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Editorial.

The Village Investigator. The village—what a charm in the name! To most of us bred and brought up in urban surroundings the word village, conjures up peace, simplicity, green fields, shady nooks, running brooks, still ponds, grazing cattle, contented villagers and such other associations arising from a sense of contrast between the restlessness of towns and the restfulness of the village. Few of us are aware of the annals of these village-folk, their joys and their sorrows, their strength and their weakness. In recent times, in the wake of the Royal Commission on Agriculture, the village has come to the forefront of attention not so much because of its intrinsic importance and needs, but because of its being the home of golden eggs. Whatever be the cause of this interest, the fact remains that now and for many years to come, the village will have not only romantic and sentimental associations but must figure seriously in all impending developments of social and political programmes. Mr. Hilton Brown, I. C. S., with whose inimitable portraits of Indian rural life many are familiar, said in a recent *darbar* speech that he felt sure that there was no country of more intense interest at the moment to any active intelligence, than India. And the very centre of this interest is the Indian Village.

Investigation connotes a search with care and accuracy. We have had recently occasion to notice the absence of care and accuracy in facts and figures concerning some of the vital aspects of our economic life. Investigation is the very essence of an enquiring mind and the spirit of enquiry has from time immemorial been one of the most potent forces in the advancement of man towards humanity and of the human being towards perfection. Investigation with its dual attributes of care and accuracy is one of the most dependable sources of general culture and to be an investigator pre-supposes in the person at this task, a character of an order meriting attention.

The Imperial Council of Agricultural Research since its inception had to struggle against want of information on many an aspect of our economic life and in no instance did it feel this ignorance so keenly as when it had to tackle our biggest industrial venture of recent times with a bearing on agriculture, namely the Sugar Problem. A huge organisation was launched under the auspices of the Research Council and a small army of workers styled Field Investigators are the rumblings of this reconnaissance in this vast field. These field investigators are in our province drawn from among our agricultural graduates and their present poor pay is no criterion to the significance and potentialities of their endeavours in this rural theatre. They are few of them now and scattered, with an apparently specific orbit of work, but from the stray contributions to our journal that we have been receiving from these investigators, we are led to feel that their humble beginnings betoken very rich harvests. To us it appears that the village investigator is, during the next decade or two, going to be the real public servant of the nation because it is round him that there is to gather that basic accretion of sound economic data which is to be the foundation on which the awakening economic consciousness of a growing nation has to shape its future. It, therefore, seems to us that when these now narrow functions are faithfully discharged there are immense future possibilities for this class of public servants proving a source of pleasure to themselves and of profit to the State. In a recent speech at Bangalore, Sister Sarojini Devi said that in the villages she found people—men and women—much more intelligent and imbued with a burning desire for service, than the city-bred man or woman. Their endurance, patience, their fortitude and their simple and profound wisdom were all marvellous. By working amidst the villagers, the youth of the country would be enriching the spirit and mind of the villagers. The youth will have a life of adventure, if he would only go and see how creative and lovely was that work of uplifting humanity in the village.

Let us take stock of a few of the possibilities that lie ahead. There is the great question of untouchability. The village investigator who will very probably be an agricultural graduate is best qualified by his

training to foresee all possibilities of an economic clash in the village commonwealth and by his example and persuasion avoid internecine troubles leading to the permanent enfeeblement of the corporate life of the village. He could engage himself in a quiet census of his village, so that armed with statistics he could plan all the better. Knowledge is power. This compulsory stay in the village will fit him for his life-work, so much so that the present disinclination to be away from urban surroundings, their attractions and distractions, will gradually disappear and he will function as his education intended him to be in the famous words of Matthew Arnold, a centre of sweetness and light in the village. Many are the opportunities that will present themselves towards this end, as this intensive touch with all the human elements in a small village will surely contribute to an intense training of the heart preparatory to this task. His head is equipped with knowledge and what he needs is a training of the heart to serve as an effective liaison between cold culture and native shrewdness. Let the village investigator look around him and then a bit inward and take a retrospect, of opportunities presented and not utilised. Has he ever milked his cow to the knowledge of the villagers and is it fair that beyond conforming to a syllabus, this simple craft be not a matter of daily practice? Has it struck him that by so doing he tunes himself to his surroundings? Is he not daily witnessing the destruction of the prickly pear and the disappearance of an effective hedge that the fields in the village had and has he taken the trouble to appraise the villagers of the knowledge that he has of other hedges through his botanical lessons? The ryot's cart creaks by and all that it needs is a washer and has he endeavoured to bring home and demonstrate this simple device of so much importance to the life of the cart and the ease of the cattle? His neighbours' cattle are full of flies and has he suggested and helped in their removal and thus created a bond of sympathy between health and wealth? An unthinking inhabitant is enamoured of the lilac of the Water hyacinth and brings in a few plants to adorn the village pond. The investigator goes quietly by without lifting his little finger, though he would be alert to mention in an essay that a stitch in time saves nine. The village investigator has a glorious future if only he realises the fullness of his opportunities without grousing at the inadequacy of his privileges. He should have for his motto "This very day do what is to thy best profit; let not this hour pass over thy head. For death carries away a man ere yet his tasks are fulfilled. Rather should one do to-day the work of the morrow, rather in the forenoon the work of the afternoon." It is given to the village investigator to face corporate life in its fullness and manifoldness and in the village, conditions prevail for a full exercise of his faculties to the benefit of his own self and to the abiding good of the country at large. May this golden opportunity be grasped is our devout prayer.

The Third International Locust Conference, London. During recent years great depredations have been caused by various species of locusts in different parts of the Old World, especially in North and Central Africa and in Western Asia, and it was felt that in view of their occurrence widely distributed in neighbouring countries and their powers of spread into enormous areas, a centralisation of effort was needed both in regard to measures of checking their increase and to the evolution of a scheme of research for investigating the laws by which their origin and spread are governed.

Consequently, an anti-locust conference was, by the invitation of the Italian Government arranged to take place at Rome in September —October, 1931, when delegates from countries interested in locusts, especially from the Italian, French and British African colonies, met and passed certain resolutions in regard to the organization of anti-locust work for consideration and adoption by the governments concerned. It was also resolved to suggest that the Imperial Institute of Entomology, London should be adopted as the centre for biological and systematic research work on locusts, in view of the presence of specialists and of a unique accumulation of collections and data.

A second conference was at the invitation of the French Government arranged to take place at Paris in July, 1932 (15th to 23rd July), in connection with the Fifth International Conference of Entomology wherein delegates from Belgium, Italy, Spain, Liberia, France and Great Britain were represented. At that Conference, the proceedings of the first conference were confirmed and resolutions passed making recommendations in regard to the study of locusts in different regions and inviting the co-operation of all the countries concerned.

The British Government have, this year, taken the initiative in calling for the third conference at London, and presumably all governments interested in locust research have been invited. The Conference is to meet for about a week at London about the 11th September 1934, and the progress made in Locust Research work in various parts of the Old World will be discussed, especially in regard to the discovery of breeding grounds, the results of ecological studies and the outcome of certain experiments in regard to new methods of locust destruction. During the previous conferences, India could not, unfortunately, be represented, but this year the Government of India have kindly permitted the deputation of a delegate by the Imperial Council of Agricultural Research to represent India at the Conference.

We are glad that one of the members of our Union and some time the Editor of this Journal, Rao Sahib Y. Ramachandra Rao, M. A., F. E. S., the Locust Research Entomologist, is the Indian delegate to this Conference. We congratulate Mr. Ramachandra Rao on this signal honour.

SOIL EROSION

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Introduction. Soil erosion is the depletion of soil from cultivated and cultivable land by various natural agencies. Unchecked erosion leads to the deterioration of the soil and the consequent impoverishment of the cultivator. This important subject is now engaging the earnest attention of all agricultural countries throughout the world. The chief object of this article is to bring to the notice of the Indian public the havoc played by soil erosion, and the seriousness of the problem in India so that by concerted action this evil may be successfully combated.

Erosin—Nature and Losses. There are three major kinds of erosion (1) Sheet erosion, (2) Gully erosion, and (3) Wind erosion. The first and second are caused by water. Sheet erosion occurs owing to flooding by heavy rains and water running off the land in sheets. This is responsible for the largest soil losses. Gully erosion is concentrated or localised erosion. It makes trenches in the soil which deepen every year and gradually become *Dongas* when neglected. At this stage plots of flat land become subdivided and profitable agriculture by the use of implements becomes practically impossible. Wind erosion occurs in arid and semi-arid regions. Fine particles of soil and sand are blown away by wind from bare patches of land and this removal gradually impoverishes the soil.

Research on soil erosion was carried out at the Missouri Experiment Station, U. S A. by Miller and Duley[1] for a number of years. They subjected a number of plots to different treatments of cropping and cultivation. They found, in terms of rain-water, the run off from the uncultivated plot was nearly 50 per cent of the total rainfall, while from a cultivated plot it was only 25 per cent and from a grass plot only 12 per cent. The plots under corn and small grains have amounts of run off intermediate between the two extremes.

As regards loss of soil[2] by washing, land ploughed 8 inches deep, lost nearly 2½ times as much soil as land having no cultivation. Land ploughed 4 inches deep lost nearly as much as that ploughed 8 inches deep. Sod land (land under pasture grass) was most efficient in preventing erosion and absorbed a greater percentage of rain-water than any other soil. Land under a suitable and well balanced rotation, for example corn, wheat and clover, lost only during the growing season of the corn, while wheat and clover protected the soil.

Briquettes were made of different types of soil and their slaking value was noted by Middleton(3). Technical methods were evolved and made use of to determine the silica sesquioxide ratio, the erosion ratio, and the ratio of colloid to moisture equivalent. These proportions have been found to have the greatest influence on soil erosion. Soil material which is easily brought into suspension is naturally more readily carried away by run-off water. Non-erosive soils are considerably heavier in texture than erosive soils. As for the quantity of soil material eroded, these experiments show that with a slope of 3·68 per cent over a length of 90 feet and with an annual rainfall of 37 inches, in an average of 12 years' measurements, bare, uncropped and cultivated land has suffered an annual loss of 43 tons of soil per acre. Under the same conditions, land cropped with corn lost 20 tons per acre annually, with wheat 9 tons, and in a good rotation 3 tons, while land left in continuous sod lost only at the rate of ⅓ of a ton annually. Under these conditions 7 inches of soil could be lost in 23 years from uncropped cultivated land, in 50 years from corn land, from the wheat land in approximately 100 years, from the land in good crop rotation in 350 years, while under sod it requires almost 3000 years. These figures show the very great influence, the system of agriculture, particularly the cropping system, exercises on erosion losses.

The slope of the land has a direct influence on soil erosion. With a slope of 3·68 per cent, land in continuous corn lost 26 tons per acre annually. With a slope of 6 per cent the annual loss was approximately 85 tons and with a slope of 8·5 per cent the loss was nearly 150 tons. In the last case the surface soil was removed at the rate of 1 inch per year, and exposed the sub-soil in less than 10 years. Owing to the fact that several other factors also intervene, it has not been found possible to establish mathematical relationship between the slope of land and the amount of erosion.

The erosion measurements at the Missouri Station include some data as to the quantity of elements lost in the eroded material. These data show an annual acre-loss from 3·68 per cent slope under continuous corn, of about 65 pounds of nitrogen, 18 pounds of phosphorous and 610 pounds of potassium. In a balanced rotation the loss is reduced to 18 pounds of nitrogen, 4 pounds of phosphorous and 140 pounds of potassium, while under continuous sod they reach extremely small quantities of less than a pound of nitrogen and phosphorous and only 4 pounds of potassium.

An analysis(4) of the eroded material revealed that the amounts of nitrogen, phosphorous, calcium and sulphur lost may equal or exceed the amounts taken off in the crops. Mechanical analysis showed that the material eroded from the bare plots contained a higher percentage of sand and a lower percentage of fine material than the soil lost from the other plots.

It has also been found that the chemical composition of soil has no influence on its erosion, and that only the physical properties are involved in the problem.

The relation of soil character to erosion losses is not well understood. It has been shown that the so-called " dispersion ratio " is the most important single factor governing erosion. This ratio refers to the proportion of the silt and clay easily dispersed in water. Generally soils having a medium texture of surface soil like silt loams, loams and sandy loams suffer most, particularly from sheet erosion and that such losses decrease as the texture reaches the extremes. If such soils are under-laid with a tight clay sub-soil the loss from erosion is generally intensified. Small gullies form readily in soils of medium texture with tight sub-soils, while deep gullies are developed when such soils are under-laid with loose silt loam, or sandy loam.

