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GULLA (LOOSENESS) IN SOIL AND ITS EFFECT ON CERTAIN DRY AND GARDEN CROPS *

BY

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Many of you are probably aware of a preliminary note on the effects of 'gulla' on paddy and sugarcane, published in the *Journal of the Madras Agricultural Students' Union*, for September 1924. *Gulla* may be briefly described as a spongy condition, which stiff clay soils attain when dug up or ploughed so as to form clods and allowed to dry and weather and in which it absorbs and retains moisture to an undesirable degree. Mr. B. Viswanath, F.I.C., was, on a perusal of the note referred to above, pleased to suggest that the evil effects of 'gulla' may be due to the creation of air-locks which prevent the movement of water. But for want of facilities, no further investigations as to the exact physical or other properties involved in the change, from the normal to the 'gulla' condition, could be attempted on the Samalkot Experiment Station. Some further practical experience on the effects of 'gulla' on certain crops has been, however, gained since 1924 and some detailed enquiry has been made on the matter in certain tracts of Godavari and Kistna deltas. In this note I shall deal with certain dry and garden crops, leaving the main crops, paddy and sugarcane, for a detailed consideration in future.

* Paper read before the M.A.S.U. Conference in July 1929.

Dry Crops Grown During the Rainy Season. Many dry crops grown during the rains such as red gram, gingelly and cotton often suffer from excessive moisture, especially in heavy soils. The more deep and thorough the cultivation, the, more 'gulla' does the soil become and the worse do the crops suffer in seasons of heavy rainfall, though in seasons of scanty rainfall, they are at an advantage. The penning of cattle or sheep shortly before sowing, counteracts the bad effects of 'gulla' to a certain extent by consolidating the soil. On the heavy alluvial dry or garden lands at the head of Godavari delta, ryots do not hoe their crops during the rains, lest they should make the soil 'gulla' and make it liable to be water-logged. The shallow, but thorough, system of cultivation annually adopted in the black cotton soils of the Ceded districts (deep ploughing being given once in four or five years) is also, perhaps, intended to guard against the bad effects of heavy rain, at the same time, enabling the soil to retain the moisture it absorbs.

Dry Crops in Winter. Though the 'gulla' condition of the soil thus affects some crops during the rainy season, it benefits those raised after the rains. On wet lands, gingelly, pulses and green manure or fodder crops are said to grow better where dry ploughing was done for the previous paddy crop. The 'gulla' in this case enables the soil to retain moisture better. A puddled soil, on the other hand, is more compact and dries up more quickly. In some plots of the Samalkot Experiment Station, where a green manure crop of sunnhemp, *Pillipesara* or *daincha* was sown in March, in plots harvested of paddy and kept under water since then, it was found that the puddling of the soil shortly after the harvest of paddy shortly before the sowing of the green-manure crop, affected the crop adversely as compared with a crop sown without any preparatory cultivation in spite of the fact that the plots so sown were very weedy at the time of sowing. The puddled plots dried up more quickly and cracked earlier and deeper, the growth thereby having been checked.

There is a limit, however, to the extent of 'gulla' which, even the crops referred to above, tolerate. Beyond this limit, the soil is said to gradually cease to grow them. In certain tracts of the Kistna district, where sunnhemp and pulses used to grow well in paddy lands they have, after several years of dry ploughing for paddy ceased to grow or grow indifferently.

Chillies and Tobacco. These are usually planted at a time when heavy rains are likely to be received. The crop requires a deep tillage to enable the soil to retain moisture necessary for the crop during the subsequent dry period and to facilitate deep rooting. But, this thorough and deep cultivation makes the soil 'gulla' which is sometimes detrimental to the establishing of transplanted seedlings in case there is heavy rain. The heavy sheep or goat penning, which is usually done on these lands, mitigates this evil to a considerable extent. With the object of consolidating the soil, a heavy levelling board is sometimes drawn on the ploughed land before the seedlings are planted out. Near Kotipalli in the Godavari district the practice in preparing land for chillies, is to plough the land deep and thoroughly till about a month before planting and then have recourse to only shallow cultivation.

Plantain. Plantains generally grow better on crow-barred lands than on ploughed ones, owing to the depth to which the soil is loosened in the former case, but occasionally, after a heavy rain or an irrigation while the plants are young, the soil under the former treatment gets too wet and the suckers or young plants begin to get sickly and die off in considerable numbers. This occurred in F. 24 in 1921–22, in F. 3 b in 1922–23 on the Samalkot Station. Sometimes seepage from the neighbouring plot of paddy or sugarcane affects the soil when thus dug deeply, and the suckers refuse to establish in such plots. In 1927–28, a crop which thus suffered gave only half as much yield as from one which was dry till the time of planting. The evil effects of crow-barring will be minimised if, before planting, it becomes possible to plough the land after a shower of rain and then pen cattle to consolidate the soil as much as possible. It has been found that when a crow-barred land gets saturated with water, even the digging of deep drains is not of much avail, as the spongy soil holds moisture strongly.

Fruit Trees. In planting mangoes, oranges and other fruit trees, the usual practice is to dig pits about 2 to 3 feet wide and deep and fill them, if possible, with silt or good soil. It has been the sad experience of many garden owners that when the plants are thus planted they did not thrive, especially so, when the planting was done in 'tholakari' or the S.W. monsoon season. The reason for this, again, is that the soil in the pits, being 'gulla' it remains too moist for the roots to be healthy. It is therefore advisable to fill the pits in summer and plant the fruit trees in the following winter or the next 'tholakari' by which time the soil

gets consolidated. The tendency, of late, has also been to dig smaller pits in heavier soils.

Some orange gardens planted on land raised by dumping silt have been known to have fared bad for the same reason as in the above case. The usual practice of planting such areas is to put in plantain first, and in the 3rd or the 4th year (by which time the plantain deteriorates) plant the fruit trees amidst the plantains and remove the latter gradually in another one or two years as the fruit trees grow and require more and more light and space. This gives sufficient time for the soil to get consolidated.

In setting fruit trees in the pits, one point to be carefully remembered is to consolidate the soil around them, especially, in the case of coconuts whose roots are pruned off before planting them. In heavy soils, some even prefer to fill the pits with water, set the plants and then fill them with soil so that it settles better than when put in dry soil and watered. Casuarina plants have also been found to establish well when thus planted.

The interculturing of fruit gardens during the rainy season sometimes affects the trees, especially, those of the citrus type. In many citrus gardens of the heavy alluvial soils of the delta, interculturing is altogether avoided, the soil being dug up once in 4 or 5 years during winter. In the Guntur district where the soils are lighter, orange gardens are ploughed every year after the rains cease. At Pedavadlapudi, of the Tenali taluq, ploughing is done in 'tholakari' also, but here, they pen cattle in the gardens almost throughout the year, so that the soil is always kept well consolidated. In other citrus growing countries also the practice is much the same. Writing of Florida and the Gulf Coast, Samuel Fraser says, 'On moist soils no tillage may be given but, from time to time, during the summer, the growth (of weeds) is mown.' Again, Hume in his 'cultivation of Citrus Fruits' says, 'The practice of keeping our gardens in which orange groves stand, perfectly free from herbage and cultivated through the whole season, year in and year out . . . . has little to recommend in it. . . . . No amount of fertilizer will do the work; it should do if the soil once loses its natural body.'

The practice of ploughing the gardens to enable the sowing or covering in green manure crops is, for the same reason, objectionable in heavy or in medium soils. Fraser, in his 'American Fruits' writes, 'It is generally advised to mow the cover crop, if it is heavy, letting it decay on the land rather than to plough it

under green.' The results of an experiment in the Philippines on Manderin oranges also show the superiority of a continuous cover crop without tillage, compared with a cover crop with tillage. (Continuous cover crop *vs.* Tillage by John de Leon *Philippine Agricultural Review*, Vol. xxi. pp. 173–182).

I have thus noted some cases in which the 'gulla' condition of the soil affects crops. As already stated, I had no facilities to carry on any systematic investigation into the causes and remedies to 'gulla'. This phase of the physical condition of the soil deserves a thorough study, as it appears to have a much wider application and greater effect on the growth of crops than is generally realized. The importance of this appears to have received some recognition in Germany where Holidack (Reviewed in *International Review of Agriculture*, Vol. xx. p. 97) who did some work in the subject, considers 'that the diminished crops of recent years in spite of increased application of fertilizers, is due to a deterioration in soil texture, resulting in insufficient action of micro-organism. Sub-soiling is said 'to either improve or spoil the texture according to conditions.' A new process for determining soil texture by the contents in volume of solid matter, water and air, is also said to have been evolved by him.

