, which injures the nitrate-forming bacteria, and that the salt is not injurious even in solution, in the presence of buffering substances like phosphates. Superphosphate in conjunction with sulphate of ammonia, therefore, affords one of the sources of the buffering that accounts for the greater efficiency of sulphate of ammonia in mixed fertilisers than when sulphate of ammonia is used alone.

It may possibly be in order to explain here that the activity of nitrifying bacteria is important in crop production, since it is these bacteria that convert ammonia to nitrates, in which form the plant is able to absorb its nitrogen as plant food.

The efficiency of sulphate of ammonia when applied singly is increased materially when an application of lime has been made to the soil. The lime neutralises the sulphuric acid and nitric acid produced, which might otherwise accumulate to an extent that would depress the activity of nitrifying bacteria.

Sulphate of ammonia and other nitrogenous materials nitrify more efficiently in soils containing considerable organic matter or humus than in soils low in organic matter, the humus serving as a buffer as well as the phosphates.

Sulphate of ammonia is used in studies of nitrification and bacteriologists recognise that, in the oxidation of ammonium sulphate nitric and sulphuric acids are formed. These acids increase the hydrogen in concentration of the soil, till a point is reached which becomes injurious to the activity of the nitrifying bacteria. In well buffered soils, such as those receiving large applications of organic matter, greater amounts of acids can be formed before the injurious reaction is attained than in poorly buffered soils.

(From "*The American Fertiliser*")

K. K. R.

STUDENTS' CORNER.

Tours—Students of class II. Short course students went on tour until the 16th. They assembled at Tenali on 1-10-24 after Michaelmas holidays. They visited Duggirala, Tummapudi, Pedapalem and Ravendrapadu where they saw splendid crops of paddy, turmeric and maize. In Guntur, tobacco and chillies interested them much. Thence they proceeded to Cumbum where they observed the crops under the Cumbam tank. They next went to Nandyal. From there Hospet was visited where they studied sugarcane cultivation. A trip to Hagari followed where they learnt all about the black soil crops in the Westerns' area as they did earlier at Nandyal in the Northern area. Their journey up to Coimbatore through the Mysore territory gave them a respite of a few hours at Bangalore which they utilised in running up to the Mysore Government Farm at Hebbal, 6 miles distant to gain an acquaintance with the soil, crops and operations done there.

Games Section.

Cricket.—Another match in connection with Y. M. C. A., tournament was played with the Gymkhana team on the 25th October. One of our steady batsmen, Mr. Vittal Rao, being out on tour, our team was greatly weakened. However, with the scanty resources at our disposal, we were able to put up a good fight. Entering first the Gymkhana rapidly scored 139 runs for their first innings, Mr. Collet topping the list with 33 runs. The Agricultural College team, feeling badly in their turn, totalling only 47 runs, were given another chance and in this, though Messrs: Venkataramanan, Balasubrahmanyam and Doraiswamy stuck up for some length of time, yet the telegraph at the close of the innings showed only 71 in all. Thus the collegians sustained an innings defeat.

Hockey.—A friendly game was played with the Foresters on their grounds, and on account of the previous unfavourable weather conditions our team was greatly handicapped. During the first half-time, the Foresters pressed hard and were able to convert only a few of the many chances. During the second half-time, the match was better contested, but still the Agriculturists could not get good combination and so lost the match by four goals to one.

30-10-24. Under arrangement Mr. G. N. Rangaswami Ayyangar took a special class and delivered a lecture to the senior classes, the subject being "Improvement of crops and importance of seed selection."

ESTATE NEWS.

Visitors. Messrs. D. Ananda Rao, Dr. B. Narasimha Ayyangar, and Dewan Bahadur K. Rangachariar for the Board of Examiners' meeting on 18th, and Mr. T. R. Torasingam, Sanitary Engineer to Government to inspect the work of the Special Officer who is taking levels and preparing plans and estimates for the Drainage Scheme on the Estate.