On hill sides clean culture and indiscriminate removal of forest growth tend to increase floods and increase soil erosion. The erosion becomes chronic where a large percentage of rains is of a torrential nature.

The laterite soils of the tropics do not erode seriously even under very excessive amounts of precipitation. It has been suggested that this is associated with the high silica and low sesquioxide content of these soils.

The Effect of Erosion. The evil effects of soil erosion are so patent that they do not require to be dialated upon. Agarwala[5] says that it is the greatest single menace to the well being of the people for it removes not only the plant food from the soil but also the whole soil itself. It is a loss of capital. Miller from Missouri[6] has called attention to the fact that erosion may be the principal contributing factor responsible for the deterioration of agricultural land. Ten or more inches of soil from the surface have been sometimes found to have been removed within 30 years. The damage is undoubtedly cumulative increasing somewhat as the absorptive power of the soil and its content of organic matter decrease.

Under a slope of 8·5 per cent on loamy soil at Missouri planted continuously to corn, the surface soil was removed at the rate of one inch per year. The normal depth of the soil there is about 9 inches, so that under such conditions sub-soil was exposed in less than one decade. It is under these circumstances that sheet erosion becomes very destructive in removing the fertility which nature has taken thousands of years to accumulate in this humus-bearing layer of surface soil. Land has consequently been abandoned without cultivation and such useless and unreclaimed land increases the poverty of the nation.

General Control Measures. The several modes of treatment for the prevention of soil erosion are alike in principle, all operate through

the regulation of the movements of the surplus water which freely runs off the land.

Green manuring and the increase of humus content of soil diminishes erosion. The presence of plenty of organic matter in the soil improves its water holding capacity and the run off consequently becomes less.

The planting of spineless cactus and American aloes or agave along contour lines retains soil on the upper side. The aloes should be planted in a number of rows or ranks close to each other to avoid gaps. Other suitable hedge plants can be selected according to local experience. Aloes are recommended as they are hardy and drought-resistant.

In England (North Somerset) Roper(7) describes experimental work with *Spartina Townsendi* in an effort to establish the grass on the extensive mud flats of the river Severn as a means of protection against erosion from the high spring tides and winter storms. The plant is said to give considerable promise for the future. A study of the indigenous grasses for purposes of preventing erosion will reveal many promising types suited to each locality.

Terracing helps and is obtained by levelling lands which are sloping. As far as possible, broad level terraces should be made. By terracing, the main field is divided into smaller fields one below the other in level, but fairly level within itself. This prevents water running off from the land rapidly as it has to go down terrace by terrace and erosion is thus checked.

For gully erosion of the medium and large size, a carefully constructed earth dam with surface inlet known as the Christopher or Dicky Dam is said to be the least expensive method of control in America.

Dam embankments(8) across *dongas* consisting of stones, boulders or brush wood held by fences, may be erected. Rough masonry work and wire netting may also be erected across small streams at intervals along the course of the stream. Even big *dongas* can be blocked by means of suitable masonry structures and when the up-stream silts up, vegetation takes root.

Contour ridges, made up 80 yards apart by means of a ditch hauled by a tractor and trimmed by hand labour have been found to be useful in checking erosion in Rhodesia.(9) The cost has worked out to 1 penny per yard length or 4 sh. per acre of land. The ridges can be put to sunnhemp or maize which will prevent weeds colonising.

In grazing areas and arid regions, wind blows off dry soil from bare patches. To minimise erosion caused by wind, contour trenches may be dug to trap the fine soil and wind-breaks erected at intervals,

consisting of hedges to check erosion of this type. Crop rotation may be planned in such a way that land will be covered for as long a time as possible with a growing crop which will protect the soil. Soil is lost only when it is unprotected and freely exposed to the action of heavy rains for a long period in the year. Thick-growing crops which cover the ground and which are effective in checking erosion must be included in the rotation.

The control of soil erosion is a continuous fight and one must always be ready to patch up, and repair and carry the work further. Soil erosion works will generally not be of a permanent character and hence they are liable to be damaged. This should not discourage the cultivators and they should be alert in mending, always remembering that a stitch in time saves nine.

A direct incentive to farmers to come to grips with the problems in S. Africa, is that expenditure incurred in stopping soil erosion is deducted with assessment of land tax. This shows the interest the Government takes in the soil conservation and encourages the cultivators to proceed with the work effectively and put a stop to it. This is an example which could profitably be followed in all countries.

To sum up, the following are the ways by which soil erosion is generally prevented. (1) Providing suitable storm-water drains, at proper places with effective vents at required levels. (2) Ploughing fields across slopes and planting crops similarly. (3) To grow more fodder crops and encourage permanent pastures. (4) In special cases growing more trees. (5) General good farming with particular attention to prevent erosion by terrace sloping etc., (6) Filling up gullies by brush wood dams, mounds, stones and rough embankments etc. More than half the battle lies in the prevention of erosion. Prevention is easier than cure.

The Problem in Foreign Countries. In the United States of America the problem of soil erosion is of major importance. It has been estimated that 10 million acres have been abandoned and 4 million acres devastated due to soil erosion. There are several soil erosion experimental farms where fundamental research on erosion is conducted. Practical and useful knowledge gained at these stations is given wide publicity.

In South Africa, that the Departments of Agriculture are determined effectively to tackle the problem of soil erosion, was evidenced by the Soil Erosion Conference which was held in Pretoria on 14th November 1929[10]. One of the most important recommendations of the conference was that the Minister of Agriculture should be responsible for the policy governing soil erosion and that he be assisted by an advisory council consisting of representatives of State Departments, Provincial Administrations, Municipal Associations and Agricultural Unions. Several important recommendations of the council have been

put into practical effect. Some of the chief recommendations are—(1) that a special competent Soil Erosion officer be appointed for the purpose of co-ordinating and carrying out work pertaining to soil erosion, (2) that there was an urgent necessity for investigational work to be done and the carrying out of initial experiments in the schools of agriculture, (3) that small areas be first handled, (4) that detailed contour surveys be made by the irrigation department, (5) that when results are obtained greatest publicity be given to them, (6) that loans be granted for conservational works, and (7) that efficient propoganda work be done to educate the masses. There is thus no doubt that South Africa is forging ahead with her schemes for the prevention and control of soil erosion.

In Ceylon the Government have fully recognised the seriousness of the situation. They have appointed a committee consisting of Planters' representatives and Officers of the Revenue, Forest and Agricultural Departments to consider this question and make recommendations for averting erosion after making a thorough study of the causes, rate and trend of soil erosion.

In Java where this subject has received attention, they employ the *Kotak* system, by which small rectangular terraces are made instead of long ones with ditches. An open drain is located at the foot of the terrace.

In China[11] prevention of soil erosion has been attempted at great expense and the results have justified the outlay. The fields were so constructed as not only to avoid erosion but to catch the maximum amount of soluble and suspended matter in the run off. Hillside fields have been terraced and carefully graded and bounded by raised rims which retain the run off until the suspended matter has settled. Heavy mulching[12] with straw has been found to check erosion effectively.

In Japan the problem of control of soil erosion in valleys which contain paddy fields is so serious, that the Government have felt themselves justified in spending on control measures as much as ten times the value of the land under erosion, a state of affairs which shows that the problem is recognised as one for the state rather than the private owner.

The foregoing facts reveal that soil erosion has become a world problem and in every country adequate steps are being attempted to control this evil.

The Problem in India. The problem of soil erosion and its control in India, should form an integral part of any comprehensive plan for the development of the natural resources of the country. India is essentially an agricultural country and the loss of soil by erosion is a national loss.

When compared with the work done in foreign countries for the prevention and control of soil erosion practically very little has been done in India either in realising the seriousness of the question or attempting to control it on an All-India basis. A few Provinces like Bombay have been trying to do something but the other Provinces are sadly lagging behind, letting the finest soil of our country go to waste.

The Board of Agriculture in India[13] met at Pusa in 1916 and took up the question of soil erosion for discussion. Dr. Mann recommended that an engineer be placed at the disposal of the Agricultural Department, Bombay, to take up the work of the prevention of soil erosion. Mr. Taylor suggested that the problem should be tackled by the Agricultural Chemist, while Mr. Bent was of opinion that famine labour should be diverted to this. The Director of Agriculture, Bombay, said that the Collector of Ahmednagar was given a grant for the construction of small bunds as famine relief work, but that the bunds had breached in various places and that no sustained care had been bestowed on this. Small bunds strengthend with stones have been useful. Wiers must be constructed at proper levels to let clear water run off. Mr. Evans suggested that grass lines across slopes reduced erosion. Mr. G. D. Hope suggested, for tea lands, contour planting, contour drains, terracing and the use of leguminous plants like Tephrosia for hedging, to prevent erosion.

Control Measures so far attempted in India. At Pusa large fields have been divided into small field by Howard[14] so as to break up the run off into units and so dissipate its destructive energy. Each small field is surrounded by trenches and small grass borders which conduct away the run off and also hold up the fine soil. Each field deals with its own rainfall only.

In Bombay this work has been taken up with earnestness. The Department of Agriculture in Bombay has realised that soil can be retained by effective field embankments. Two officers have been doing experimental work. In 1914-15 an enquiry was started into the problem of bunding and levelling. In 1915-16 it is reported that soil erosion work was in full progress. Many embankments and waste wiers were being built. This became so popular that applications were being received to put up embankments and the staff at the disposal of the department was unable to cope with it. In 1921-22 the Government announced that they would appoint a Land Development Officer for collective schemes of irrigation. In 1922-23 a systematic study of soil erosion was made and suitable recommendations were being put into practice. In 1926-27 a Superintending Engineer was appointed to provide technical skill in preventive works of large size while smaller schemes were in the hands of the Department of Agriculture. Three men have been employed as "Bunding Officers" and extensive work is being undertaken and pushed through.

The collectors were issuing *taqavi* loans to suitable applicants and the Registrar of Co-operative Societies advanced loans to individuals for embanking. The District Agricultural Officers were also being trained in the work of the prevention of soil erosion. It was being fought on almost all fronts.

Let us now turn our attention to the problem in Madras. No adequate attention has been paid either to assess the loss to our province by soil erosion or take steps to combat it. The natural agricultural capital of the country is slowly running into waste. The loss of soil fertility reacts on production and the consequent well-being of the people. It will mean debt, increased liability to disease and finally rural depopulation. The gradual denudation of the soil of the country is the real economic drain.

The monsoon rains are not an unmixed blessing. Soil erosion is an attendant evil. Fine soil particles get washed and create minor depressions in the soil which are accentuated every year so much so ravines and gullies are gradually formed in badly neglected cases and soil in very appreciable quantities gets washed away every year through streams across the fields. This is a very common sight in the dry lands of the Ceded Districts. This evil is not chronic in wet lands and is not absent in garden lands.

It does not require high technical skill to combat soil erosion of minor types. Leaving aside *Porombokes* all minor erosions in cultivated lands must be bunded up at the outset so that they may not become bigger streams. There will be always enough stones and pebbles in the field itself that could be picked and laid across so that regular streams may be made into many little cascades.

Regular carting of silt from tank beds and giving it back to the soil will generally make up much of the loss from erosion. To lessen the cost of this work it should be taken on hand when cattle have no other work. In the first instance silt can be made into a bedding for cattle. After it has absorbed the urine it should be put into the manure pit where it makes an excellent starter for cholam stubble and other straw and when fit may be spread on the land.

By suitable publicity of their evil effects, an end must be put to the reckless destruction of forests, to over grazing and careless farming. Measures should be taken to conserve forests in valleys and water sources, and to see that such places are not brought under tea, coffee or other planters' crops.

It is suggested that this soil erosion problem should be taken up seriously by the Madras Agricultural Department. Agricultural Demonstrators should be given training in methods of erosion control and be asked to put them into effect in their centres of activity. Fundamental research on the erosion of South Indian soils should be

made and any useful results obtained may be vigorously advocated. A systematic survey of the Presidency has to be made for assessing the seriousness of the problem in Madras, so that adequate measures for the prevention of soil erosion may be put into operation. The disappearance of the prickly pear through the cochineal insect has resulted in the loss of a valuable plant, which until man found it necessary to remove it and cultivate the cleared land, has been one of the best agencies in the protection and retention of the soil.