OUR SCHOOLS

BY

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It is true that there is a general disillusionment about the dignity and value of the ' degrees ' obtained after heavy expenditure and hard work of years. If is also true that mass education comprising industrial, agricultural, and commercial courses alone can meet the needs of our country under the present conditions. Nevertheless, much work has yet to be done to create a real demand for vocational education, a demand based on taste and liking on the part of its votaries. Some of these vocational courses are more favoured than others on account of their higher cash value in the market.

Our profession, though noblest of all, is probably the poorest of trades, and it is no wonder that our agricultural schools are what they are. The average lad that goes out of the school, is a pretty poor specimen of a business farmer from the point of view of his guardian, or the employer, whose tradition and experience of years have stood him in good stead and have never made him feel the necessity for a school course in Agriculture. In order to turn out, therefore, a high class farmer boy, high quality work has to be done as well within the school as without.

Quality in recruitment has no doubt its own limitations. To take the school at Taliparamba, Malabar, as an instance, he who cares can see, that out of 19 lakhs of the population that live on agricultural income, only one lakh represents the actual land owning cultivator, while the rest are absentee land lords or tenant farmers, field labourers or farm employees. So, the chances are 1 in 19 that the Agricultural Demonstrator hits upon the right type of a recruit consistently with the avowed aim of the school—' back to the land.' It is natural that if a boy has not gone from the field, he cannot be expected to come back easily to it. With all the cheapness of the course, the novelty of the institution and the personality of the Demonstrator, the annual recruitment cannot be considered a success, especially in quality. It happens more often than not, that the candidate has to his credit only a family reputation on the father's or uncle's side, and a smattering of education, got rusty by neglect of years, but he has not stepped into the field so far, and is a stranger to the agricultural work. Conscientious and honest recruiting will probably not do in these hard days of competition. But, ' honesty is the best policy ' and it pays better.

in the long run, as it saves a lot of trouble in the school and after career of the recruit.

Intensive and high quality work within the school demands too much of the teacher. In vocational schools, especially in agricultural schools the boys have to be taught more as individuals than as a class, if they are to attain anything like a working knowledge and skill in the art. Unless the teacher has a real love for the work, he is sure to take refuge under factors that are apparently beyond his control—to wit—want of uniformity of students in attainment and age, poor educational background, etc. No doubt the teacher hasn't got a free hand in the affairs of the school, all the same, he has the liberty to bring out the best in the raw material placed under his charge.

Modern equipments of schools as museum, laboratory, play-ground, library, and debating society may be necessary adjuncts to an agricultural school also, but, as decoration precedes dress, these sometimes receive undue attention alike of the teacher and the taught, to the detriment of the legitimate work of spending more time in the field in watching operations, making observations and enquiries, and taking notes of facts and figures, which alone is going to serve the would-be farmer in solving practical difficulties that are sure to crop up day by day in the management of his or another's farm. An easy going, pleasure seeking life can under no circumstances be allowed in agricultural schools.

Too much is probably attempted by way of general instruction. At any rate, there are too many subjects handled non-technically. Our school must have its own curriculum, probably peculiar from the point of view of Educational Department, but it cannot be helped. We have at once to aim at a unity in the work so that the subjects shall not get separated in water-tight compartments. No instruction that has not got a rural bias, nor a direct bearing on agriculture, may with profit be attempted in our school. It is indeed a very good idea to improve the general knowledge and widen the outlook of the student, but a two-year course of an agricultural school cannot afford to devote time and energy for a study of history, geography, morals, and language. This is, in fact, the considered opinion of the parents who take real interest in the after-career of their sons and nephews.

How far and with what success, the boys that passed out of the Taliparamba School, have taken to agricultural work as their career, and the causes and remedies for their failure, will be examined in a subsequent article.

RECENT AGRICULTURAL DEVELOPMENT IN MADRAS*

BY

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Director of Agriculture

I have been requested by your President to tell you about some of the recent advances made by the Madras Agricultural Department. Before attempting to do so, I want those of you who are strangers to this part of India to realize that in this Presidency we have a very wide range of conditions and we are able to grow in consequence more or less every crop which is grown in India with the single exception perhaps of Bengal jute.

On the East Coast we have three large deltas with big irrigation systems and a net-work of canals which carry paddy; on the West Coast we have an intricate maze of rivers and backwaters; in the central regions we have land which is cultivated under wells and tanks, or merely rainfed, and in the north the rainfall is so precarious that we are seldom free from famine conditions of greater or less intensity. Down the western side of the Presidency runs a range of hills which rise to 9,000 feet in places and provide dense jungles and open rolling grass downs. Here are situated our Hill stations where fruit and flowers can be grown which will rival those grown in England. Large areas have been brought under tea, coffee, and rubber.

Our soils range from heavy black cotton soils, through clay loams, laterites and gravels to almost pure sands, the latter carrying coconuts and casuarina.

We depend upon both monsoons and our rainfall varies from 300 inches to 20 or less. Our main crops are paddy and cotton, and we have large areas under groundnuts, millets, and coconuts. Sugarcane is a minor crop and is grown in small patches all over the Presidency and we look in a five acre block of cane as rather a big thing.

It will be understood therefore that our agricultural problems spread over a very wide range.

As in other provinces we have paid a great deal of attention to crop improvement by selection and breeding, especially with our two main crops—paddy and cotton. Development in recent years has been in the opening of new breeding stations to serve particular areas and in the study of other crops. Thus we now have four paddy breeding stations, one at Coimbatore, the headquarter station, one at Āduturai to serve the Tanjore delta, one at Maruteru to serve Gōdāvari delta, and one at Pattambi to serve the West Coast. So also with cotton we have several subsidiary stations as well as the headquarter station at Coimbatore. In 1923, a millet-breeding station was started at Coimbatore and we are now taking steps to open a subsidiary

* A paper read at the Indian Science Congress, January 1929.

station for millets and cotton work, these two crops being grown in rotation in the Bellary district at Adōni. Considerable progress has been made with the improvement of cholam and ragi by the usual methods of selection and it is hoped to issue the first of the improved strains to the ryots in the coming year. A beginning has also been made in a small way with the improvement of groundnuts in the same way and we contemplate the appointment of an Oil-seeds Specialist before long to take up the intensive study of this crop as well as coconuts. The latter is a big and important crop with us, along our sea coasts. Under our conditions the coconut is never self-fertilized naturally so that selection of nuts for sowing purposes is of limited value. We have evolved a method which has proved quite successful of selfing selected trees and a number of plants have been raised as a result of both self-fertilization and cross-fertilization of trees chosen for special characters. It will naturally take a long time to produce any results of a tangible nature but a start has been made.

In recent years another advance has been made with this crop. It has always been thought that coconuts can only be grown in places where they can be watered, at least in the young stages, during the hot weather. We have been able to demonstrate on a very wide scale that coconuts can be grown quite successfully from the nursery stage without any water except the natural rainfall if dry farming methods are employed and the plants are set out 30 to 35 feet apart and the soil between them thoroughly intercultivated during the hot weather. This has enabled large areas of land hitherto carrying no crop at all to be placed under coconuts. Grown under these conditions, the palms come into full bearing at 8 to 10 years old which is a gain of several years over the local method of cultivation.

A considerable number of improved strains of both paddy and cotton have been evolved on the breeding stations and issued to the ryots. These have become popular and are in great demand but it is difficult, often impossible, to supply seed. To overcome this difficulty we have organized a system of seed farms conducted under a simple agreement with selected ryots. There is nothing novel about this system but we are now endeavouring to persuade the seed farm ryots to form co-operative societies for the multiplication and supply of seed and in the case of cotton to combine this work with co-operative ginning and the sale of pure unmixed lint of standard types.

Full advantage of the improved strains of cotton has not been obtained by the ryots owing to the unpopularity of legislation introduced in the first place to control the ravages of insect pests and in the second to control the mixing of lint types. The Pest Act and the Cotton Transport Act have raised a storm of controversy and unfortunately brought agriculture into the realm of politics with the result that both Acts have been so modified that they are largely abortive and certainly do not now produce the result for which they were originally designed.