Lt. Col. Ponsonby paid a short visit to some of the laboratories of the College.

Officers' Club. The Officers' Club celebrated its 'Club Day' on the 18th. The programme for the day began with a fancy dress parade at 9 A. M. in the morning. At 10 A. M. there were several interesting items such as 'musical chairs', and 'Egg and spoon race', in which the older members of the club took part. The afternoon saw the finishing of several tournaments such as 'Ping-pong' 'Volley-ball', 'Cards', 'Foot-ball', 'Badminton', 'Tug-of-war' etc., which had been, in full swing throughout the week previous. "Blow-ball" was a very interesting game introduced by Mr. Chandy and was a source of great amusement to the spectators. The Club Building was illuminated by Rao Saheb T. S. Venkataraman as on last year's club day. There was a dinner at the close of the day's entertainments. After dinner Mr Chandy delighted the members with his fine recitations and the day closed with a distribution of prizes by the President, Mr. T. V. Ramakrishnayyar who in the course of his speech thanked all those concerned in making the 'Club-day' a success—especially Messrs. Cherian and Chandy. The prizes took the form of numerous cups—apparently gold and silver—and of various useful articles.

Mr Chokkalingam Pillai, Head Tamil Pandit of the London Mission High School gave lectures in the early part of the month on important portions in Kamba Ramayana.

Mr. R. K. Shanmukam Chettiar, M. L. A., and Mr. T. Lakshmana Rao each gave a 'conversazione' in which they gave a very pleasing account of English life.

Rao Saheb T. S. Venkataraman moved to Imperial Bungalow No. 2, north of the Lawley Road and in connection therewith arranged for a Harikatha on "Rukmani Kalyanam" by the Lady Bhagavathar, Srimathi Sanjeevi Bai of Mangalore on Monday the 27th.

DEPARTMENTAL NOTES.

Account Test Examination:—Agreeably to the decision of the Government of India, the local Government have ordered that all officers of the I. A. S. with the exception of those engaged in research work and all officers of the Provincial and subordinate services should pass a departmental examination, all India officers within two years of the date of their posting, and other officers within 3 years of their appointment to the department. This order applies only to officers recruited subsequent to July 1923. The subjects are:—

(1) An introduction to Indian Government Account, Chapters I, II, IV and paragraphs 110, 114 and 120 inclusive of Chapter VII

(2) Civil Account Code Volume I, Chapters I whole, 2 article 54, 3 whole, 5 whole, 6 whole 12 articles. 195, 198, and 202 appendices 4 and 8 (c).

(3) Madras Civil Budget estimate entries relating to Agriculture.

(4) Madras Budget Manual prescribed portions.

(5) Agricultural Departmental Manual.

The examination will consist of two papers each of two hours duration the first paper will be on subjects 1 to 4, the second on 5. The use of books is allowed in answering papers. A fee of Rs. 6 will be levied from each examinee.

Council Proceedings:—In reply to a question from Rao Bahadur M. R. Ry. T. M. Narasimhachari, the Minister for Development said that the Government did not propose to open an agricultural Farm in the Cuddapah district this year or in the future.

(2) To another question from the same member, the answer was given that Veterinary dispensaries in the following centres during 25-26 if funds permitted, Kistnagiri (Salem District), Harpanahalli (Bellary District), Gobichettipalayam (Coimbatore District), Kavali (Nellore District), Conjeevaram (Chingleput District), Karur (Trichinopoly District.)