Soil erosion is a national menace and calls for joint action and sustained effort on the part of the cultivators on the one hand and the Government on the other. If this colossal waste of basic capital accumulated patiently through centuries is prevented, the foundations of a new agriculture will have been well and truly laid.

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MECHANICAL ANALYSIS OF SOILS

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Though a detailed mechanical analysis is done as a regular routine in the course of a soil study, a rapid separation into two fractions one of which is the coarse fraction including coarse and fine sand and the

other is the fine fraction including silt and clay has been found to yield useful preliminary information and to be valuable in advisory work especially when large numbers of samples have to be dealt with rapidly. The fine fraction is determined by Robinson's pipette method and the residue left after the removal of clay and silt by the sedimentation method (beaker method) is the coarse fraction. Both these fractions may be estimated directly or one of them alone determined directly and the other obtained by subtraction from 100.

With several kinds of soils the results of the above rough separation do not seem to be affected by the method of dispersion employed. Simple shaking of the sample with distilled water for twelve hours is found to be enough and as good as adopting the International method or the Puri method. There are, however, certain cases where efficient dispersion is necessary for obtaining correct information and the percentages of the two fractions vary markedly with the method of dispersion employed. Typical results obtained with highly silty soils characteristic of the deltas are given below :

Shaking with distilled water.

Soil No.	Coarse fraction.	Fine fraction.	Total.
1	32·1	59 9	92·0
2	36·5	56·8	93·3
	International method.		
1	33·6	67·0	100·0
2	34·8	66·1	100·9

It will be noticed that with imperfect dispersion the fine fraction is found to be too low and the total is much less than 100. However, the coarse fraction is found to be almost the same by the two methods of dispersion. The explanation seems to be that when not properly dispersed during the estimation of the fine fraction by the pipette method, a portion of it seems to behave like the coarse fraction and during the subsequent repeated washing in the course of the estimation of the coarse fraction by the beaker method, this portion seems to get dispersed and removed as silt or clay leaving the correct coarse fraction alone behind. The easiest method of analysing such samples is to shake them with distilled water, estimate the coarse fraction directly and obtain the fine fraction by subtraction from 100.

With red soils particularly of the Lateritic type complete dispersion by the International method has been found to be essential, otherwise the results for the fine fractions are markedly low. Boiling with water as a method of dispersion is found to be not desirable since in certain cases it has a coagulating effect. Clayey calcareous soils also require thorough dispersion. The following table summarises a few typical results obtained with black cotton soils.

Sample.	Fine fraction.	Coarse fraction.	Total.
	Shaking with water.		
1	68·2	32·5	100·7
2	70·1	31·3	101·4
	International method.		
1	69·4	23·2	92·6
2	70·3	23·1	93·4
	Puri method.		
1	75·3	24·9	100·2
2	78·0	23·0	101·0

On comparing the International method and Puri method which employs sodium saturation, it will be noticed that the former gives too low values for the aggregate and the values for the coarse fractions are almost the same. It may, therefore, be concluded that the deficit is entirely due to the fine fraction which seems to contain all the soluble portion. It is immaterial which of the two methods of dispersion is adopted provided the coarse fraction is estimated directly and the fine fraction calculated by difference. Simple shaking with water gives obviously high results for coarse fractions and low results for fine fractions.

When a large number of soil samples of the same type have to be studied rapidly it is advisable to find out with one sample whether it requires efficient dispersion or not. Subsequently it is enough to estimate only the coarse fractions which is quite early and rapid and calculate the fine fractions therefrom.

Acknowledgments. Part of this work was done in the Agricultural Research Institute, Coimbatore and our thanks are due to the Agricultural Chemist for facilities offered.

PINEAPPLE CULTIVATION IN MALABAR

By E. K. GOVINDAN NAMBIAR, L. Ag.,

Farm Manager, Agricultural Research Station, Taliparamba.

In all countries where the value of fruit diet has been recognised, pineapple occupies a high rank. In most of the western countries and in all tropical islands within easy reach of the West this has assumed great commercial importance. In India where the plant seems to have been introduced about 300 years back and has spread through the West Coast to Bengal, Assam and Burma, little attention seems to have been paid to improve the quality or commercial possibilities of this valuable fruit plant.

In this Presidency it occurs in several places as a hedge plant or as an ill-kept bush yielding stray fruits of small size and of an insipid sour taste. In the Simhachalam hills of the N. Circars and in isolated estates of the southern and western portions of the Western Ghats it

has received some attention at cultivation. During the last decade the cultivation of this has been taken up in several places on the West Coast through the activities of the Agricultural Department and this note deals with the experience gained in its cultivation on the West Coast both in the Government farms and outside.

Climate. The pineapple is a hardy plant thriving best under conditions of moist, heat and well distributed rainfall of 50 inches and above, but it does not seem to stand extremes of temperature or very high altitudes.

Soil. A rich sandy loam is the best suited, but under proper care even the shallow gravelly soils of the high level dry lands of the West Coast have been found to produce fruits of excellent quality. High level sand and heavy clays are unsuitable. The plant can hardly stand water-logging or heavy shade.

Varieties. The local variety yields only fruits of very poor quality. Of the imported varieties the 'Kew' and the 'Mauritius' have been found to be the best. The Kew is distinguished by its ashy deep green violet-tinged leaves with smooth or sparsely thorny leaf margins by the stout build of the plant and by the remarkable size of its sweet fruit weighing 10 to 15 lbs. and more. The Mauritius is of a much smaller build with reddish tinged leaves and sharp close-set thorny margins and producing small bright yellow fruits with prominent eyes and of excellent flavour and taste.

Preparation of land. To get fruits of uniformly good size without exhausting the soil, great care is required in the preparation of the land. Clearing the scrub jungle, terracing, and drainage have to be arranged for in advance. In the neighbourhood of jungles a rubble-stone wall or wire-net fence or a strong thorny hedge should be provided and the area must be as compact as possible. Planting is best done in trenches 2 feet deep and 1½ ft. wide and 3 to 4 feet apart. An extra space of 1 foot for alternate trenches will facilitate all cultural operations.

Manuring. Pineapple is a heavy feeder and demands heavy manuring. Where virgin soils are not available about 25 to 30 cartloads of cattle manure or an equivalent of compost or other bulky manures and about 2 cartloads of ashes per acre may be worked in the trenches before planting. The same must be applied every year in 2 doses. An equal dose may be given during the succeeding years. Where enough bulky manures are not available a supplementary dose of about 1 lb. of fish guano, or a mixture of ¼ lb. of bonemeal, ¼ lb. of ammonium sulphate and ¼ lb. of sulphate of potash may be applied per year per plant in 2 doses.

Propagation. The plant is best propagated from suckers produced on the mother plant just above the ground level. Those from the base

of the fruit known as slips or robbers and those from top of the fruit known as crowns take a considerably longer period to bear. For rapid multiplication especially of rare varieties, each mother plant can be made to produce a large number of suckers by removing them as soon as they develop to convenient size. Great care should be taken not to break the butt-end of the suckers while removing them from the mother plant. These can be set out in a close-set nursery until required for planting.

Planting. This is done with the first heavy rains in May-June in trenches prepared in advance. A spacing of 3 feet will be enough for Mauritius while an extra foot may be required for Kew. This with the extra spacing for alternate trenches will give about 4100 plants per acre for Mauritius and 2400 plants for Kew. The removal of a few scale leaves and dead roots from the suckers will facilitate quicker rooting. Care should be taken not to get the central shoot clogged with mud.

After-Cultivation. This consists mainly of weeding, mulching and gradual filling up of the trenches just to cover the subsequent doses of manure. The fruits may require propping, and protection from enemies when about to mature. After the first fruiting which takes about 1½ years from planting for Mauritius and 2 years for Kew all extra suckers except one or two of the lowest are to be removed and the plants manured and earthed up to cover the manure but not to cause the development of a shallow root-system which will weaken the plant during the hot season.

Catch crops. Under systematic cultivation pineapple allows of shorter duration catch-crops especially in the first year of plating. Since the suckers take about one year to cover the ground, a crop of vegetables or chillies can be planted between the suckers in the heavily-manured trenches while on the loose ridges a catch crop of sweet-potatoes, groundnut, redgram, gingelly or other rainfed short-duration crops can be taken in the first year. In virgin soils even plantains and tapioca can be grown with advantage especially in badly exposed situations where some shade is not unwelcome. Pineapple also allows itself to be grown as an inter crop in young plantations of cocoanut or fruit trees. Not only as a profitable catch crop, but even as a decorative plant this can be given a place in all well-kept house gardens.

Pests and Diseases. In the neighbourhood of jungles, the wild boar, the jackal and the toddy-cat do lot of damage when once they chance to taste the fruit. Rubble stone wall, wire-net fence or thorny hedges combined with careful watching can save the crop to a great extent. In extensive plantations the percentage of loss from such enemies is much less than in small isolated blocks. In certain places even crows do considerable damage. This can be prevented by tying

up strings across the plots supported on poles struck along the border and by occasional shooting.

No serious disease has been observed except excessive vegetative growth of the plants and deformities of fruits noted more in Kew than in other varieties. These can best be avoided by using suckers only from healthy plants.

Yields. The Kew variety takes about 2 years from planting to harvest while Mauritius takes about 1½ years About 75% of the plants may be expected to yield during this period. The rest may be expected to yield in another six months. The main flowering season is from December to February with the fruits ripening from April to June while a small crop my be expected in November—December. In the case of Mauritius the fruiting season is spread over a slightly longer period. Good suckers of the first ratoon will yield in about a year.

Ratooning. Pineapple yields best during the 2nd and 3rd year of planting. The suckers from the subsequent ratoons will lift up too high to be benefited by manuring and earthing up and the yields will be consequently poor. It is then advisable to shift the plantation to a new site. It is said that where new sites are not available the plantation can be indefinitely continued on the same site by starting fresh planting in the trenches formed between the ridging of the previous plantation.

Marketing. The profits from the plantation depend mainly on proper marketing. Early in the season Kew fruits may fetch up to Re. 1 each but the average can be put at about 4 annas. Until the value of the fruit is appreciated locally the planter must take special care in getting in touch with a good market like Bangalore and Madras where good fruits are always in demand. The fruits should be harvested with a bit of the stalk just when the lowest eyes turn yellow. The least injury to the fruits will start rotting. For safe transport they are best packed with dry packing in single or double bamboo baskets. In this condition Kew fruits will keep about 10 days while Mauritius will keep about a fortnight and so can be sent to fairly long distances.

Uses. The improved varieties rank among the best of fruits. Due to its refreshing and even medicinal properties, pineapple is considered to be good even to invalids and children. It is also a vermifuge. Boiled with sugar it makes preserves of good colour, flavour and keeping quality. The juice itself can be preserved and kept for flavouring other preparations. Half-ripe fruits are good for chutney. The fleshy thornless leaves of Kew can be fed to cattle during the dry season. The leaves also yield about 3% of cleaned fibre of good quality.

Profit. Pineapple is one of the most paying crops especially as it can be successfully grown even on cheap lands. A Kew plantation kept

for four years may yield about 7000 fruits of an average weight of 5 lb. Valued at a modest rate of 6 pies per pound, this will fetch about Rs. 1000 per acre. In the case of Mauritius though the fruits are only about 2 lb. on an average the total income can be expected to be equally good due to its earlier bearing and superior quality of the fruit. The cost of cultivation as done in the Government Farm comes to about Rs. 500 per acre so that under proper care the plantation can give an average annual profit of Rs. 125. Where local preservation of fruits and ready marketing can be arranged for, the profits will be much more. In a newly introduced locality a decent amount can be made by the sale of suckers which sell at Rs. 2 to Rs. 3 per 100.

Scope. Judged from the experience of areas where concentrated work has been done to increase the area under this crop, there seems to be great scope for expansion (in all wasteland areas) near big towns. Among the fruit-bearing plants it is perhaps the earliest and the most paying. With a long sea-coast and rail road and with plenty of road and river communications to the interior where plenty of cheap land and manure are available the pineapple cultivation has a great future.