Cultural improvements such as the economic planting of paddy from thinly sown nurseries, the drill sowing and subsequent intercultivation of cotton and millets with bullock drawn implements have been adopted over wide areas as a result of demonstration and propaganda work.

Now that a strain of Cambodia cotton has been isolated which is vigorous and produces lint of fair quality, and we are in a fair way to do the same for rainfed cottons we have begun to turn our attention to the cultivation and manuring of this crop. The question of the best time at which to sow is now under investigation. The local practice is to wait for the monsoon rains, but the results of our experiments have shown that the interval between the date. of sowing and the date of picking has a profound effect upon the final yield and early sown cotton has in our hands given nearly four times the yield of late sown cotton. If future experiments confirm this result the introduction by the ryots of early sowing should have far-reaching effects.

The use of light iron ploughs is also spreading but more slowly, probably on account of their price and also because of the smallness of the cattle in some places. About 2,000 ploughs a year are purchased and there must be some 10,000 now at work in the Presidency. The increased use of implements like ploughs and three-roller cane crushing mills is linked up with the problem of cattle breeding and fodder production in a very intimate way and these problems have to be dealt with as a whole and they will take time and patience to solve. We have recently started an organized campaign with the demonstration of pit silage making, but it is not always easy to find the material to silage when the cultivator does not grow enough fodder to feed his animals even in the rainy season and when he is tempted to place land under a money crop rather than under a fodder crop. There are opportunities however on the West Coast of converting the hill grasses into valuable silage and this idea is being exploited.

By economic planting, by green manuring, and by using selected strains the department has demonstrated to the ryots that it is possible to increase the yield of paddy very considerably and these methods have been applied to other crops and widely adopted. But there is a limit to this, the limiting factor being the quantity of available manurial constituents, especially phosphorus and nitrogen in the soil. To maintain these increased yields and to obtain still better yields, more intensive manuring is necessary and unless this is attended to there is a danger that the introduction of improved strains which are inherently heavy yielders may do more harm than good by exhausting an already impoverished soil. This is a point of view which has been brought to the notice of this Congress in former years.

There is not enough cattle manure to go round and the use of artificials is indicated. Ten years ago Dr. Harrison had shown that the nitrogen in green manure is largely dissipated in the form of gas and experiments conducted on our station at Manganallur based on his work had shown that, paddy responds well to a concentrated nitrogenous manure such as sulphate of ammonia in addition to green manure and that this is particularly the case when phosphate is also added.

The difficulty at that time which stood in the way of demonstrating this to the ryots was the very high price of all imported artificials like sulphate of ammonia and superphosphate while the price of bonemeal was also tending to rise owing to the export demand and the supply of fish manure from the West Coast was variable depending upon the seasons.

Of late years the whole situation has changed and now not only sulphate of ammonia and superphosphate are easily obtainable at reasonable prices but

firms are vying with one another to sell all kinds of artificials and one of the outstanding features of recent years is the way in which the ryots have waked up to the value of manures and are quite ready to buy them. Over 3,000 tons of sulphate of ammonia alone was purchased last year. This is due to the fact that the department had demonstrated the value of green manure and cattle and fish manure and planted the idea in their minds.

But they are now being besieged by propagandists and firms to buy sulphate of ammonia, nitrate of soda, calcium cyanamide, ammophos, leunaphos, nitro-chalk and a number of other new fertilizers about which no one knows anything at all. They naturally turn to the Agricultural department for advice, but unfortunately we also know little or nothing about these new fertilizers and as yet have had no time to experiment with them. Realizing, however, that it is our duty to test them out, we are just starting an experiment station on a new plan. This station will be subsidized by manure firms. The cost of each trial has been worked out and firms will pay a subsidy as a proportionate share, of the total cost based on the number of trials which they wish to have made. The Agricultural department will carry out the work and the trials will be conducted on scientific lines based on the latest methods adopted at Rothamsted over a period of five years when the results will be published.

In this way it is hoped to give a thorough trial to all new fertilizers placed on the market. In the first instance the trials will be confined to paddy, but if the scheme proves popular and successful it will be extended to trials with other crops and on dry as well as on wet lands.

There is a danger at present that these cheap artificial manures will be used to replace organic manures and not merely to supplement them and this leads me to speak of another problem on which we have done a good deal of work recently. It was found by a study of our permanent manure plots that seed produced in different plots behaved in different ways, depending upon how the crop from which it was obtained had been manured. When sown on soil of average fertility seed produced on plots which had been manured with cattle manure gave a much better crop than seed which had been produced on plots manured with artificials only. This somewhat surprising result was followed up and in collaboration with Lt.-Col. McCarrison it has been found that the food value and vitamin content of the grain is probably dependent upon, and can be controlled by, the system of manuring, and that in order to produce grain of high food value the crop must be manured with organic manure. What the minimum quantity of organic manure necessary to ensure a full vitamin content in the resulting grain may be we do not yet know, but if it is all replaced by minerals the food value and vitamin content of the grain falls beneath that of an unmanured crop.

This has opened up a new field of study and we are now beginning to pay attention to the study of the food value of paddy and other crops from all points of view. It emphasizes the necessity for increasing the supply of organic manure and the system of producing artificial farm-yard manure advocated by Rothamsted has been carefully studied and we have now been able to prepare good material from waste products like prickly-pear, cane, trash, weeds, stubbles, cotton stalks and even groundnut husk by a method which is demonstratable to the ryots. We are also about to instal an experi-

mental activated sludge plant at Coimbatore to convert our estate sewage into fertilizer for the farm.

We have also taken up the study of animal nutrition and have our own buildings and staff at Coimbatore so that we can work out local problems. We carry on this work in collaboration with and under the friendly guidance of Mr. Warth, the Imperial Physiological Chemist at Bangalore.

Turning now to other sections, we have recently attempted the biological control of a caterpillar pest of coconuts on the West Coast. This pest was introduced a few years ago to the West from the East Coast on coconut leaves carried on the railway, and it was introduced without the parasites which control it naturally on the East Coast. The consequence was that it spread with alarming rapidity and did a great deal of damage. We have now introduced a number of its natural parasites and have established laboratories where these are bred and released in large numbers. This method has met with considerable success and the pest is being kept under reasonable control. Quite recently the Icerya scale has made its appearance in the Nilgris where it is attacking wattle and a number of local weeds. We propose to deal with this biologically also and are only awaiting a consignment of the necessary lady bird beetle from South Africa and Australia.

Satisfactory progress has been made in recent years with the control of fungoid diseases of crops. A fungus which attacks the fruit bunches of the areca palm during the monsoon has proved controllable by spraying just before the rains with Bordeaux mixture and this method is now adopted on a large scale and involves millions of trees. The bud-rot disease of palmyra palms on the East Coast is also being controlled successfully by systematic destruction of dead trees and removal of attacked leaves at the outset of infection. The Pest Act has been introduced to deal with this disease and it has worked quite smoothly and the work is carried out systematically by the Revenue Department under our guidance, a special staff being employed for the purpose.

The most recent development in mycological research of recent years has been the search for strains resistant to certain diseases, a more logical way of attacking the disease problem in general than a frontal attack on the disease itself which can never give a permanent amelioration. This work now involves several crops and fungi, among which may be mentioned the mosaic of sugarcane, Piricularia of paddy, and the wilt of groundnuts.

On the propaganda and district work side we have found that the most satisfactory way of getting information to the ryots and persuading them to adopt new methods is to demonstrate the improvement whatever it may be on their own land so that they may be convinced that it is an improvement in the first place and that it can be carried out under the conditions of life and farming in the second place. We now have hundreds of such demonstrations and confine ourselves to small plots rather than to trying to conduct big demonstration areas or model farms. The latter we have persuaded co-operative societies to undertake and we now have a few better farming co-operative societies which conduct small model farms on which the improved methods of cultivation and manuring advocated by the department are adopted and demonstrated, one or two plots being farmed in accordance with local methods

to act as a control and contrast. Departmental officers supply advice and draw up cropping schemes but the society runs the farm and keeps a profit and loss account so that it is able to demonstrate to the members the monetary gain to be obtained by the adoption of these improved methods. I may say that in the case of paddy it amounts on the average to an increased profit of about Rs. 25 per acre. Improved strains of seed are grown on these farms and the seed is sold to the members of the society. Some of these societies are now beginning to conduct the sale of implements and manures.