(3) Mr. K. Koti Reddi and P. Siva Rao questioning, the Hon'ble the Law Member said that the number of acres estimated to be irrigated by (1) the Tungabhadra and (2) the Sangamaswaram projects was

Districts.	Wet crop	Dry crop protection
	Acs.	Acs.
(1) Bellary	214,547	454,500
Kurnool	63,014	98,625
Anantapur	57,354	83,470
Cuddapah	116,975	188,400
North Arcot	6,920	...
Nellore	340,209	...
Total	799,019	825,000

(2)	First crop
	Acs.
Guntur	500,000
Kistna	175,000
Kurnool	175,000
Nellore and Chingleput	900,000
Total	1,750,000
Second crop	600,000

The latter project has in view the construction of a reservoir in the Kistna and of a group of channels considered in connection with previous proposals for a Kistna project designed to irrigate 13.4 million acres in Kistna, Guntur, Kurnool, Nellore and Chingleput districts. It is probable the original Tungabhadra project may be reduced to serve only the Ceded Districts, and made a protective scheme the portion left over being covered by the other or some similar project. Bellary West canal is designed to irrigate about 70 80,000 acres in Bellary.

Hosur Farm—Livestock Headquarters. The Headquarters of the Deputy Director of Live Stock have been shifted to Hosur. Consequently Mr. Littlewood and his office left Coimbatore early this month. The work of his section at Coimbatore is being looked after by Mr. K. Gopalakrishna Raju, who joined the newly created post of Assistant Director under the Deputy Director of Live Stock towards the end of last month.

Retired Agricultural Officers. Mr. E. Shearer M.A., B.Sc., formerly Imperial Agriculturist, Pusa, has been appointed Principal, East of Scotland College of Agriculture, Edinburgh, and Mr. E. Ballard is now Cotton Entomologist, Queensland.

QUERIES AND ANSWERS.

This page is intended for questions and answers as certain members have expressed a desire to this effect. It is requested that members will help the Editor and the management in being brief in their communications owing to considerations of space.

EDITORIAL NOTES.

Our Governor. It is encouraging to learn that His Excellency Viscount Goschen has been continuing to show his interest in the study of local agricultural problems. We are glad that amidst his heavy programme, he could find time to visit the Taliparamba Farm in the morning on the 18th instant in company with Viscountess Goschen and that the occasion was marked by each of them planting a coconut seedling near the Agricultural Middle school at the request of Mr. R. D. Anstead, the Director of Agriculture. They visited the school, the dryland area, the orchard, the Pepper gardens and the wetlands and also inspected an arch decorated with exhibits of all the chief agricultural products of Malabar. We trust they carried pleasing impressions of agricultural life in the picturesque interior of North Malabar.

Scottish Outlook in Agricultural Education. We beg to invite the attention of the authorities and the public to the recommendations of the Committee on agricultural education in Scotland published under *Gleanings* in this issue. Our problems here are almost similar and the effects of the recommendations may be watched with interest and advantage in this Province where attempts are often made to raise the same issues in reference to agricultural education and the grant of allotments for the department.

Our members. We congratulate Messrs. D. Balakrishnamurthi, S. Sundararaman and G. N. Rangaswami Ayyangar on their confirmation in the Imperial grade, with effect from 29th October '24. We hope they will continue to discharge their duties to the satisfaction of the authorities and of the public and earn further distinction in their respective spheres of work.

Plant breeding.—Elsewhere in this issue we publish extracts of a paper on 'Modern Wheats' read by Professor Biffen of Cambridge, with a cryptic comment by Sir J. B. Harrison of British Guiana. Professor Biffen has worked at Plant-Breeding for a quarter of a century, and Sir Harrison was the first in the sugar world to produce seedling canes in 1885 in collaboration with Bovell. Their views are therefore entitled to much weight. Prof. Biffen sets down precise limits to breeding work and repudiates the claims of breeders for 'outstanding cropping capacity of new' types. This is endorsed by Sir J. Harrison. Experience of workers in this country seems to be otherwise, as is evident from the several publications. We are sure the last word on "plant breeding" has not been said and it would certainly add to our knowledge, if conditions operative in this country which tend to throw doubts on the universality in the application of the conclusions arrived at by Prof. Biffen and Sir Harrison, were made much more widely known so as to supplement available information.