For suckers and for information regarding the cultivation and disposal of the crop help can be obtained from the Deputy Director of Agriculture, VII Circle, Tellicherry.

CASUARINA PLANTATIONS IN CUDDALORE

By K. S. KRISHNAMOORTHY, L. Ag,

Agricultural Demonstrator, Cuddalore.

Casuarina is a tree of rapid growth introduced into India about 60 years ago. It is good as fuel which burns well though not of much value as a timber. This is grown in extent in South Arcot District owing to the ready demand for fuel at Madras to which place it is carried in boats along the Buckingham canal and also by rail. Owing to the increasing scarcity of fuel, the area under casuarina is steadily increasing.

Soil. The casuarina is planted on all kinds of soils ranging from pure sands on the edge of the sea to the stiff clay soils in the inland. Sandy-loams with a water table at a depth of about 4 to 6 feet in summer are the best for casuarina.

Gathering of seed and nursery. The fruits that ripen during December to April are gathered from the trees of 6 to 8 years old and are dried on a good drying floor protected from wind. The fruit bursts and scatters the seed. The seed is collected and dried. Ash is mixed along with the seed as a prevention from ant attack and preserved in good pots or tins. The seed is generally collected just before sowing as it is found to lose its vitality after three or four months.

Nursery. Nursery raising at Devanampatnam near the sea coast at Cuddalore is described below. More than 100 ryots raise casuarina nurseries for the sale of seedlings alone. The land is sandy and free from white ants. The lands are well dug with mammaties and left as such for a week. Again, it is redug and the nursery bed is properly prepared.

The bed is a long strip 48′ to 60′ long and 2½′ to 3′ broad. The nurseries are never manured. Casuarina seeds 1 Madras measure to 1¼ M. M. are sown in the plots in early mornings when there is no wind. The seeds are evenly sprinkled by hand and lightly covered by sand. The seeds are generally sown from the 3rd week of February (i. e.) from Masimakam day up to 3rd week of March. It is besides, covered by leaves and twigs to prevent the direct contact of the heat of the sun. The nursery plots are moistened by sprinkling with the aid of a Rosecan. For the first week, the nurseries are watered thrice a day, the first during the early hours of the morning, the second from 9 to 10 A. M. and the third in the evening after 5 P. M. After a week, the leaf covering used is removed exposing the small seedlings which are 1″ to 2″ high and white in colour. For another three weeks, they are watered twice a day, once in the morning and again in the evening. After a month they are watered once a day, either in the morning or in the evening for another period of 5 to 6 weeks.

After 60 to 75 days, the seedlings are pulled out and replanted in Nursery plots 48′ to 60′ long and 2½′ to 3′ broad. Even *these plots are not manured* but are well dug with mammaties. The plants are watered once a day for a month. Later, depending upon the weather they are watered every day or once in two days. Thus, after 6 months from the date of sowing i.e., after August, they are fit for planting in the fields, when the seedlings will be about 1¼′ to 1½′ high. In one bed, there will be about 12,000 seedlings, of which 6,000 to 8,000 well-developed ones are first pulled out as "first rate" seedlings and then the rest classed second rate. after another period of 3 to 4 months. The seedlings are generally sold from Rs. 0—12—0 to Rs. 1—8—0, priced according to the vigour of the seedlings and also to the buyers' demand at that time.

Field Planting.—The plants are usually put in at distance of 4½ feet apart each way; but in some good soils, they are planted 3′ × 4½′. Thus 2,150 to 3,250 seedlings are planted in an acre.

The usual time of planting is during the rains from October to December, the earlier planting being better. In places where water stagnates, the planting is done just after the rains.

Generally, the fields to be planted receive no preparatory cultivation but small pits 9″ in depth are dug and the soil loosened. Then holes are made with a blunt stick to insert the seedlings.

Watering.—The plants are watered both in the morning and in the evening for about 10 days if there is no rain. Subsequently, watering is given once a day for another 10 days. The plants establish themselves by then and are watered twice a week. Till the next rainy season, the plants are watered once or twice a week according to the prevailing weather. In most cases plants are not watered in the 2nd year.

Other Cultural Operations.—The soil is loosened between the rows of plants during the second and third year by working the country plough. About 3 years after planting the lower branches of trees from 6′ to 8′ are lopped off and sold. The trees that do not come up well at the end of four years are removed and sold. This thinning, generally reduces the number by 25% to 35% and finally there will be about 1,500 trees per acre.

Harvest. The plantation is cut at the end of 8 to 10 years when each tree will fetch on an average Rs. 0—6—0 to Rs. 0-8—0 and thus a net income of Rs. 560 to Rs. 750 is obtained in an acre. The proceeds from the lopping of the trees and the proceeds from the sale of thinned out trees will generally cover the cost of seedlings, planting, watering and watchman's wages.

CHICKEN POX AND ITS TREATMENT *

By J. J. DE VALOIS,

Mission Poultry Farm, Katpadi.

There are a number of diseases that work great havoc with the amateur poultry keeper in India especially in the villages where the vitality of birds at best is very low due to poor feeding, promiscuous breeding and bad housing conditions. In my experience I have found that chicken pox perhaps takes a larger toll than any other poultry disease. Its ravages are not considered so serious as that of fowl pest because it does not do its work as dramatically as the "Angel of death". This disease, like the poor, is ever with us and many people take it for granted as some do itch and scabies for example, or the proverbial fleas on a dog. But anyone who has made a study of poultry rearing in the villages will agree with me that thousands of chicks, especially, are claimed by this disease every year.

In the early days of our poultry work I considered this one of the major problems we had to solve. As surely as the cooler days of January began to wane and evidences of the hot weather began to appear, chicken pox would be right around the corner to say her "How-do-you-do". After considerable experimentation we have learned to control this disease with considerable success and no longer consider it one of our major problems to deal with.

Prevention.—Prevention is again our best weapon of defence, as it is, in our poultry-disease control. Chicken pox has its very noticeable outward lessons and consequently many people think that it is an external disease like a pustule. This however is not the case as it is a disease of the blood and apparently makes its appearance without any communication from without. It naturally assumes a more virulent form when additional foreign bodies are communicated to the

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flock but many cases are known where infection took place without any contamination from outside. The first control I would suggest is to make an attempt to hatch and rear chicks early before the evil days are upon us. An outbreak of the disease in South India may be expected any time after the first of February. The disease is particularly trying for small chicks under two months of age. Older birds too are affected, but, for them it is not such a serious matter and the death rate is rather low. In villages I would estimate that 90 per cent. of chicks under two months of age are claimed by the disease from February to June. Consequently my strong advice to our village friends and others who experience difficulty is *hatch and rear your chicks before January first.*

Thriftiness.—Considering the preventive side of this problem further I would say a second policy to follow would be, to see that chicks at all times, but especially during the first six months of the calendar year should be kept in a good thrifty condition. Naturally a thrifty, well kept, healthy chick has a much better chance of resisting infection in the first place, or if attacked, to survive the shock that accompanies the disease. A poorly fed and cared-for chick is already in a weakened condition at best and if attacked by the pox has virtually no chance of recovery. At no time in the life of a chick or any other animal, man included, is proper care and feeding as essential as during the first weeks or months of that particular animal's life. No animal stunted during this period of its life ever fully recovers. Aside from any consideration of chicken pox, therefore, a young chick should be kept as healthy and strong as possible. If underfeeding and under-nourishment have to be practised, I beg you to postpone it till the chicken has had a chance to become well established the first two months. Proper care and feeding will very materially reduce the risk involved by an attack or threat of the disease.

Tonic for Prevention.—We have found that giving a good tonic from the middle of January will also go far towards preventing an outbreak, or if it does occur, to greatly decrease the severity of the trouble resulting. This tonic presupposes that the chickens are thrifty and being kept in prime condition. Unless that is done, any amount of "doping" will be useless. The following drugs should be finely powdered and mixed in poultry well :—

Epsom salts	... 8 Ounces.
Ferric Sulphate	... 4 ,,
Calcium Phosphate	½ ,,
Ground Ginger	... 3½ ,,

Every 25 chicks of about 2 weeks of age should receive one teaspoonful of this preparation once a week. Larger and smaller chicks should be given proportionate doses. We find that withholding food on a given morning till about 10 a. m. and then mixing this tonic with the dry mash will ensure each chick getting its proportionate share if sufficient dish space is allowed so all can feed at the same time. As much of the mash as the chicks will clean up in a half hour should be given. The tonic should be given regularly on the same day every week beginning from January 15 and continuing till the danger of the disease is over, which we have found to be by the middle of June. This tonic will never do any harm however, and may prove useful at other times as well. We recommend it chiefly for chicks under two months of age although we feed it, more or less as a matter of routine, to all our growing stock in the early months of the year.

The drugs can be obtained at any good chemist but we have found that it is considerably cheaper to buy the raw ginger and grind it ourselves. This is not as pure as that coming from the Chemist's stock room but serves our purpose equally well.

Fowl Pox Immunity.—Immunity against fowl pox has been tried successfully for many years but was used only on adult fowls or birds half-grown until very recently. The Poultry Husbandry Department of Iowa State College has more recently experimented with the vaccine on day-old chicks with apparent success. Following their example we used it on 2000 baby chicks at our Farm at Katpadi and our results also were successful to a large extent. We did find that the chicks reacted to the treatment but the disease occurred in a rather mild form. The shock of the treatment did lower the vitality of the chicks so that I would not recommend it to a person who can control the disease successfully with the tonic and general thriftiness.

We made our own vaccine as follows:—One part powdered fowl pox scab secured from infected birds was mixed with 250 parts of a dilutent made of:

40 per cent. glycerine
60 ,, ,, 0·85 per cent. sterile saline solution. (We used a concentrated saturated saline solution).

A small patch of fluff is plucked from the breast of the chick and slightly scarified to obtain a successful infection and uniform reaction. The vaccine is applied to the skin and feather follicles with a stiff brush. The chicks should be isolated in a dark room for a day or two following the treatment to prevent cannibalism by picking at the wound. Here again success will depend in no small measure on the general health of the youngsters both before and after treatment.

I should like to say that our experiment has not been tried sufficiently long to enable us to make any dogmatic statements, but our limited experience does lead us to believe that this simple treatment may perhaps prove a real boon to the village poultry-raiser in India who can secure the service of an interested party to demonstrate the manner of treatment on a commercial basis perhaps.

Summary.—To summarise my brief remarks I should say:—try to raise your chicks in October, November and December. push them all you can the first two months at least, giving them the tonic from the 15th of January for several-month and as a last resort, fall back on the immunzation work to protect our feathered friends.

THE SANITARY DISPOSAL & AGRICULTURAL UTILISATION OF HABITATION WASTES BY THE INDORE PROCESS

By F. K. JACKSON & Y. D. WAD

Detailed Technique.

Installation.—The essential part is the charging trench, which should be fifteen feet wide, and two feet deep. The floor must slope gently along its length to prevent water-logging, and must discharge into a natural drainage channel. It must be served by a road to be used as a charging platform running alongside. This road may lie between two trenches, serving each, and usually the most economical construction is to dig the trenches one foot deep and pile enough of the excavated earth to make the road foundation. The road should be at least fifteen feet wide (preferably twenty feet) and suitably metalled to stand carting in wet weather. The side of the trench against the road must be vertical and should be reveted with timber or a wall of stone or brick, the top of which should carry a sill of suitable material (e.g., old steel rails, girders, or heavy logs) against which carts can back. Without this sill a log must be put in position at each tipping.

The other side of the trench is to be bunded, preferably by a partition, the top half of which is removable—old sleepers, boards, logs, or thick corrugated iron sheet between upright posts—or by an earth, stone or brick wall, rising two feet above the trench floor. Beyond this partition about twenty feet space must be left for storage; in practice extensive sales of compost are usually confined to two or three periods of the year. This storage ground may be excavated level with the bottom of the trench if desired. Unless dug on solid stony ground the trench must always be floored with road metal or at least well-rammed brick-bats and rubble; the storage ground is also better so treated. It is wise to build an earth bank with a drain on those sides of the whole installation from which the flow of surface water is to be feared.

The total length of charging trench required is determined by the average daily quantity of refuse received. Experience has shown that for each cart-load (a cart-load of refuse is here taken as 35 cubic feet and a cart-load of night-soil as 60 gallons), of refuse received daily, 1 foot 4 inches length of trench is necessary. The volume of night-soil received has no influence on this figure as it is taken up in the interspaces.