We take advantage of all local fairs and festivals to hold small agricultural exhibitions and to deliver lantern lectures, and we endeavour to make these as practical as possible, that is to say, we give actual demonstrations of iron ploughs at work for example and allow and encourage the visitors to handle them themselves; during the cane crushing season we erect a Sindewahe furnace and actually make jaggery over it in a thin pan, and so on.

We have just built and equipped a travelling motor van to carry an exhibition from village to village thinking that in this part of the world where we have not many railways and where they do not always pass through the most densely populated rural areas such vans would serve our purpose better than exhibition trains. One of these van units is in show in the grounds here for you to see. We hope before long to add a cinema outfit to it, at present it carries a magic lantern outfit.

I have now touched quite briefly on some of the more important and outstanding recent developments of the Madras Agricultural Department but the time is too short to really do them justice and to cover the whole ground. I have not for example touched on the thorny problem of agricultural education partly for lack of time and also because the subject will come up elsewhere during this Congress. I have also had no time to speak of the cattle-breeding work which is being done on a large scale on three cattle farms the largest of which is at Hosur, near Bangalore.

The headquarters of our research work is situated at Coimbatore which is 12 hours by train from Madras and if any of you can spare the time to pay us a visit we shall be more than delighted to show you what we are doing and attempting to do.

SCIENCE OF NUTRITION

Its Importance to India

BY

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I have chosen to speak on Nutrition, believing that for no country in the world has this Science a greater importance than for India; and for no part of India a greater importance than for the Madras Presidency. No country has more need to profit by the newer knowledge of Nutrition, and none more opportunity to add to it. Millions of the Indian people are living on restricted diets which are either incapable of maintaining them in a state of normal nutrition and health, or capable only of sustaining them at a low level of physical efficiency. Malnutritional diseases are rife, while the great scourges of the Tropics—malaria, cholera, dysentery, leprosy—exact an immense toll from India's malnourished multitudes. In this Presidency alone 'deficiency diseases' of almost every kind abound, and the level of physical efficiency of the masses is, in general, low. But while this is so in certain parts of the Peninsula there are others where the inhabitants are unsurpassed by any race of mankind in physique and capacity for endurance and hard work. Nowhere is the composition of human dietaries more influenced by racial, religious, economic and climatic considerations and nowhere have foods and food-habits remained more consistently the same from one generation to another. So it is that the diverse races, comprising the population of India, afford an unrivalled, and almost wholly unexplored, source of information regarding the effects of diet on the physical efficiency of human beings. India has thus not only much to do in applying the newer knowledge of Nutrition and in surveying, in the light of this knowledge, the foods available for the use of her immense populations, but much to learn regarding their nutritional needs, and much—by such learning—to teach the rest of the world.

I venture to hope that the subject may prove of interest to Government officials, business men, private individuals and members ot the medical and other professions. In one way or another—social, political, economic, mercantile or hygienic—Nutrition is a matter that affects them all: the medical men, perhaps more than any other since his intimate acquaintance with it provides a shrewd instrument wherewith 'to tune this curious harp of man's body and reduce it to harmony.'

Let me, in as few words as I can endeavour to explain to you why this is so.

'La vie est une fonction chemique.' So said Lavoisier in 1780 (He it was who inaugurated the modern era of the Science of Nutrition and who first applied the balance and the thermometer to the investigation of the phenomena of life. He was executed by the 'Powers-that-be' of his time; but his work still lives and that of to-day is but a continuation of it). To his dictum it may be added that everyone of the myriad cells of which the body is composed is a

chemical laboratory wherein the materials provided by the food are, with the aid of the oxygen derived from the respired air, broken down or built up into substances required for the nurture and energising of the body as a whole. The sum of these chemical changes—whereby the function of nutrition is effected—is known as *metabolism*: health accompanies its perfection, ill-health is the sequel of its imperfection.

The food, then, must provide all the substances needed by the living cells for the proper exercise of their chemical processes: there must be none that are in deficiency and none, if the cells are not to be burdened with a maximum of labour, that are, in excess. For if there be some that are deficient or lacking in the food, then do the chemical changes with which these substances are concerned become impaired or fail; with the resultant impairment or failure in function of some corresponding organ or tissue of the body. While if there be some that are continually in excess certain cells will ultimately fail from exhaustion brought about by overwork, and disease of the corresponding organ or tissue will result. There are thus two directions in which nutritional disorders may arise: the one by deficiency of essential elements in the food; the other by excess of certain ingredients of the food; and these two by their combination may provide a third. The ideal food is, therefore, a palatable mixture of essential food-stuffs arranged in such proportions as to satisfy every need of the body without overburdening it with work.

The essential food-stuffs are nitrogenous substances called *proteins*, starches and sugars, called *carbohydrates*; *fats*; *mineral salts*; and *water*. The amounts of these required for each sex, from infancy to old age and under varying conditions of rest, work, climate and temperature are now fairly well known though there is still much to be learned especially in regard to the quantities of them that are needed in Tropical countries for various classes of labour. All these food-stuffs exist, some in greater proportion than others, in the food-materials which Nature provides for our use: the proteins principally in animal foods, such as meat, fish, fowl, egg and milk but also in vegetable foods, such as pulses and cereal grains, though in less suitable form and in less proportion than in animal foods. The carbohydrates exist principally in vegetable foods, such as cereal grains, root-vegetables and fruit; the fats in the flesh of animals, milk, egg and certain fish as well as in various nuts and seeds; while the mineral salts—of which there are some 20 essential kinds—are derived both from animal and from vegetable sources. The essence of successful nutrition is so to combine these natural foods as to provide a sufficiency of all essentials without excess of any.

The five essential food-stuffs or 'proximate principles' as they are called—proteins, carbohydrates, fats, mineral salts and water—can be prepared in the pure state and set out, as it were, in bottles in one's laboratory bench. Not so very long ago—only a few years before the Great War, in fact—it was thought that these 'proximate principles' were all that the body needed for the normal processes of Nutrition. But it was found by Gowland Hopkins of Cambridge, that if they be combined in due proportion and given as food to young rats—the animals usually for nutritional work—the food mixture did not admit of growth nor sustain life. But if to it a little whole-milk were added then growth proceeded and health was maintained. Later it was shown that if the milk were subjected to heat, in the presence of air,

growth again failed and the animals died. There was 'something' in the milk other than proteins, fats, carbohydrates, salts and water, which was essential to life. The something is 'vitamin.' Soon it became known that there are more 'vitamins' than one: some soluble in water, others soluble in fats; some destroyed by heat, oxidation, and certain chemical agents, others not; some contained in one kind of food-material, others in another. To distinguish them they were named after the letters of the alphabet and designated vitamin A, B, C, D and E. At the present time there are known to be six; B having recently been divided into two (B1 and B2). Twenty years hence this number may have increased several-fold. But whether there be six or sixty they will all be found to exist in the simple foods made in Nature's Laboratory—whole cereal grains, milk, milk-products, fresh fruit, and green leafy vegetables—and in quantities and combinations adequate for the due digestion and assimilation of the natural food-stuffs with which they are associated in Nature. Their multitude need cause the layman no anxiety provided he remembers that it is only by the purification, sophistication, storage, and excessive cooking of Nature's foods that they become deficient in these elusive and most necessary substances. Now-a-days it is possible to buy concentrates of some of them over the counter of druggists' shops, but the wise man will rely on Nature and not on the druggist for their provision; for no synthetic diet, which it is possible to prepare in the Laboratory, is in my experience as good as one made from a proper combination of natural foods.

The 'proximate principles' are the substances from which the body is built and repaired and from which it derives energy and warmth; the vitamins are substances which enable these principles to be properly utilised. Some years ago I likened the action of vitamins to that of the spark which ignites the fuel mixture of a petrol driven engine liberating its energy. The spark is of no use without the fuel nor the fuel without the spark; nay, more! the efficacy of the spark is dependent on the composition of the fuel-mixture. This simile has its limitations: but so far as it is applicable it will serve to fix the function of vitamins in the mind.