Mr. H. Srinivasa Rao:—We have great pleasure to learn of the successful career of a young Madras in the Zoological Survey of India. We refer to Mr. H. S. Rao the officiating Assistant Superintendent in that department. Mr. Srinivasa Rao is a Zoology graduate (Hons.) of the Madras University. He was an Assistant for some months in 1919 in the Mycological section in this college. He has been in Calcutta about four years. With the opportunities available and a compelling desire to improve, he has worked hard under that renowned Zoologist, the late Dr. N. Annandale, has made special studies, and been a frequent contributor to the Records of the Indian Museum. His latest article on "Asiatic Succineidae" which has been given the place of honour in Vol. VI. Part V of the Records is a masterly account of his work on a group of Mollusca. His utilization of Sanskrit terms in naming new forms is suggestive of their morphology and would be well worth copying by all earnest students of science in India, as avoiding confusion and unsavoury correspondence as to priority of claim in discovering or naming them. He has described some species new to science, and has thus contributed substantially to our knowledge of this little group in this country.

We congratulate our young friend and wish other young men in this and other provinces were as enthusiastic, lucky and devoted to science.

DEPARTMENTAL NOTIFICATIONS.

Confirmations :—

The following officers are confirmed in the Indian Agricultural Service with effect from 29-10-24 :—

1. Mr. D. Balakrishnamurti, Deputy Director of Agriculture on other duty as Professor of Agriculture and Superintendent, Central Farm, Coimbatore.
2. Mr. S. Sundararaman, Pulses Specialist on other duty as Govt. Mycologist
3. Mr. G. N. Rangaswami Ayyangar, Millets Specialist.

Appointments and Transfers etc.—

1. Mr. A. V. Thirumuruganatham Pillai, Assistant Director of Agriculture, II circle, to be Assistant Director of Agriculture, VI Circle, Madura.
 2. Mr. K. Narayana Ayyangar, Upper subordinate III grade, promoted to II grade.
 3. „ S. Sitharama Pathrudu, IV „ do. III „
 4. „ E. K. Nambiyar, V „ do. IV „
 5. Mr. P. Narayanan Nair, Offg. Upper subordinate, V grade to be on probation with effect from 15-8-24.
 6. Mr. R. Govindaramayya, Offg. Upper subordinate, V grade, to be on probation with effect from 17-10-24.
 7. Mr. V. Gomathinayakam Pillai, offg. Upper subordinate V grade, to continue vice Mr. K. Unnikrishna Menon on other duty.
 8. Mr. A. Krishnaswami, offg. Upper subordinate V grade to continue vice Mr. M. Krishna Rao Nayudu on leave.
 9. Mr. V. Kumaraswami, offg. Lower subordinate V grade to be on probation in an existing vacancy with effect from 11-10-24.
- Leave.*
1. Mr. P. H. Rama Reddi, Dy. Director of Agriculture, III Circle, leave on average pay for two months instead of six weeks.
 2. Mr. V. Ramanadha Ayyar, Assistant to the Cotton Specialist, leave on average pay for 15 days from 13-10-24.
 3. Mr. S. N. Chandrasekhara Ayyar, Assistant, Govt. Lecturing Botanist's section leave on average pay for one month from 7-10-24.
 4. Mr. J. A. Muliyl, Assistant to the Entomologist, leave on average pay for one month already granted extended by one month.
 5. Mr. T. S. Ramasubrahmanya Ayyar, leave on average pay already granted extended by one day.
 6. Mr. B. S. Narasimha Ayyar, Assistant to Govt. Agricultural Chemist, leave on average pay for one month from 7-10-24.

7. Mr. K. L. Ramakrishna Rao, Assistant to the Cotton Specialist at Hagari, leave on average pay for 12 days and leave on half average pay for 8 days in continuation thereof from 3-10-24.

8. Mr. S. Subrahmanya Ayyar, Farm Office Manager, leave on average pay for one month on medical certificate from 7-10-24.

9. Mr. A. Raman, Farm Manager, Central Farm, leave on medical certificate on average pay for three months already granted extended by one day on average pay on 19-10-24.