Charging the trench.—The first charge should be made so as to leave a vacant space of four feet at one end of the trench. To start with, cart-loads of refuse, without sorting, are tipped in from the charging platform and spread by drag rakes to make a layer three or four inches thick. About a dozen forkfuls of inoculum from a charge at least two weeks old is then scattered (this of course is not necessary for the first charges of a new installation) and the cartful of night-soil tipped on the top, followed immediately by more refuse, tipped over the night-soil. Then the refuse, together with the night-soil below, is drawn by drag rakes in small lots until the breadth of the trench opposite is covered. About four layers per day should be made thus until the whole depth is charged in two days. The top layer for the day and at the end of the charge should be refuse only, without being mixed with the night-soil layers beneath. This top layer should not be more than 1 inch to 2 inches thick, being intended as a coating to preserve uniform moisture, and to prevent the breeding of fly larvae on top. The next charge should be given to the adjacent portion of the trench without any interspace and so on continuously.

Proportion of night-soil to refuse.— No proportioning is necessnry; whatever quantities of refuse or night-soil arrive must be treated at once, no excess of either being left over. If the proportion of night-soil is high or of a very liquid nature, the refuse layer should be spread with a surrounding raised margin until the mixing is complete. After the charge or the later turns the heaps must have flat tops and vertical sides, otherwise difficulty will arise in preventing water-logging in a wet season and in keeping uniform moisture during dry weather.

First turn.—Two days after charging is finished the first turn is given—i. e., four days from the start. Half the charge is forked on the four feet-vacant space left. Then the remainder of the charge, is forked on top of this already-turned mass.

While this is being done water should be distributed if necessary from a hose or by hand upon the turned material so as to soak it without permitting seepage or local water-logging. Sullage water may well be applied to the lower layers at this stage but on no account to the surface.

The few fly larvae that may be found on the cool sides of the charge are turned into the heap and destroyed by the high temperature therein. If the first turn is delayed beyond four days there will be a greater development of maggots

and more chance of their escaping to pupate in crevices in the walls or floor of the trench, especially in wet weather Such pupation is usually slight and if desired can easily be checked by disinfectants.

Second turn.—The second turn is given eight days later by forking the charge over to the opposite side of the trench, adding water if necessary.

Third turn.—This should be given from eight to fifteen days after the second turn according to the stage of decomposition—when the material has crumbled to a fairly advanced degree. The mass is forked out of the trench (with watering as necessary) on to the adjacent storage ground where it may be heaped up to four feet in height.

Watering between turns —During very hot or windy weather the upper layers may become too dry ; a well-distributed surface watering should then be given.

Duration of the process. The manure will be ready for use in from three to eight weeks after charging, the period depending on the proportion of night-soil to refuse, the correct control of moisture and air throughout and the season.

Precautions during monsoon rains. The initial charge should not occupy the full width of the trench ; a two feet space should be left next to the partition to allow storm-water to flow. If there is risk of water flowing into the trenches from the road the charge should be built up a foot higher, above road level. In a trench of considerable length there may be a danger of exposed corners of the heap being washed away by drainage water on the trench floor. This can be prevented by protecting such surfaces with strips of sheet iron about three feet long and suitable height. During prolonged rains it is advisable to give the third turn earlier, to prevent water-logging and slowing down decomposition.

Implements necessary. One drag rake with four seven-inch blunt steel tines and a long handle, and one fork will be needed to deal with a daily intake of five cart-loads of refuse. English shovels are useful for handling the finer material.

The sprinkling of water to ensure good distribution may be done, on a small scale, by throwing it with a suitable vessel such as *tagari.* For larger installations a hand pump with a hose and sprayer or even a permanent supply of piped water would be more efficient. (From *Instt. of Plant. Industry*, Indore, Bull. No. 1. 1934.)

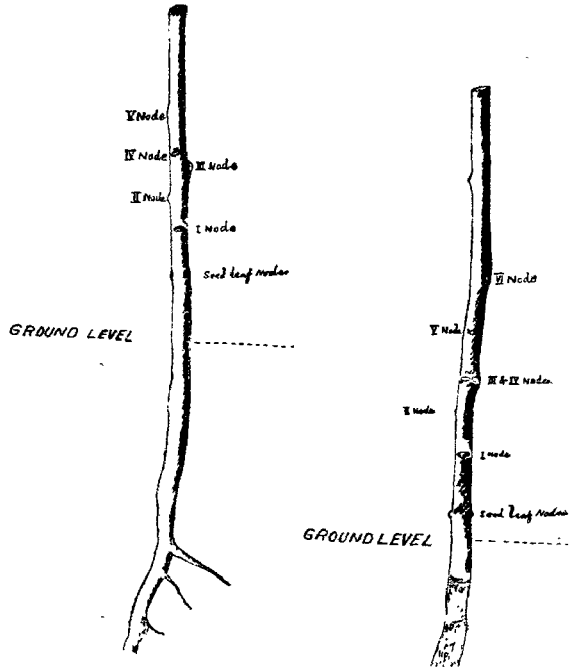
Research Notes.

The occurrence of a conjoint node at a constant position in indicum cottons.

The usual arrangement of the nodes and leaves on the stem of the cotton plant is a spiral one. In the course of counts leading to the determination of the first fruiting branch node in selections of indicum cotton both at Nandyal (in the 'Northerns' area) and at the Agricultural Research Station, Kovilpatti (in the Tinnevelly cotton area), the author has met with cases of plants where the positions of two of the nodes and consequently of the two leaves happened to be conjoint instead of being separate from one another like the rest of the nodes in the spiral phyllotaxy. An interesting feature about this occurrence is that the position of these conjoint nodes happens to be constant; i. e., counting the node after the pair of seed leaves as the first, the position of the two conjoint nodes invariably happens to be the third and fourth. Stray cases of the seventh and eighth nodes occurring collaterally have also been noted by the author at Kovilpatti. The accompanying plate shows, side by side, a normal plant and one where the conjoint nodes occur at the third and fourth positions.

NORMAL

III & IV NODES SIDE BY SIDE



The following table gives the percentages of plants with conjoint nodes at the particular position in seven of the indicum selections grown at the Nandyal Agricultural Research Station during 1929—30 and the percentages range from 4 to 14.

Percentage of plants with conjoint nodes at third and fourth positions.

Sel. No.	% (1929—30)	% (1933—34)
11	12	
15	8	
16	7	
29	4	3
23	14	6
24	14	3
N 14	7	
N 54	7	

The case cited is one of morphological interest. The constancy of the feature may have some physiological bearing. Three of the cultures examined during 1929—30 have again been examined for this character during 1933—34 and the percentages of plants with conjoint nodes are given in the table; further study will be necessary to see if the character has any genetic value or whether particular environmental conditions induce this collateral position.

Stray cases of conjoint nodes at the third and fourth positions were also noticed during the season 1932—33 in the local Gadag cotton–*Gossypium herbaceum*. Based on the presence of two collateral leaf scars at the particular position

noted, they have been arbitrarily assigned individual nodal status and this is no doubt a matter for discussion. It is also possible to view them as a compound twin or a botanically-single node. Anatomical investigations regarding their leaf traces and detailed observations regarding the time interval if any in the formation of these nodes are likely to throw light on the notation that is to be adopted. But the chief point that is stressed in this note is the constancy of the position of occurrence.

Acknowledgment. My thanks are due to Mr. L. Neelakantan, M. A., Second Cotton Assistant, for the counts during 1933—34 and some suggestions in the preparation of this note.

Agricultural Research Station,
Nandyal. C. Jaganatha Rao, B. A.

Gleanings.

Scum on the Water Surface of Rice Fields. The 'Scum' consists of a thick layer of algae and its *occurrence is common where the water becomes stagnant*, i. e., in low lying areas or where the natural fall in the level of adjacent fields is insufficient. "Scum" rarely forms where there is circulation of water from one field to another.

The "Scum" layer begins to develop soon after transplanting and, in bad cases, results in the formation of a thick green or brown covering upon the water surface. This covering gradually increases in density round the stems of the rice plants and *prevents growth and tillering*. The plants in affected fields are generally unhealthy and poor yields are obtained. The trouble recurs in certain fields year after year and becomes gradually more intense.

About 16—20 lbs., of copper sulphate crystals per acre are put in a thin cloth bag which is drawn through the water in the affected plot so as to ensure uniform distribution of the solution thus obtained. Smaller quantities of copper sulphate crystals per acre will do if the field is only partially affected by the "Scum". As a result of this treatment, the scum soon dries up and settles, leaving a clear water surface in the field and enabling healthy growth and increased tillering to take place. In fields which have been treated in this way, the 'scum" does not reappear with subsequent irrigations. (Sind Agri. Dept. Leaflet No. 7—November 1931.)

The Rat Pest in Paddy Fields. *Damage caused by rats.* The damage caused to the rice crops by the rat pest commences when the plants are in the 'milky' stage. At this stage of crop growth, the rats enter the field and cut through the bottom portion of the stem which is sweet and pulpy. They construct nests in the field by cutting and twisting the tops of plants together in which they live. The second period of severe damage to the crop is when the grain has formed and the ear-heads are ripening. At this time, the rats are usually living in holes in the fields and they store large quantities of ear-heads and grain in these burrows in addition to the material actually eaten by them in the field.

The different methods of control and destruction are described below:—

(a) *Hand digging and destruction.* This method involves digging up the burrows of the rats in bunds and in fields and in killing the rats found therein by sticks and spears or with the help of dogs. To be successful, this method must

be carried out systematically over a large area otherwise many rats will escape and find refuge in neighbouring fields where digging is not being done. It is also an expensive method and requires skilled labour which is not always available. To carry out an effective hand killing campaign, parties of men should be organised to work simultaneously over a wide area as there will be little advantage if the work is done only in isolated areas and by individuals on their own account.

(b) *Poison baits.* Another method of dealing with the pest is to lay down poisoned baits in the vicinity of their burrows and in the fields where they feed. The proper and safe use of poison baits requires careful and skilled supervision and this method of destruction is not recommended for general adoption.

(c) *Fumigation.* As poisoning by means of baits was not found to be very successful, the Agricultural Department investigated methods of destroying the rats in their burrows by fumigation with poisonous gases, etc. As a result of these investigations, it was found that the best results were obtained by the use of calciumcyanide in the form of a very fine dust ("A" dust) which was pumped into the rat holes by an easily portable pump called the "Cyanogas" pump. The best time for carrying out this method of destruction is during the months of July to October when the rats are generally living in short burrows in field bunds and embankments. When rat attack is severe, treatment of burrows with the "Cyanogas" pumps should be carried out three times during the season, firstly in July as soon as transplantation is over, secondly in the beginning of September and lastly in October. The cost of the treatment is eight to ten annas per acre and, in badly infested areas, will result in the saving of several rupees worth of grain per acre on treated areas. The Cyanogas pump (small size) costs Rs. 20 to Rs. 25 each and is obtainable from Messrs Shaw Wallace & Co. The Calciumcyanide powder costs approximately Rs 1—8—0 per lb. One pound of this powder will be sufficient to treat 150—200 burrows. The treatment is very simple and can easily be done by ordinary coolies after a little instruction in the method of applying the dust in the burrows and in the use of the pump. (Sind Agricultural Department Leaflet No. 29 May, 1933).

Soaking Sugarcan Setts for better Germination. Results of an experiment with POJ 2878 cane on Negros, comparing no soaking of the seed pieces in water with 12, 24, 48, and 120 hour soakings, show that soaking for 12 hours gave a higher percentage germination than the longer soakings, and increased the number of stalks per acre by over 33% as compared with non-soaked seed-pieces. (Sugar News Vol. 12 (7)—1931). (Biological Abstracts—Vol. 8 (5)—No. 11682—1934.)

Propagation of Kapok (Silk-cotton) by Budding and Grafting. The Kapok plant responded to patch budding and grafting readily. The rate of a sexual propagation of this plant can be increased about 40 times by patch budding alone and many more times if all the small branches are utilized for grafting. The budded trees started to produce pods when the scion reached the age of about one year and continued to fruit yearly. The budded trees, being comparatively low, are less subject to injury by heavy winds. Scions from the upright branches produced upright growths. Patch budding or cleft grafting, or both may be recommended for propagating the desirable kapok trees or varieties. (The Philippine Agriculturist July 1934.)