With the discovery of 'vitamins' and with more exact methods of experimentation, knowledge of nutrition progressed rapidly: experiments, as is the way of Science, revealing causes and causes inventing new experiments. Presently there arose the conception of disease as being due to negative as well as positive causes: a conception slow to gain general acceptance no doubt because 'it is the peculiar and perpetual error of the human intellect to be more moved and excited by affirmatives than by negatives; whereas it ought properly to hold itself indifferently disposed to both alike' (Francis Bacon). At the present time there are few who would dispute the influence of either. The negative factors are lack or deficiency of certain essential elements in the food; the positive factors are, for the most part, pathogenic agents such as bacterial and protozoal organisms. Sometimes one or other of these factors may operate alone in disease-production, but more often they join forces. And it is not only in those whose food is insufficient in quantity, but in many whose food is sufficient or even excessive in quantity while lacking in quality that these forces operate to cause disease.

Let me now attempt to describe the sequence of events leading to disease as a result of deficiency of a single factor in the food. For this purpose

I shall choose ' vitamin A ' one of the most common of all deficiencies in the dietaries of India's inhabitants : indigenous as well as non-indigenous. But before I do so I would emphasize that it is rare to find only one substance deficient in a diet ; more often there are several and more often still the deficiencies of some essentials are combined with excess of others. Balance of the food in every essential is a principle as important as the avoidance of deficiency in any. And if I select for this story of pathogenesis a Vitamin-deficiency it is not to say that an equally impressive one could not be told in regard to deficiency of some ' proximate principle ' such, for example, as of the mineral elements : lime, phosphorus, iron or iodine. To limit my story to a reasonable compass I will not only select a single deficiency—vitamin A—but will tell of its effects on only one tissue of the body : mucous membrane. As you know it is with mucous membrane—a highly specialized skin—that various cavities and passages communicating with the outside air are lined ; the conjunctiva, the alimentary tract, the passages from the kidneys to the bladder, the bladder itself and the respiratory passages. To protect it, and through it the body, against attack by pathogenic organisms Nature has endowed mucous membrane with a very wonderful defence mechanism. It is unnecessary to enter on a description of this mechanism, suffice it to say that the cells covering the mucous membranes produce certain secretions and possess certain qualities antagonistic to harmful bacteria. When vitamin A is absent from, or deficient in, the food the cells covering the mucous membrane dry up and become what is called keratinised. The mucous and other secretions are either no longer produced or such as are produced are lacking in protective quality ; the outward defences of the body are thus broken down, and a door is opened for the entry of bacterial and other pathogenic agents into the tissues of the body. This door they are not slow to use. When this sequence of events takes place in the conjunctiva and the nearby tear-producing glands, infection of the eye is likely to occur, especially in a dusty land like India, and the whole organ may be rapidly invaded and destroyed. In this Presidency alone there are thousands of people who have been wholly or partially blinded in this way. Your distinguished ophthalmologist—Lt.-Col. Robert Wright—has recently emphasized this cause of blindness in Madras : a cause discovered by patient experiment on rats. Or if the respiratory tract be affected in a similar way the bacteria which cause such diseases of the lungs as pneumonia and tuberculosis have the way made ready for their ravages. Herein is one cause of the wide prevalence of tuberculosis and an illustration of the way in which dirt and diet combine to cause disease. Or if the urinary tract be similarly involved infection is likely to occur therein chemical changes are brought about in the urine, and its contained salts and other substances no longer remain in solution but are deposited in the kidney or bladder with the formation of that common and distressing malady : ' stone '. In my own laboratory stone-in-the-bladder and kidney have been produced in this way and prevented as easily by adding whole-milk containing vitamin A, to the stone-producing diet ; while many disorders of the gastro-intestinal tract have been shown to have a like causation.

There is no organ nor tissue of the body which is not affected in some similar kind of way by one deficiency or another or by the combined action of such deficiencies and pathogenic agents : the nerves, the bones and teeth, the stomach and intestines, the reproductive glands, the thyroid, the adrenals, the liver, the kidneys, the spleen, the blood and skin. And according as one

or other or several of these are affected there appear certain clinical pictures which we recognise as disease entities: keratomalacia, beri-beri, scurvy, rickets, osteomalacia, pellagra, anaemia and so on. But underlying them all, and causing many conditions of ill-health for which we, as physicians, have no hagnostic label, there is depreciation of chemical and cellular functions: the foundation upon which disease is built.

Not long ago I had occasion to survey the incidence of lung diseases in the rats I use so largely for experimental work. I found in 2,000 odd post-mortem examinations carried out in deficiently-fed animals that no less than 35 per cent had died of lung diseases; while in an average daily population of 800 or more well-fed animals the incidence of lung disease was less than one per cent. An observation of this kind has an immence significance. The final cause of the lung disease was a microbic agent but it was the defective food which enabled it to overrun and kill the host. Ten years ago I made a similar observation in regard to dysentery. Such experiences lead one to think that sometimes we, as physicians and investigators of disease, fail to see the wood for the trees and that by singling out for meticulous study the pathogenic organisms associated with certain diseases we often neglect to consider the influence on their growth and disease-producing potency of the human soil in which they may become implanted. For myself I do not doubt but that faulty nutrition is the prime means whereby the soil is made ready for the rank growth of morbific organisms.

It is not only in regard to man but in regard also to his domestic animals that the study of nutrition is of such vast importance. Time does not permit me to dilate on the veterinary and stock-rearing aspects of the matter. It is sufficient to say that animals are no less subject to dietary diseases than man himself and that the future of the Veterinary Science, like the future of Medical Science, lies largely in the study of nutrition. Nor do the ramifications of the science of nutrition end with man and his domestic animals: they extend to his crops and to the very soil itself. Soil, irrigation, manure: all these have their influence not only on the quantity but on the quality of the crops as food. So it is that nutrition has its human, its animal and its plant aspects and its proper study must embrace them all.

In this brief sketch of so wide a subject I trust I may have said enough to convince you that it is one having an interest for everyone: laymen as well as medical men; rich as well as poor. Fortunately, like the principles of true religion, those of nutrition are simple and easy of comprehension. It is not my purpose here to expound them. I have done so lately in a little book called *Food* which I hope some of you may be sufficiently interested to read. It is the answer, so far as I am able to give it, to a question put to me twenty-seven years ago. At that time, and shortly after my entry into the Service, I had in the Hindu Khush my first private patient: a Mullah whom I afterwards came to number amongst my friends. He was suffering from 'gravel'. Ripe from the University and full of the medical lore of my day I disposed of his case with the confidence of youth, insisting magisterially on a certain line of treatment. He heard me with becoming courtesy not to say deference and then remarked: 'But Sahib, what shall I eat?' I did not know! I had been taught much, some of it of doubtful utility, but not this essential thing. Now after 27 years devoted to research some glimmering

of the predominant part played by diet in causing his condition is being revealed to me. But still his salutory question—'what shall I eat?'—recurs to me in connection with many other states of ill-health; and I realise that my days of research must come to an end before I can learn its complete answer. 'What shall I eat?' is a problem that has exercised the minds of many since the dawn of Medical History. Its full solution lies in the future and goes to the very root of Medical Science. Indeed the prophetic words of Hippocrates spoken in regard to the nutritive quality of different breads, are as apt to-day as they were 2,000 years ago: 'Whoever pays no attention to these things, or paying attention does not comprehend them how can he understand the diseases that befall a man?'

In view of the importance of this subject is it not a little remarkable that while India—and to go less far afield: Madras—has her great and essential organisations dealing with the nurture of the fruits of the earth and of the trees of the field, she has, as yet, none dealing with the nurture of man himself and of his domestic animals? It is true that she has her Medical, Veterinary, and Public Health Departments: all beneficent in their own sphere and effecting great good. But the two first are for the most part engaged in the salvage of wrecks, while the last, though brilliantly successful at times in its skirmishes with disease, must continue to fight a losing battle until it is recognised that malnutrition is the root cause of the vast proportion of human and animal disease in this country, and until means are found for improving the standard of the living of the masses.