10. Mr. W. Raghavacharya, Agricultural Demonstrator, VIII Circle, leave on average pay on medical certificate for six months from 11-10-24.

11. Mr. V. N. Subbanna Acharya, Agricultural Demonstrator, leave on average pay for one month and 23 days from 1-11-24, with permission to avail himself of the ensuing Christmas Holidays.

12. Mr. R. Swami Rao, Agricultural Demonstrator, Guddapah, leave on average pay for 15 days from 14-10-24.

13. Mr. P. V. Raghavendra Rao, Assistant Agricultural Demonstrator, Dhara-puram, VIII Circle, privilege leave for one month from or after 5-11-24.

14. V. Chidambaram Pillai, Assistant Agricultural Demonstrator, VI Circle, leave on medical certificate on average pay for six weeks from 6-10-24.

15. Mr. A. S. Purnalingam Pillai, Sub Assistant to the Cotton Specialist leave on average pay on medical certificate for 27 days from 8-10-24.

16. Mr. A. Moses, Sub Assistant to the Govt. Sugarcane Expert, leave on average pay for two months already granted extended by six months on medical certificate.

17. Mr. V. N. Ramunni Kidavu, Assistant Farm Manager, VIII Circle, leave on average pay for four months already granted extended by leave on half average pay for two months.

18. Mr. V. Narasimhamurti, Assistant Farm Manager, III Circle, leave for seven months already granted extended by extraordinary leave without pay for six months.

Recent Books and Publications—

1. E. B. Copeland, Rice., Pp. xiv 352 18 plates (London Macmillan and Co., Ltd. 1924) 20 s. net.

2. Cruess, W. V.—Commercial Fruit and Vegetable Products Med. 8 vo. Pp. vii 530 New York and London. (McGraw Hill Book Co., 1924) 22 s. 6d. net.

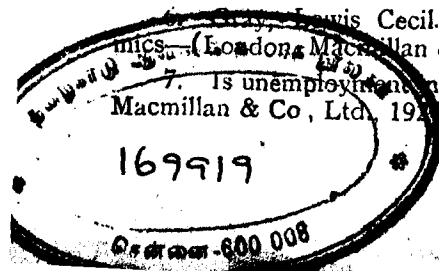
3. Emsley, H. H.—Factory costing—Cr. 8vo. Pp vi 254 (London, Constable and Co., Ltd. 1925) 7 s. net.

4. Henny, Thomas Anderson.—The Plant Alkaloids.—Demy 8vo. Pp viii 456, 8 plates. (London J. & A. Churchill, 1924) 28 s. net.

5. Huddleston. Mary Pascoe.—Food for the Diabetic—Crown 8vo. Pp xiii 75 (London. Macmillan & Co. 1924) 8s. net.

6. Gray, Lewis Cecil.—Introduction to Agricultural Economics.—(London, Macmillan & Co., Ltd., 1924) 12 s. net.

7. Is unemployment inevitable? Cr. 8vo. Pp viii 388 (London, Macmillan & Co., Ltd., 1924) 8s. 6d. net.



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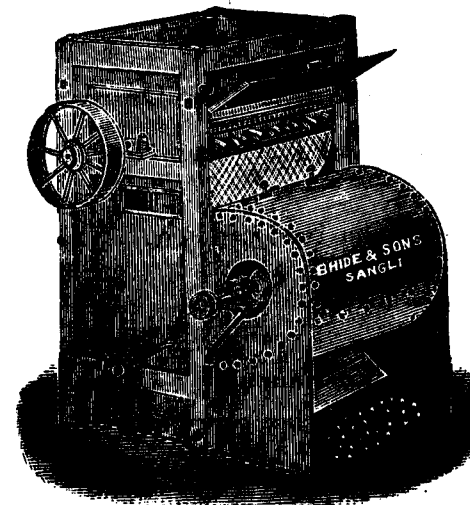
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