Improving the Keeping Quality of Plantains. A series of experiments were conducted at Jalgaon (Bombay Presidency) to find out methods of preventing deterioration of plantains during transit. During long journeys plantains become spoiled by rotting and by developing dark spots on the skin. It is found that this deterioration of fruits can be controlled by treating the cut ends of the bunch with parffina wax or candle wax. The following advantages are observed from

this treatment. 1. It increases the keeping quality of the plantain fruits on the bunch. 2. The fruits remain in a fresh condition for a longer period 3. Plantains do not drop from the stalk. 4. Fruits get good yellowish attractive colour when ripe and no dark spots are formed. 5. Rotting of fruits is appreciably checked.

It is therefore recommended that all plantain growers and dealers should adopt this practice. The practice is very simple. Soon after cutting of the stalk from the plant melted paraffin wax should be applied to the cut surface of the stalk. Paraffin wax is easily available in all towns and it costs annas four to six per pound. One pound will be sufficient to treat more than 100 bunches of plantains.—(Leaflet No. 6, Department of Agriculture, Bombay). Nagpur Agri. Coll. Magazine, Vol. VIII, No. 4.

Flaked Coffee. In merchandising coffee, three methods are commonly employed in an attempt to give the consumer fresh coffee; (1) roasted whole-bean coffee is ground in the store to the purchaser's order; (2) freshly roasted coffee is ground and hermetically sealed in exhausted containers, and (3) freshly roasted and ground coffee is packed in a closed but not gas-tight container and sold with an expiration date, beyond which its freshness is not guaranteed. Coffee aroma is a complex mixture of volatile compounds formed by roasting (pyrolysis) of the components of the green coffee bean. The soluble non-volatile principles of the bean likewise undergo phyrolysis, resulting in the production of caramel-like substances that give body to the brew prepared from the roasted coffee. Coffee also contains a fatty oil that undergoes some alteration during roasting. The changes that produce stale coffee are, in decreasing order of importance, volatilization of aroma, oxidation of aroma and oxidation or rancidity of the coffee oil. During the roasting of coffee, there is a copious production of gas in which carbon dioxide predominates. In addition to the gas that escapes during the roasting, a considerable portion is retained in the roasted bean by occlusion. Ground freshly roasted coffee contains approximately five times its volume of this gas, which slowly escapes as the coffee ages, sweeping out a large proportion of the aroma. When attempts are made to preserve the freshly roasted coffee by immediate hermetic sealing, the accumulating gas produces such a pressure as to rupture the container, unless one of special strength is provided. If, on the other hand, the container is vacuumized, the occluded gas is by no means completely removed during the operation, permitting the building-up of some gas pressure within the container, which escapes upon opening carrying with it at the same time the aroma with which it has become saturated.

It has been found that the application of high pressure to ground, freshly roasted coffee brings about the expulsion of about 90 per cent of the occluded gas, with practically no loss of aroma. This pressure is most conveniently applied by means of a roller mill. At the same time the coffee particles are converted into thin, flat, coherent flakes, averaging about 0·06 inch in diameter and about 0·003 inch in thickness. By this flaking operation the soluble constituents of the coffee become instantly accessible to the extracting liquid, resulting in the quick extraction of all the water-soluble constituents. Coffee thus processed may be hermetically sealed in containers in which the air is replaced by carbon dioxide, and samples have remained fresh for a period of two years. Because of the accessibility of the soluble constituents in these flakes, extraction is not only much more rapid but is also more uniform and much more complete. When coffee flakes are brewed in a coffee percolator or in a drip coffee pot, the strength of the brew obtained in even less than the customary period of time is such that the amount of coffee required is materially reduced. Flaked coffee yields during brewing operations approximately 50 per cent. more exfractive than is obtained from the customary drip, and from 75 to 100 per cent, more than is had from the ordinary percolator. (Tropical Agriculture. Vol. XI No. 8—1934, Page 215.)

ABSTRACTS

Pre-history in the Light of Genetics *by J. B. S. Haldane.* In this discourse before the Royal Institution in February 1931 it is proved that genetics can throw light on antiquity. There are four human blood groups. The corpuscles in the blood may contain one, both or neither of two substances called isoagglutinogens A and B and along with another gene R, the combinations constitute various groups. This was noticed during the war in the course of blood transfusions. If the wrong blood is transfused there will be agglutination resulting in illness or death. If we map the world on this basis we will get information of racial origins quite different from those set down to the colour of the skin. The general result of blood group studies is to point to a migration in all directions from central Asia into a more primitive population. Human society is a symbiosis of man with certain animals and plants. With plants the centre of diversity gives a clue to the centre of origin. For example fourteen wheat species fall into three groups according to the number of chromosomes in the nucleus. The primitive has 7 pairs. Others 14 and 21 pairs. The 14 chromosome varieties grow from the Balkans to Kurdistan. The 28 chromosome varieties are from Abyssinia and North East Africa. The 42 chromosome variety includes bread wheat and its centre is the Punjab hill country. It is here that it shows its widest diversity. There are about 20 varieties in Europe, 52 in Persia and 60 in Afghanistan. On a similar analysis of other crops Vavilov of Russia distinguishes six main centres of origin of crop plants. 1. Between Hindukush and Himalayas (Bread Wheat, small-seeded flax, leguminous plants, Old-World cottons, the turnip, carrot, apricot, and peach). 2. South Eastern Asia (Hulless barley, millet, soy-bean, and many fruit trees.) 3. Round the Mediterranean (hard wheats, large-seeded flax, leguminous plants, beet, olive and fig.) 4. Abyssinia (ordinary barley, some beans and forage plants.) 5. Central and South America (maize, potato, tobacco New-World cottons.) 6. Philippines, possibly rice. Ancient Agriculture was in mountainous regions and not as is supposed in valleys in which it figured only later on. This type of analysis is in its beginnings and shows incidentally how important this line of attack is to anthropological problems.

G. N. R.

The Influence of Some Factors on the Hatchability of the Hen's Egg *by D. C. Warren.* (*Kansas Agri. Expt. Stn. Bulletin (Tech.) 37, June 1934.*)

1. There is a tendency for hatching quality of eggs to decrease as the age of the female producing them increases. No evidence was found for any influence of the age of the male upon hatchability of the eggs which he fertilizes.

2. Heavy egg production was not found to impair the hatching quality of the eggs produced.

3. Pullets pausing during the period previous to the hatching season produced eggs with better hatchability than did those laying continuously throughout this period.

4. Close inbreeding impairs the hatching quality, while outcrossing improves it.

5. Hatchability percentages vary inversely with the size of the egg.

6. Under the experimental conditions provided, holding eggs longer than six days appeared to be detrimental.

7. There was some indication that under certain conditions hatching quality of eggs was interfered with by low temperatures encountered before the eggs were placed in the incubator.

Manganese, An Essential Element For Green Plants *by E. F. Hopkins.* (*Cornell Agri. Expt. Stn. Memoir 151, January 1934*). A technic is here described by which manganese may be removed from culture solutions to such an

extent that it cannot be detected by the most sensitive methods known. It is shown that in solutions thus freed from manganese there is no growth of the organisms studied—two species of unicellular green algae, and the common duckweed *Lemhna minor*. When, however, minute amounts of manganese are added to the solutions so as to give concentrations of this element ranging from 1:5,000,000 to 1:100,000,000, normal healthy growth takes place. Not only is there no new growth from the "inoculum" without manganese, but death of the original cells or tissues occurs because of an insufficient supply of manganese. In the case of the duckweed this gives rise to characteristic symptoms of manganese deficiency; in the case of the algae there is apparently an autolysis of the cells which results in a decrease in their number.

Confirmatory evidence is given by the fact that if manganese is added to these cultures before the disintegration processes have gone too far, recovery takes place and normal growth proceeds. Recent literature concerned with the relation of manganese to the higher seed plants, in conjunction with the experiments here reported, support the author's contention that manganese is essential for all green plants.

Application of Ammonium Sulphate to Sugar-cane in the Java Method. In the use of soluble artificial manures to any crop, one important source of loss of the manure that one has to guard against is its displacement during irrigation. It is particularly so in the case of a highly soluble nitrogenous manure like Ammonium Sulphate.

Until recently, the usual method of applying ammonium sulphate to sugar-cane was to distribute a certain quantity of this manure for a certain length of furrow as a top dressing and allow the irrigation water to gently flow in the furrow. Loss of a certain amount of manure by displacement was inevitable in this method.

The new method of using sulphate of ammonia for cane was introduced in February last on the Irwin Canal Farm, other Factory farms and several raiyats' fields as well. This consists of making a hole about two inches wide and four inches deep a little away from each stool of cane and dropping a definite quantity of sulphate ammonia in each of these holes. The quantity of manure required is measured out in conical shaped tin spoons having long handles and dropped into each of these holes. The dose of manure being fixed, it is quite easy to calculate how much manure is to be dropped into each of these holes. Usually 8000 setts of cane are planted per acre. It would, therefore, be accurate, for all practical purposes, to start the manuring on the basis of 8,000 stools of cane per acre. If the dose of ammonium sulphate is three cwts. per acre, the spoon may be made to hold 1 ½ tolas of ammonium sulphate and this would work out to about three cwts. ammonium sulphate per acre making sufficient margin for errors. Holes at each stool can be made with bamboo sticks of 3½ feet height to which pointed metal ends are fixed.

The cost of applying the manure works to Re. 1—1—6 per acre according to this method. Two men to make holes, four boys or girls to drop the manure, and one boy to carry the manure will be required for the manuring of one acre of cane.

At the time of planting cane this method of manuring cannot be adopted. The initial dose of fertilisers has to be applied as a top dressing. The second and the subsequent applications may be done in the Java method. The crop must be at least seven or eight weeks at the time the second application is made. The holes should be made 6" to 8" away from the cane shoot as, otherwise, the

soil round about the shoots becomes highly concentrated with ammonium sulphate which kills the shoots. The first irrigation after the application of the manure in this method wets the ammonium sulphate and dissolves a portion of it also, and when the moisture dries up, the manure becomes a hard mass and assumes the shape of the hole into which it is at first dropped. This mass goes on gradually dissolving and diffusing into the soil. The heavier the irrigation and the longer the water stands in the field, the quicker the manure dissolves. In order not to have any adverse effect of the manure on the crop for the first fortnight after the application of the manure, more frequent irrigation should be given so as to keep the soil just moist without allowing it to dry up. The effect of deficiency of water at this stage can be observed in the foliage turning yellow due to ammonium sulphate dissolving in water leaving the manure in a highly concentrated form around each stool. If moderate irrigation is given, the foliage changes to dark green after 12—15 days when too copious or frequent irrigations should not be resorted to, as otherwise the effect of the manure is partially lost in irrigation water. If moderate irrigation is resorted to, the foliage remains dark green until the cane crop is about to mature and adds considerably to the tonnage.

The ratoon cane crop on the Irwin Canal Farm in several blocks is very good and the crop remained absolutely green until it was nearing ten months. The average yield from a block of 40 acres may be expected to be at least 40 tons of cane per acre and 30 per cent of the canes in the field weigh between 4—5 pounds individually. One of the chief reasons for this uniform big yield on these blocks and a more uniform stand than the previous year's in the other blocks where the crops were poor last year, may be said to be due to the application of ammonium sulphate in the Java method *(Extract from Mysore Agricultural Calendar 1934).*

Sunnhemp Fibre. The results of the detailed examination of the samples at the Imperial institute and their submission to merchants for valuation indicated (1) that fibre from stems stripped immediately after retting was better than that from stems stripped 3 days after retting; (2) that under the conditions of the experiments 5 days' retting might prove better than a shorter or longer period; (3) that no obvious advantage had accrued from a longer period of growth than 108 days; and (4) that seed rate of 60 lb. per acre had proved on the whole preferable to rates of 40, 50 or 90 lb. per acre. *(Imperial Institute, London. Annual Report 1932—Page 24).*

Studies in Plant Propagation. *By L. C. Chadwick (Cornell University, Agricultural Experiment Station Bulletin 571, June 1933).* The bulletin is a record of experimental work done, and the conclusions drawn, by the author, on the methods of stimulation that could be adopted for increasing root growth and development in cuttings. The study was made in three directions.—(1) the influence of chemicals, (2) the influence of the medium and (3) the influence of the position of the basal cut. The investigation included both ever-green and deciduous plants and the important conclusions may be briefly summarised as follows:—

1. With the plants studied, treatment of cuttings with either sucrose or Potassium Permanganate solution, resulted in increased root activity, the permanganate giving greater stimulation than sucrose. The most effective strengths were for a 24 hour treatment, 0·05 molecular solution (1 pound to 7 gallons of water) of the Sucrose and 0·01 molecular solution (1 ounce to 5 gallons) of the permanganate; 2. The permangnate exhibited callus growth which resulted in increased root production; 3. Experiments with medium for rooting, showed that peat is superior to sand for evergreen, but inferior in the case of deciduous plants and the use of a sand-peat mixture, as a rooting medium for deciduous

plants will result in a better massing of roots; 4. The position where the basal cut is usually made, at the node, is not the best position for cuttings of many of the common shrubs; 5. Although one position for the basal cut cannot be recommended as being best for all plants, the basal cut made one half-inch below the node, seems to be the best, as it was favourable with 75% of the plants used.