What then should India, what should Madras, do in this matter? Mindful that the business of the Scientist is to stick to his Science, I say nothing of means for improving the standard of living of the masses; but there are two adjuvants to that end: education and the development of Research. India should see to it that the elements of Nutrition are taught in her schools and that this subject occupies a prominent place in the medical curriculum of her Universities. She should find amongst her own sons and daughters those capable of undertaking, and desirous of devoting themselves to, Nutritional Research: those actuated by the spirit of inquiry and possessed of a fitting humility, 'the entrance into the kingdom of man, founded on the Sciences, being not much other than the entrance into the Kingdom of Heaven, whereunto none may enter except as a little child' (Bacon). Following the example of Japan she should house these votaries of Science in her own National Institute for Nutrition; where they are taught, trained and tried and where they in their turn train and teach; where every aspect of Nutrition is ardently explored; 'where tireless striving stretches its arms towards perfection; where words come out from the depths of Truth; where the clear stream of reason has not lost its way into the dreary desert sand of dead habit' (Tagore). *Madras Mail.*

Notes

Bagasse for Rayon

It is reported in the *International Sugar Journal* for September 1929 that the Cornstalk Products Co., of Danville, III., U.S.A , are in the market for 25,000 tons of Louisiana bagasse for use in making rayon or artificial silk, it having been found that a very fine grade of the product can be made from it. There will perhaps come a time when sugarcane will be cultivated more for bagasse than for its sugar.

A New Sugarcane

The Planter and Sugar Manufacturer, August 31, 1929 reports that the Sourabaya *Handelsbad* writes that the Experiment Station at Pasoeroean will distribute towards the end of this year cuttings of a new variety of cane to which it has given the name of P. O. J. 2961. This new cane will be even more robust than the celebrated P. O. J. 2878, and it is thought that it will suffer less from the attacks of 'top-borers'—worms that penetrate into the tops of the cane.

The intention is to plant this cane in sandy soil as well as in clayey soils.

Food and Emotions

'There are three ways of regarding the body. The first is as an enemy, an evil to be fought and ill-treated; the second as the spoiled child, pampered and put first, and protected; and the third, as a good servant and friend, that is the winning and harmonious co-operator with mind and spirit. The third is the correct way in which to regard the body. The whole personality should be considered. Looking to the harmonious working of the body did not mean fussiness. Wholesome food eaten in a happy, controlled spirit may do more good than a faultless diet combined with worry. All negative emotions such as anxiety fear, resentment, and anger have ill-effects on the body. Confidence, trust, and love, and other positive motions liberate the physical powers.'—Dr. Evelyn Saywell in an address to a health conference.—*Queensland Agricultural Journal*, October 1929, p. 459.

Cabbage Moth Control

Mr. W. L. Morgan, Assistant Entomologist reports as follows in the *Agricultural Journal of New South Wales*, results of Preliminary Experiments in Cabbage moth control.

The results pointed to a double treatment, consisting of spraying with arsenate of lead and dusting with lime and tobacco dust, as being likely to give a satisfactory control. The arsenate of lead was applied at the rate of 1½ lbs.

to 50 gallons of water every ten days and was alternated with dusting with lime and tobacco (equal parts) once a week.

Lime and tobacco dust used by itself gave a fair protection to the central leaves and is therefore valuable in control. Arsenate of lead spray, with the addition of a spreader, did not give sufficient control of grubs on the central leaves, although the outer leaves were protected satisfactorily.

It is essential, however, that cleaning up old plots and seed beds be carried out in order to reduce initial infestation to a minimum.

Mr. F. R. Parnell

Most of our readers who know Mr. F. R. Parnell, till recently Paddy Specialist to the Government of Madras will be interested to hear of Mr. Parnell's activities in Swaziland In the course of an article under the caption *Swaziland Revisited* contributed to the *Empire Cotton Growing Review* by Mr. G. F. Keatinge, the following passage occurs:

'The Jassid (a common insect pest of cotton) for some years past, has taken its annual toll, and in particular seasons has wiped out the crops, as was the case in the season of 1927–28. This danger has now been eliminated by Mr. Parnell's Jassid resistant varieties. But Mr. Parnell has done more for the farmer than this. His Z_1 cottons certainly have the great merit of keeping the Jassid at bay, but apart from this they have their limitations. In his new V_4 selections however, he is offering the farmer a very different plant. Not only does it resist the Jassid but it is a very free fruiter. It develops early, stands up to drought well, recovers quickly after adverse periods and ripens its crop rapidly; a great list of virtues, to which may be added a high ginning percentage and a superior staple. Every cotton grower is clamouring for seed of this variety and keen to plant it.'

Air Routes and Plant Quarantine

Under the above caption, Mr. Kisliuk of the U.S.A. Plant Quarantine service, writes as follows in the *Entomological News* of June, 1929.

'Speed and still more speed is the trend of modern transportation. With more and better roads in all parts of the world and with the increasing number of motors, the more rapid railroads and steamboats, all replacing the packmules, ox-carts, camels, sailing vessels, slow steamers, etc., of yesterday, the most remote parts of the world are now but a few days' time from our ports. Needless to state, that with this rush against time, there is a corresponding increase in the danger of new insect pests and plant diseases being shipped alive and virulent, with such plants and plant products as may comprise the cargoes, baggage or stores of these carriers.

Now these potential dangers are still more threatening with commercial and private airplane travel; for numerous airplane services have now sprung up between the United States and Mexico, Central and South America, and West Indies. In addition there is still another type of air-vehicle that must be considered as a potential carrier of live insect pests and plant diseases new to

the United States namely, the dirigible or the lighter-than-air vessel. Recently, on the 15th October 1928, the first foreign commercial passenger and cargo carrying dirigible—*Graf Zeppelin* arrived at the U.S. Air Station at Lakehurst, N. J. During the quarantine inspection made, though no living plants were noticeable, bouquets of roses, chrysanthemums and carnations were found along with some passengers from Germany, on which live insects, mostly aphis, thrips, scales, and plantbugs were found on examination.'

This will make clear the dangers of introduction of foreign insects, which are ahead of us, in the future.

War declared against the 'Mediterranean Fruit-fly' in America

Following promptly on the discovery of the notorious pest of Fruits—the Mediterranean Fruit-fly—in Florida, the Federal Department of Agriculture in the United States of America has taken prompt measure to exterminate the insect in the places of introduction before it can spread into other States. This pest had entered Hawaii as early as 1910, and had made the horticultural development of those Islands an impossibility; and with this experience in mind, the Federal Authorities had taken every possible precaution to see that the pest was not introduced unwarily by way of imported fruits; but after all, all such vigilance appears to have been in vain.

Mr. Henry W. Hough writes as follows, in an article contributed by him to the *Scientific American* of August 1929, under the title—'Our Crop-Destroying Insect Pests.'

'In April of this year, it (the Mediterranean Fruit-fly) was discovered in Florida, already well established in the citrus groves surrounding Orlando. Within a week, 75 trained insect fighters and plant experts were on the ground, quarantine zones were established, an appeal was made for a federal appropriation to provide money for meeting the emergency, and in record-breaking time Congress had made available a fund of 4,250,000 dollars (or nearly Rs 127 lakhs) for the greatest defensive campaign of its kind yet undertaken by man.

'Every orchard in the state was inspected for the pest. Inspected zones and protected zones were charted; in every infested area all fruit and produce were destroyed, and in the protected zones all products were subject to examination before being shipped or transported to uninfested regions. The regulations were more rigid than those prescribed when nations go to war, and several companies of the National Guard were called out to aid the 2,000 insect specialists who were directing the campaign of destruction and inspection. But before the infestation had been discovered, almost three-fourths of Florida's enormous citrus crop had been moved out of the state through normal channels of distribution. The fly was soon found as far west as Texas and Arkansas, and as far north as Ohio and New York and now every state in the south is menaced.'

How one wishes that a similar confidence in Scientific work, were present in India!

Reviews

Madras Agricultural Department Bulletins

No. 94. *Field Experiments with Calcium cyanamide as a nitrogenous manure for South India soils.* By B. Viswanath and S. Kasinathan. Price, four annas, Superintendent, Government Press, Madras :

In this bulletin the nature of Calcium cyanamide, its manufacture, the chemistry of its decomposition in the soil, the results of field trials with paddy, cholam and cumbu on different soils, the economics of manuring with Calcium cyanamide and its future in South Indian agriculture are discussed in simple language. Full tabular statements of the results of experiments are given.

No. 95. *The work of the Live Stock Section.* Government Press, Price, six annas.

A good knowledge of the several important breeds of cattle in South India and also those of other provinces and countries that thrive well here, is essential before any attempt is made to improve our cattle. The main problems are to improve the milking qualities of our local breeds and to maintain a regular supply of sturdy animals for agricultural and draught purposes. This bulletin describes in a general way, illustrated with nice photographs, the Scindhe, Ongole, Kangayam and the cross breed herds and also the Delhi breed of baffaloes, all with special reference to their milking capacities. There is also a brief account of the various cattle-breeding centres managed by the Department in this Presidency. The bulletin concludes with instructions for care and treatment of a breeding bull, giving full details of rations and management.

No. 96. *Cultivation of Grape Vines.* Government Press, Price two annas.

This bulletin attempts to give a complete account of the grape vine cultivation, suitable soil, preparation and planting, irrigation, manuring, pruning, seasons of harvest and such other details with special reference to practices obtaining in the several noted grape vine centres as Penukonda, Krishnagiri and Kodaikanal Road. A description of the various pests and diseases that appear on the vines, is also given with full instructions as to the procedure to be adopted in combating them.

Correspondence

To

THE EDITOR,

MADRAS AGRICULTURAL JOURNAL

LAWLEY ROAD

Sir,

SAMPSON MEMORIAL—*A suggestion.*

In a recent issue, a note of appreciation of Mr. Sampson was published in connection with a notice regarding the unveiling of his portrait by Mr. Anstead at the time of the College Day and Conference, last July. The Secretary of the Memorial Committee made then a brief statement that about Rs 500 had been promised and that a part of it had been collected. As Mr. Sampson, both while he was here as Deputy Director and later, has been evincing an abiding interest in the study of plants in their Botanical aspect also, and as he is now occupying the post of Economic Botanist to the Empire Marketing Board, a desire has been expressed that a prize for Botany be instituted in his name at the Agricultural College, Coimbatore. This is certainly appropriate as the other major subjects have enjoyed this distinction for several years past. It is hoped that the Committee of the Sampson Memorial Fund will consider this suggestion.

LAWLEY ROAD,
11th October, 1929.

Yours truly,

V. MUTTUSWAMI AYYAR.

College News

Final Year Students' Agricultural Tour in the Ceded Districts and Circars

An extensive tour over the more important tracts of the Presidency, observing and studying the variations in cultivation and cropping in their manifold aspects of seasonal and economic conditions, has been considered to be an important factor in clarifying of ideas and improving the knowledge of an agricultural student. The final year students had therefore the advantage of visiting some of the most important and interesting tracts of the Presidency this month, viz; the black cotton-soil areas of the Ceded districts and the deltaic regions of the Godavari and Kistna rivers.

Meeting the Principal at Hospet on the 1st October, the party made a detailed survey of the sugarcane cultivation in the vicinity of the town and then proceeded to the Government Experiment Station at Hagari. The party made an observation of the crops and implements on the farm and obtained full details of the soil moisture, manurial and other experiments that are being conducted on cholam and cotton. The Experiment Station at Nandyal was the next place of halt and there, the students were able to make a comparative study of these two stations located on the noted blacksoil tracts of the Ceded districts. On these two stations they had an opportunity to go into the details of cotton improvement work that has been done for the last several years. Besides these stations, the party visited also a few villages including Tadpatri, to study ryots' crops of chillies, groundnut, cholam and paddy and also their economic conditions and their cattle.

Leaving Nandyal, the party travelled north to reach Anakapalle, making a flying visit to the Kistna river anicut near Bezwada *en route*. Anakapalle in the Vizag district is situated in a very fertile locality and the Government Station at this place afforded opportunity for the students to study in detail the up-to-date methods in the cultivation of cane, paddy, ragi and other garden crops. The next place of halt was Samalkota, representative of the Godavari deltaic region. At this station, the students observed fine crops of paddy, plantain and sugarcane including demonstration plots, and obtained full information regarding the cultivation and manuring of these crops to give very successful results in that tract. Tenali, at the head of the Kistna delta and famous for production of rice, was next reached, where an extensive study of paddy cultivation was made. Making enquiries at Duggirala, a great turmeric centre, regarding cultivation of turmeric, the party boarded a steam launch at Repalle and visited the Divi Island project, where powerful Deisel engines pump out enough water from the Kistna river to irrigate about 40,000 acres in the island delta. Returning, the party entrained to Kavari from where the Government Cattle Farm at Chintaldevi was reached. Here fine breeds of Ongole cattle were observed and breeding and rearing methods studied. The last place to visit was Madras, where the Adayar gardens were visited to study fruit cultivation and horticulture. The party returned to Coimbatore on the 20th, after an interesting, instructive and extensive itinerary.

GAMES: *Hockey*—The College Team competed for the local Hockey tournament which commenced on the 28th. On the 29th, our team played the Government College. The weather was fine and the game was interesting. At the outset the opponents scored a goal and matters looked very unpleasant till the very end, when in the last minute after pressing hard our team managed to equalise. The match having ended in a draw, extra time was allowed and our team won by scoring two more goals. In the semi-finals our team should have met the Stanes European High School, but as ill-luck would have it, the Coimbatore Collegians launched a protest with the Committee against our team having included two officers who were outside the teaching staff. The tournament Committee met and decided in favour of scratching our team as a penalty and thus what promised to be a victorious end, proved to be a great disappointment in this year's Hockey activities of the College.

Cit-Bits

Tips for Protection from Lightning

For persons in-doors, lightning fatalities are very rare. Only about ten per cent of the cases happen to persons who are indoors. All one has to do, therefore, is to stay indoors, and to keep away from fireplaces, stoves and other metal objects.

If one is out-of-doors, the following shelters in order of preference is given : (1) Large metal or metal-framed buildings, (2) dwellings having lightning conductors, (3) large buildings, or (4) small buildings. If one has to remain out-of-doors, *keep away* from (1) small sheds and shelters in an exposed position, (2) isolated trees, (3) wire fences, or (4) hill-tops or wide open spaces. If one is in the ' wilds ' seek shelter in (1) dense woods, (2) a grove of trees, (3) a cave, (4) a depression in the grounds, (5) a deep valley or gorge, or (6) the foot of a steep or over-hanging cliff.

These rules are, of course, not perfect, but their brevity and generality should make them acceptable. *Nature, 3rd Aug. 1929.*

The Song of the Bee

God blesses all. The flowers bloom
We bees we gather and we store
Man looks upon it as a boon
To rob us and so leave us poor.

We don't complain, we creatures here,
For God has taught us thus
To feed his children far and near
With honey made by us.

We are, however, not content
When left to Moth and Ant,
By man forgotten with contempt
When the honey flow is scant.

We ask but one condition,
When helpless and so weak,
Give us some small attention
And a look in every week.

We'll give you this as fact,
And will pay it back in Gold,
For just this kindly act,
With Honey double-fold.

Journal of Jamaica Agricultural Society, June, 1929.

Uses of Lemon

Many people prefer lemon juice to vinegar when mixing a salad dressing, and it is much more easily digestible.

For washing dainty hand-kerchiefs add a few lemon rinds to the water when it is cold, and boil it with the hand-kerchiefs, and you will be surprised at their snowy whiteness.

As every one knows, lemon juice is very useful after an accident with the inkpot. Rub lemon juice on the mark at once, leave for five or ten minutes, then wash off with milk, and the stain will have disappeared.

The juice of a small lemon, or half a large one, taken first thing in the morning, without adding sugar or water, is wonderfully helpful for rheumatism or indigestion.

The same treatment will soon make the muddiest complexion clear. After the lemon has been squeezed out, save the skin and rub it over the fingers if you want to remove ink or other stains from the hands. A few drops of lemon juice added to a little glycerine will make the hands soft and white again after a day's work in the garden.

In cookery the lemon is invaluable. Many sauces are insipid unless a squeeze of lemon is added. Sauces and custards are all the nicer if the thinly grated rind of the lemon is boiled in the milk or cream preparation and then strained out. In stuffings a little finely grated lemon rind adds piquancy and flavour. Many people prefer a slice of lemon in their tea to sugar and milk. Cakes for tea and some light puddings are nice with the finely grated lemon rind added. Lemons too are invaluable for garnishing, their yellow tint adding colour to insipid food. Cutlets, fillets of fried fish, and pancakes all look and taste better if garnished with slices of lemon.