In view of the great importance to nurserymen of changing their practices to ensure better and quicker-rooting cuttings, the bulletin gives valuable information and some of the experiments may be tried with some of our plants, roses for examples, where propagation by cuttings is not very successful.

M. R. B.

Crop and Trade Reports.

Cotton Crop, Madras 1934—35, First Report. The average of the areas under cotton in the Madras Presidency during the five years ending 1932—33, has represented 9 per cent of the total area under cotton in India.

2. The area under cotton up to the 25th July 1934 is estimated at 198,400 acres. When compared with the area of 176,500 acres estimated for the corresponding period of last year, it reveals an increase of 12·4 per cent.

3. Central Districts and South—mainly Cambodia tract. The area in the Central districts and the South represents generally the last years crop left on the ground for second pickings before the plants are removed in September in compliance with the provisions of the Pest act. The area in these districts rose from 115,500 acres to 142,200 acres i.e , by about 23 per cent. The yield is expected to be generally normal.

4. Deccan or Northerns and Westerns tract. In Bellary, where the early crop is sown in June, the area fell from 28,000 acres to 18,599 acres owing to want of rains. In Kurnool, the area rose from 8,600 to 12,500 acres owing to the good rains received in June.

5. Cocanadas tract. The increase in area in Guntur is due to the good rains received in June and July.

6. The wholesale price of cotton lint per imperial maund of 82 and 2/7 lb. as reported from important markets towards the close of July 1934, was about Rs. 21—2—0 for Cocanadas, Rs. 16—5—0 for Red Northerns, Rs. 16—13—0 for White Northerns, Rs. 15—2—0 for (early crop) Westerns, Rs. 24—5—0 for Cambodia, Rs 22—8—0 for Coimbatore Karunganni, Rs 23—13—0 for Tinnevelly Karunganni, Rs. 23 for Tinnevellies and Rs. 20—2—0 for Nadam

Groundnut Crop, Madras 1934, Second report, Summer Crop, Area and yield. The area under the summer or irrigated crop of groundnut in parts of the Madras Presidency during the five months of January to May 1934 is estimated at 77,400 acres. When compared with the area 74.800 acres estimated for the corresponding period of last year, it reveals an increase of 3 per cent. The crop has been harvested in most places. The yield is reported to be below normal in Chingleput, South Arcot, Trichinopoly and Tanjore. The total yield is estimated at 66,700 tons of unshelled nuts as against 66,500 tons during the corresponding period of last year.

2. *Early crop—Area and yield.* The area under the early crop of groundnut (mostly unirrigated) up to the 25th July 1934 in the districts of Salem and Coimbatore is estimated at 12,700 acres. When compared with area of 168 000 acres estimated for the corresponding period of last year, it reveals a decrease of 24 per cent. The decrease is due to want of timely rains in July. The condition of the crop is good in Salem but the crop in Coimbatore is in need of rain.

Harvesting of the crop is expected to commence in a month. The total yield is estimated at 61,000 tons of unshelled nuts as against 84,000 tons estimated for the corresponding period of last year.

3. *Prices.* The wholesale price of groundnut (shelled) per Imperial maund of 82 and 217 lb. as reported from important markets towards the close of July 1934 was Rs. 3—11—0 in Guntur, Rs. 3—10—0 in Cuddalore, Rs. 3—6—0 in Vizagapatam, Rs. 2—13—0 in Cuddapah and Vellore and Rs. 2—8—0 to Rs. 2—11—0 in the other districts. When compared with the prices of June 1934, these prices reveal a rise of 32 per cent in Guntur and 20 per cent in Cuddalore and 3 to 8 per cent in the other stations and a fall of 20 per cent in Vellore.

Sugarcane Crop, Madras 1934. First Report. The average of the areas under sugarcane in the Madras Presidency during the five years ending 1932—33 has represented 3·7 per cent of the total area under sugarcane in India.

2. *Area.* The area under sugarcane up to the 25th July 1934 is estimated at 104,080 acres. When compared with the area of 103,740 acres estimated for the corresponding period of last year, it reveals an increase of 0·3 per cent. There has been a decrease in area in Ganjam, Bellary, Chingleput, Cuddapah, Chittoor, North Arcot, Salem, Tanjore and Tinnevelly which has been counter-balanced by an appreciable increase in East Godavari, Kistna, Guntur, South Arcot, Trichinopoly and Madura. The large increase in area in Kistna is due to the expectation of the opening of sugar factories in the district.

3. *Condition.* The condition of the crop is generally satisfactory.

4. *Price.* The wholesale price of jaggery per Imperial maund of 82 and 2/7 lb. as reported from important markets towards the close of July 1934 was Rs. 6—5—0 in Nandyal, Rs. 6—0—0 in Erode, Rs. 4—2—0 in Vizagapatam and Rs. 4—10—0 to Rs. 4—14—0 in the other markets.

Summer Til (Sesamum Crop—Bengal—1934-35—Forecast. On an average of the five years ending 1932-33, the area under til in Bengal has represented some 2·4 per cent of the total area under til in British India.

Character of the season. At the outset weather was favourable for ploughing operations and sowings commenced generally in normal time Subsequent dry weather affected the growth and development. The season was fair for the crop this year.

Acreage. The area sown this year is estimated at 107, 300 acres as against the same estimate last year.

Outturn. From the District Officers' estimates the average outturn of the crop for the province works out at 77 per cent of the normal this year as against 80% last year. Taking the normal yield as 7-2/5 maunds per acre, the gross outturn of the crop for the province is estimated at about 22,500 tons this year as against 23,300 tons last year.

Gingelly Crop, Madras 1934-35, First Report. The average of the areas under gingelly in the Madras Presidency during the five years ending 1932-33 has represented 12 per cent of the total area under gingelly in India.

2. *Area.* The area under gingelly up to the 25th July 1934 is estimated at 310, 600 acres. When compared with the area of 395, 700 acres estimated for the corresponding period of last year, it reveals a decrease of 22 per cent. The decrease in area occurs in most districts and is due to want of timely sowing rains.

3. *Yield.* The yield is expected to be below normal in Ganjam, Vizagapatam, South Arcot, Tanjore and Madura and normal in most of the other districts.

Sugarcane Crop, Bengal, First Forecast, 1934-35. On an average of the five years ending 1932-33 the area under sugarcane in Bengal has represented some 7·2 per cent of the total area under sugarcane in British India.

Character of the season. The weather was generally favourable for planting, although prolonged drought in March somewhat delayed the operation in places. Subsequent conditions also proved helpful to germination and growth of the crop. Present outlook, so far, is reported to be generally satisfactory.

Area planted. The total area planted with sugarcane for the province is reported to be 274,900 acres this year as against 250,500 and 256,600 acres reported in the corresponding and final forecasts of last year. The increase in area is due to the extensive cultivation of the crop owing to abnormal demand and the propaganda work to restrict jute cultivation.

Cotton Crops, Bengal, First Forecast, 1934-35. On an average of the five years ending 1932-33, the area under the cotton crops in Bengal has represented some 0 2 per cent of the total area under cotton in India.

There are two crops, early and late. The "early" crop is chiefly grown in the Chittagong Hill Tracts and in the Tripura State and to a small extent in other districts. The "late" crop is grown in Bankura and Midnapore. As the late crop has not yet been sown, this forecast deals only with the early crop.

Character of the season. The weather was generally favourable for sowing and for early period of growing. The present outlook is reported to be satisfactory, on the whole.

Area sown. The area sown is reported to be 72,903 acres this year as against 74,760 acres in the corresponding forecast of last year. The decrease in area in the Tripura State is attributed to depression in the cotton market.

Review.

The House of Pocha (1884—1934). We are in receipt of the Golden Jubillee publication, which Messrs. Pocha and Sons have kindly sent us. Attractively printed, and with a number of good photographs, this little brochure gives very interesting information about the House of Pocha, and the steady progress and the all-round reputation, which this firm have built up during the last fifty years. We also get an insight into the several departments of their business organisation, their methods of attracting, satisfying and increasing their clientele, and how exactly they have managed from a modest beginning made by the Founder, Mr. Pestonjee P. Pocha in Poona city in the year 1884, to rise to the front rank of reliable and courteous Nurserymen, to-day.

The Dewan Bahadur L. D. Swamikannu Pillai Memorial Fund.

Mr. S. Sundararama Ayyar, sends us the following for publication:—Readers of the Journal are aware of the fact that the late Dewan Bahadur L. D. Swamikannu Pillai was for some time Director of Agriculture and a memorial was started to institute a University prize medal in the Agricultural College to commemorate the valuable services rendered by him during his tenure of office.

Donations to the fund so far received have been noted below.

All those interested are requested to subscribe liberally to make up the required amount and remit to the undersigned.

		Rs
Rao Bahadur	M. R. Ramaswami Sivan	100
,,	T. S. Venkataraman	100
,,	D. Ananda Rao	100
,,	C. Tadulingam	100
M.R Ry.	P. H Rama Reddi	100
,,	S. Sundararaman	100
,,	K. T. Alwa	50
,,	K. Krishnamurthi Rao	30
,,	A. V. Tirumuruganatham Pillai	30
,,	S. R. Venkatakrishna Mudaliar	25
Rao Bahadur	B. Viswa Nath	25
M.R.Ry.	K. Ramiah	25
,,	G. N. Rangaswami Ayyangar	25
		810 0 0
Interest up to 30th June 1934		206 15 1
	Total	1016 15 1

College News & Notes.

Student's corner. Cricket has engaged the greatest attention during the month and the considerable enthusiasm evinced in this game by students and officers alike can be guaged by the fact that for the Y. M. C. A. Rondy shield tournament, two teams have entered from our College. The 'A' team played the Forest College on the 24th August and won handsomely declaring at 205 for 7 wickets, B. Suryanarayanamurty with a vigourous 82 not out including a six and 6 fours, Narasinga Rao 35, Lakshmanan 31 not out, Rajagopal 22 and Shiva Rao 19 being the principal scorers. The Forest College were all out for 40 runs, Narasinga Rao, Lakshmanan and Thomas, claiming the bowling honours with 4 for 8, 2 for 18, and 4 for 9 respectively. On the 25th August the 'A' team played the Municipal High School and the 'B' team the Forest College, and both matches were won, the 'A' team winning convincingly. In the first match, the 'A' team declared at 267 for 6 wickets, Shiva Rao 74, Lakshmanan 41, Rajagopal 49, Ramanatha Rao 32, Narasinga Rao 34 not out and Suryanarayanamurty 20, contributing to this total. The school were all out for 65 runs, Venkatachalam 39 not out, alone defying the College attack, which consisted of Lakshmanan (2 for 8) Narasinga Rao (2 for 19) Rajagopal (2 for 14) and Kulandai (2 for 1). In the second match the 'B' team made 148 runs (Ganguly 26, Ayyappah 23, Unni Nair 14, Sundararaman 10, and K. Ramaswami 18) while of the Forest College bowlers Veerapan bagged 6 wickets for 49 and Vijayaraghavan 3 for 24. The Forest College were all out for 93

(Veerappan 51, Kale 14). The Bowling honours of the 'B' team were shared by Colaco (3 for 8), Ayyappah (3 for 38), Rajaram (2 for 15) and Ganesh Sundara Rao (1 for 13). On the 8th September the 'A' and 'B' teams of our College tried conclusions and the former won again, by a huge margin. Entering first the 'A' team piled up 186 for 2 and declared, Kanakaraj David scoring 45, and Muthuswami 100 not out. Muthuswami's century was a very creditable performance, marred only by a difficult chance in the square leg, when the batsman was in the seventies. The 'B' team could not make headway against the strong bowling of the 'A' (Narasinga Rao 3 for 34, Lakshmanan 3 for 34, and Albuquerque 1 for 3) and were all out for 79 runs, only Ganesh Sundar rao (22) and Sundararaman (12) reaching double figures. On 12th September the 'A' team met and crushingly defeated the Government College team. Our College declared at 237 for 3 wickets, Narasinga Rao who retired after a briliantly hit 101 made in about 2 hours, Thomas 80, Albuequerque 26 not out, and Suryanarayanamurty 16 not out being the scorers. Narasinga Rao and Lakshmanan were deadly with the ball taking 5 for 6 and 4 for 15 respectively and the Government College were all out for a paltry 22 runs.