Queensland Agricultural Journal,
October 1929, p. 460.

Weather Notes

SEPTEMBER 1929

Rainfall Data

Station	Actual Rainfall	Departure from normal
Gopalpore	3·7	—3·6
Vizagapatam	5·9	—0·9
Cocanada	7·1	+1·0
Masulipatam	7·2	+0·9
Kurnul	7·8	+1·5
Bellary	8·1	+3·1
Anantapur	7·7	+1·7
Cuddapah	8·9	+2·2
Nellore	6·8	+2·5
Madras	7·4	+2·6
Cuddalore	6·5	+0·9
Vellore	5·8	+1·2
Salem	4·3	—2·3
Coimbatore Town	2·8	+1·3
Coimbatore Lawley Road	4·5	...
Trichinopoly	8·3	+2·8
Negapatam	5·7	+2·0
Madura	4·5	+0·3
Pamban	2·0	+0·3
Palamkotah	3·5	+1·9
Trivándrum	10·0	+5·9
Cochin	15·7	+6·4
Calicut	8·6	+0·3
Mangalore	15·6	+4·5
Bangalore	6·0	+0·8
Mercara	12·6	+1·7
Kodaikanal	8·6	+1·8
Coonoor	8·9	+3·1

The month of September was an abnormal month. The first eleven days saw a South Western Monsoon distribution, on the 12th a change came about, with an area of Low Pressure in the centre of the Bay, which persisted without developing into a depression till the 15th. The 'Low' now shifted westward and lay over the Deccan on the 16th and persisted there till the 20th by which time it had extended southward into Ceylon. A depression appeared that day centred off Konkan. The depression moved northward and soon became unimportant off Kathaiwad. Again on the 25th conditions were unsettled off the Malabar Coast and a storm formed on the next day centred about 15° N and 68° E which moved Westwards towards Arabia towards the end of the month.

The unsettled conditions in the central parts of the country induced an influx of moist sea winds, and determined widespread rain during the second half of the month. Rainfall was heavy in the Deccan, the southern districts and in the adjoining areas associated with thunderstorms from the 14th to the 19th and again from the 25th to the 30th. No very heavy falls occurred but rainfall was above the normal in the whole of the Presidency outside the Circars, where it was in defect.

In consequence of the unsettled and rainy weather Temperature was markedly below the average in the center of the Presidency and in the South during the periods of general rainfall.

Humidity was also high during these periods. Winds were of low velocity owing to the absence of steep gradients, and chiefly directed from sea to land, and hence gave rise to numerous thunderstorms.

Report of the research Institute Observatory

The barometer was steady for the first ten days of the month, when a rise followed by a fall occurred. The lowest reading was 28·417 (unreduced to sea level), and this fall was during a period of unsettled weather which Coimbatore shared with the rest of the Presidency, and which gave heavy rain on the 25th and on the 26th. Thereafter the barometer rose steadily and reached the highest point (28·579) on the 30th.

Winds during the month had a southernly component on all days excepting the 21st to the 24th when the low pressure area over the central parts of the country induced an indraught from the Bay. Velocity was low and calms were recorded on twelve mornings.

Temperatures were high in the first half of the month, the maxima being above 90° the second half was cool, temperature being markedly low from the 15th to 17th and 25th to 30th.

Rainfall was heavy and totalled 4·52 ins., this being one of the heaviest falls known in the month of September. The heaviest fall occurred on the 25th and amounted to 2·11 inches.

Summary of Weather Record

Absolute Maximum in shade	95· 0
Do Minimum ,,	65· 5
Mean Maximum ,,	89· 7
Do Minimum ,,	70· 7
Mean daily wind velocity	4·72 Miles per Hour
Do 8·00 a.m. ,,	2·20 ,,
Total Rainfall	4·52 inches
Heaviest fall in 24 hours	2·11 ,,
Number of rainy days	8
Total Hours of bright sunshine	215 hours
Mean hours of bright sunshine	7· 5 hours

Prospect for October

The unsettled weather during September, coupled with widespread rain and the depression that crossed the Circars coast early in October seems to point to a much delayed and weak North-East Monsoon. The indications so far (14th) seem to bear out this forecast, since South-west winds continue and the movement of the Upper Air currents are still from some Westerly point.

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

Departmental Notifications

Appointments, promotions, transfers, leave, etc.

Mr M Manghesa Rao to be Assistant Director of Agriculture on probation in the retirement of Mr A V Tirumuruganatha Pillai. Mr M. Govinda Kidavu, leave on average pay for two months from 22nd October. Mr Y G Krishna Rao, extension of leave on medical certificate from 14-9-29 to 17-10-29 and leave not due up to 13th December. Mr Rao Bahadur D Ananda Rao, Deputy Director of Agriculture, to be Head Quarters Deputy Director, Madras, Mr. M Govinda Kidavu, to be Deputy Director of Agriculture, Fourth Circle, Mr S U. Khan, to be Deputy Director of Agriculture, Seventh Circle and Mr. D Balakrishnamurthi, on leave to be Deputy Director of Agriculture, Second Circle.

Mr K V. Natesa Ayyar, B Sc Ag., to be Upper Subordinate, V grade on probation and posted to IV Circle The following Upper subordinates are promoted provisionally to the IV grade with effect from 15th October, 1929 Messrs T. G. Anantharama Ayyar, K Avadanayakam Pillai, V. N. Subbannacharya, A. Ramaswami Ayyar and V T Subbayya Mudaliyar. Mr. S. Katchpeswara Ayyar from VIII Circle to the Nilghiris for district work, Mr. M Subramanya Pillai from V Circle to VIII Circle

Second Circle Mr S Sithapathi Rao, Assistant Demonstrator, Nellore, leave on average pay from 9th for 10 days.

Third Circle Mr P Naghadar Nayadu, Assistant Demonstrator, extension of leave on average pay on medical certificate for one month and one day from 6-10-29 and leave on half average pay for 29 days in continuation Mr. N Annaswami, Demonstrator, Kadiri, leave on average pay for one month from 3-10-29. Mi C Subbarao Nayadu, Assistant Demonstrator, extension of leave on medical certificate for two months.

Fourth Circle Mr A. S Nithyakalyana Reddi, Assistant Demonstrator, leave on average pay on medical certificate for 4 months and 14 days from 7-9-29. Mr A. Ramaswami Ayyar, Manager, Palur, leave on average pay from 23-10-29 to 21-12-29 with permission to avail of Christmas holidays.

Fifth Circle Mi M. Subramanya Pillai, Demonstrator, leave on average pay for 15 days from 4th October.

Sixth Circle Mr. L. Sankarakumar Pillai, Demonstrator, extension of leave on average pay on medical certificate for two months.

Seventh Circle Mr K Achyutan Nayar, Assistant Manager, leave on average pay for 10 days from or after 17-9-29.

Eighth Circle Mr. K Avadanayakam Pillai, Demonstrator, extension of leave on average pay for 7 days up to 12-10-29, he is again granted leave on average pay for one month from 21-10-29, Mr. P V. Raghavendra Rao, Demonstrator, Hosur, is granted privilege leave for one month from 25-10-29

Live-Stock Section Mr. P. K. Krishnan Nambiyar, Assistant Manager, Hosur Cattle Farm, leave on average pay for one month and eleven days from 11-11-29 Mr. T. V. Krishnaswami Rao, Manager Chintaldevi, leave on average pay on medical certificate for one month and ten days from 28-9-29.

Curator's Section Mr K Govindan Nambiyar, Assistant Manager, leave on average pay for one month from 5-11-29

Paddy Specialist's Section. Mr T Lakshumipathi Rao, Assistant Manager, Maruteru, leave on average pay for 29 days from 3-11-29

Cotton Specialists' Section Mi. S. N. Venkataraman, Assistant, leave on average pay for one month from 6-10-29.

Millets Specialist's Section Mr P. Subramanyan, Assistant, leave on average pay for 11 days from 29-9-29.

Government Systematic Botanists' Section: Mr. T. R. Naganatha Ayyar, Sub-Assistant, leave on average pay for one month from 3-10-29.