Having won all the matches the 'A' team have annexed the Rondy shield this year and the College Cricket Team and its lucky captain Lakshmanan are to be congratulated on the unbeaten record and all round brilliance with bat and ball.

The College closed for the Michealmas vacation on the 14th, and the College Cricket Team has gone on a games tour to Bangalore and Hosur where some fixtures have been arranged. Some of the members of the team who also happen to be good at tennis will have an opportunity to play some tennis matches as well.

The Fieldmen Association. At a general body meeting of the above Association held on 10—9—'34 the following office-bearers were elected for the year 1934-35.

President:—M.R.Ry. G. N. Rangaswami Ayyangar Avl., B.A., I.A.S. *Secretary*:—Mr. S. Kalyanasubramanyam *Asst. Secretary*:—Mr. D. M. Thangavelu. *Committee Members*:—Messrs. C. K. Kuppamuthu Pillai. R. Velumurugan. B. Rangiah Pillai. S. Srinivasan.

Personal. Mr. C. V. Padmanabha Sarma our popular cashier who is under orders of transfer to Hosur was entertained by a number of his friends at 'tea'. Mr. T. S. Ramasubrahmania Iyer has been elected Secretary of the Agricultural College Public Servants' Co-operative Society, in his place. Mr. R. Sankara Ayyar, M A. (Hons), Assistant to the Cotton Specialist, left on 31st August for Madras, en-route to England, where he is proceeding on two years' leave to prosecute higher studies in Plant Physiology. He was entertained at 'tea' by friends and a number of them were present at the station to give him a hearty send off.

The Officers' Club. The Club Day has been fixed for the third Saturday in October and the various games and tournaments connected therewith are in progress. A handicap tennis doubles tournament for which the president of the club, Mr. G. N Rangaswami Ayyangar has announced two silver cups as trophies, is also going on.

Weather Review (AUGUST—1934)

RAINFALL DATA

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars	Gopalpore	8·7	+0·9	26·9	South	Negapatam	0·1	−3·5	12·0
	Berhampore*	4·8	−3·7	21·7		Aduthurai*	0·3	−2·8	12·8
	Calingapatam	7·7	−1·2	17·6		Madura	0·7	−3·6	10·6
	Vizagapatam	6·2	+0·9	17·9		Pamban	...	−0·7	12·6
	Anakapalli*	15·7	+12·6	23·3		Koilpatti*	...	−1·8	12·8
	Samalkota*	13·0	+8·3	23·8		Palamkottah	...	−0·5	12·1
	Maruteru*	7·7	+1·9	17·1					
	Cocanada	12·5	+6·9	25·8					
	Masulipatam	4·3	−2·6	16·8	West	Trivandrum	4·3	+0·2	41·1
	Guntur*	3·8	−1·1	20·5	Coast	Cochin	7·1	−5·8	77·3
						Calicut	13·5	−1·9	87·3
Ceded Dists.	Kurnool	2·3	−2·8	15·5		Pattambi*	13·0	−4·1	69·8
	Nandyal*	3·3	−1·4	18·0		Taliparamba*	29·6	−3·0	112·0
	Hagari*	0·4	−1·8	10·8		Kasargode*	24·4	−0·9	105·4
	Bellary	0·3	−2·0	7·8		Nileshwar*	31·1	+5·5	112·0
	Anantapur	0·2	...	7·2		Mangalore	22·7	+0·1	101·0
	Cuddapah	1·7	−4·0	11·5					
Carnatic	Nellore	2·6	−0·6	6·3	Mysore	Chitaldrug	2·1	−0·8	
	Madras	7·2	+2·5	13·8	and	Bangalore	2·7	−2·6	14·9
	Palur*	4·3	−1·0	14·4	Coorg	Mysore	3·6	+0·3	14·0
	Palakuppam*	6·2	+1·1	16·3		Mercara	31·5	+6·0	15·5
	Cuddalore	8·9	+4·6	16·0					92·1
Central	Vellore	2·4	−3·9	13·7	Hills.	Kodaikanal	2·4	−4·5	38·5
	Hosur cattle farm*	0·9	−2·1	11·4		Coonoor	2·8	...	27·5
	Salem	4·1	−2·7	17·0		Ootacamund*	4·0	−3·4	27·1
	Coimbatore	0·2	−0·9	10·5		Nanjanad*	4·3	−2·8	30·7
	Coimbatore Res. Inst.*	0·1	−0·9	10·7					
	Trichinopoly	0·6	−3·2	9·0					

* Meteorological Stations of the Agricultural Department.

Summary of General Weather Conditions. The weather during the month was marked by a series of depressions which formed in the North Bay of Bengal one after another in quick succession. The unsettled conditions which prevailed off the Circars coast on the 31st July passed inland on the 2nd and appeared as a shallow depression over Central Provinces, which moved over Chota Nagpur and United Provinces and caused strong monsoon with locally heavy rain in the central parts of the country and near the Punjab Kumnon hills. The low pressure area filled up on the 7th over United Provinces. Monsoon was strong in the north of Peninsula. A second depression formed in the North Bay of Bengal off the Chittagong coast on the 9th, passed inland near Balasore on the Orissa coast on the 10th causing widespread and heavy rain in East Central Provinces and Orissa. The depression moved over West Central Provinces where it was filled up on the 13th. A third depression appeared off the Orissa Ganjam coast on the 14th, centred about 120 miles south east of Puri, crossed the coast inland on the 17th and passed over Orissa. Moving over East Central India and West United Provinces the depression broke up in the Kumnon hills on the 20th. Monsoon continued to be strong in North Peninsula, central parts of the country and

Burma. A fourth depression formed over South Bengal on the 20th, intensified and crossed the coast near Balasore and Sangor island on the 22nd causing widespread rain over North Eastern India and locally heavy rain over Chota Nagpur and East Central India. Moving over West United Provinces on the 25th, the depression got filled up on the 27th over North Rajaputana. Monsoon continued to be weak in the Peninsula after 20th.

Rainfall was locally in large excess in the Circars and in large defect in Deccan, South Madras and the hills.

Chief reports of heavy rainfall were;

Anakapalle (Vizagapatam) on August 1st.	=	7·3″
Malkanagiri do.	,,	5·1″
and at Vira Rajendrapet (Coorg)	,,	5·3″

Weather Report for the Research Institute Observatory.

Report No. 8/34.

Absolute Maximum in shade	94·0° F.
Absolute Minimum in shade	69·0° F.
Mean Maximum in shade	89·8° F.
Departure from normal	+ 2·3° F.
Mean Minimum in shade	72·0° F.
Departure from normal	+ 0·4° F.
Total rainfall	0·12″
Departure from normal	− 0·9″
Heaviest fall in 24 hours	0·07″
Total number of rainy days	Nil.
Mean daily wind velocity	6·7 M. P. H.
Mean Humidity at 8 hours	68·2%
Departure from normal	− 4·9%
Total hours of bright sunshine	219·1
Mean daily hours of Bright sunshine	7·1

General Summary. Monsoon was very weak throughout the month. Humidity is in defect by 4·9% from normal. Day temperature was in excess of normal by 2·3° F.

Departmental Notifications.

D. A's Office orders. Mr. C. Jaganatha Rao who was pemitted to accept the training grant offered by the Indian Central Cotton Committee to undergo a course of training in cotton Physiology, will report himself for training to Dr. Ekambaram, Lecturer, Presidency College, Madras on 5th October 1934. Mr. G. Konda Reddy, offg. Upper subordinate, Agricultural Section, is transferred to Science Section and is appointed to officiate as Assistant in the Millet section from 7—9—34 till 5—12—34 vice Mr. T. Narayana Rao on leave. Mr. V. N. Subbana Acharya, District Agricultural Supervisor, Bellary, on the expiry of his leave on 5—10—34 is posted as Farm Manager, in charge, Agricultural Research Station, Nandyal. Mr. K. W. Chakrapani Marar, Farm Manager, Kasargod on the expiry of his leave on 17—8—34 is transferred to VIII circle to report to the Assistant Director of Agriculture, Salem. Mr. K. Sivasankara Menon, A. D. Dharmapuri, is transferred to VII circle, to report to the Dy. Director of Agriculture. Tellicherry.

Postings and transfers. Mr. A. Kondiah Sarma, A. A. D. Bhadrachalam will revert as A. A. D. in charge of Tanuku. Mr. M. L. Narayana Reddy, A. A. D. Tanuku, is transferred to Palakonda. Mr. M. Ramamurty A. D. Palakonda, is transferred to Narasapur. Mr. P. Lakshminarayana A. A. D. Narasapur is posted to Rajahmundry. Mr. P. V. Subbarao, A. A. D. on the expiry of his leave is posted to Cumbum subcircle with headquarters at Giddalur. Mr. K. Varadhachari, A. D. Trivellore is transferred to Chingleput (New subcircle). Mr. K. W. Chakrapani Marar, to be A. D. Salem, vice Mr. A. Chidambaram Pillai on leave. Mr. N. S. Rajagopalan A. D. Omalur, to be A. D. Dharmapuri vice Mr. K. Sivasankara Menon transferred. Mr. K. Sivasankara Menon is posted as A. D. Cannanore vice Mr. C. S. Madiah granted leave.

Leave. Mr. A. K. Annaswami is granted extension of 3 months l. a. p. on M. C. in continuation of the one month leave granted to him from 3—7—34. Mr. J. S. C. Antony, A. A. D. granted l. a. p. for 3 months from 23—8—34.

Gazette Notifications. Dr. J. S. Patel, Oil Seeds Specialist (temporary) with effect from 1st April 1934 to be a full member in the Madras Agricultural Service, class 1, in the post of Oil Seeds Specialist, Coimbatore. Mr. C. R. Srinivasa Iyangar, Superintendent, A. R. S. Maruteru and special officer for the study of rice trade to hold the post of Marketing Officer for a month with effect from 1st August 1934. Mr. K. Gopalakrishna Raju, Ag. Headquarters Deputy Director of Agriculture, to be Marketing Officer (on return from leave) with effect from 1st September 1934. Mr. K. Avadainayagam Pillai, Upper Subordinate on special duty in connection with the seed distribution and extension scheme in the Coimbatore District is with effect from 1st May 1934, appointed to the temporary post added to the cadre of the Madras Agricultural Service, for the performance of the duties of Grader, Adviser, and Business Manager in connection with the same scheme. Mr. P. Subrahmaniam, Upper Subordinate, to officiate as Assistant Director of Agriculture, Madura, vice Mr. C. V. Seshacharya with effect from the date of taking charge. Mr. K. S. Viswanatha Iyer, Assistant Agricultural Chemist, Coimbatore, an extension of leave on half average pay without medical certificate for three months from 14th July 1934. Mr. T. Lakshmana Rao, Assistant Agricultural Chemist, Coimbatore, is granted leave on average pay for two months from 3rd September 1934 with permission to prefix the holidays on 1st and 2nd September to his leave. Dr. J. S. Patel, Oil Seeds Specialist, Coimbatore, leave on average pay without medical certificate for two months and fifteen days from 3rd September 1934 with permission to prefix the holidays on 1st and 2nd September and to affix Sunday the 1st November 1934. Mr. C. R. Srinivasa Iyangar, Offg Provincial Marketing Officer leave on average pay for two months with effect from 27th August 1934 or date of relief.