

Pongamia glabra is the next higher, but does not fulfil the hopes entertained of it by the cultivators, only 14 per cent of its Nitrogen being available as nitrates in the course of eight weeks. With ammonia, the percentage of available Nitrogen increases to 38.33 per cent.

Calotropis gigantia is the best since 28 per cent of its Nitrogen is available as nitrates during the same period. This is in entire accord with the popular practice. When ammoniacal Nitrogen is added on, the availability rises to 55.33 per cent.

Oil Cakes. Of all the cakes tested, White Castor was found to be the best, as 80 per cent of its Nitrogen becomes available for the nutrition of a growing crop in the course of eight weeks. In the same period 57 percent of Nitrogen in Black Castor Cake is nitrified, thus showing that the removal of the husk (i. e., decorticating) enhanced the availability of Castor, and the Ryot may with advantage go in for the decorticated cake wherever possible. 57 percent of the Nitrogen in Neem and 50 percent in Pungam become available in the same period. In some localities Pungam is in great demand, but the value of Neem is not sufficiently realised.

Illuppai Cake is peculiar. It resists all bacterial action in the soil at least during a period of eight weeks. This inhibitory character is perhaps due to the presence of a large percentage of a poisonous glucoside "Saponin" (29 per cent to 31 per cent), and it is a problem whether it would not be worth while attempting to remove the 'Saponin' with a view to make it nitrifiable as the cake contains 2.41 per cent Nitrogen, i. e., five times as much as is contained in the Farmyard manure. Further work will elucidate this point. In its raw state it has absolutely no manurial value.

EXTRACTS.

SOME ASPECTS OF ECONOMICS IN RELATION TO AGRICULTURE.

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The Agricultural Department of Madras is the only Agricultural Department in India which has a Statistical Section attached to it. We publish a weekly season report showing the progress of the sowing and harvesting of the main crops, and the influence of the

weather on them, the state of irrigation supplies, and grazing for cattle. We also publish fortnightly statements of retail prices. Each year we issue a season and crop report which shows the area under each crop in the presidency and the yield. In addition to these we publish forecasts of the more important crops, such as sugarcane, cotton, paddy, groundnut, and gingelly, and we pride ourselves on the accuracy of these forecasts and that we are justified in doing so is shown by the fact that our forecasts are accurate within a percentage of error never higher than three per cent and in the case of some crops as low as 0.2 per cent.

Now it may be asked, "What is the use of all these figures. A lot of time and trouble is taken to collect them and a certain amount of expense is involved. Does anyone ever look at these publications with their pages and pages of tabulated figures?" That is a fair question.

Forecasts serve many useful purposes. Government for example are able to see beforehand whether there is likely to be any shortage of a food crop. For instance our next paddy forecast will show to what extent the recent floods have damaged the crops in any particular locality and by how much the crop is likely to be reduced in consequence, and the Government will be able to decide whether it will be necessary to make arrangements to import paddy into the country on a large scale, or to make any special arrangements for ensuring supplies to the affected areas or for controlling prices, and if so to make the necessary arrangements in plenty of time. In the case of an exported crop like groundnuts any large increase or decrease would mean a corresponding increase or decrease in revenue which again is a desirable thing to know about in advance.

One use of such figures is that they indicate the balance between food crops and commercial crops in any particular area, be that area a taluk, or Province, or country and I need hardly tell economists that this is of the greatest importance. The primary duty of any country is to feed her population. In England it is impossible to feed the population by food grown in England itself. England has passed during the last century or so from an agricultural country to an industrial country and she now depends on other parts of the Empire for her food. Not so India. India is still an agricultural country though we hear much talk now-a-days about industries. Any change to industry must be carefully watched by her rulers and provision made for feeding an industrial population crowded into towns, and statistics of the nature described help those whose business it is to keep their fingers on the pulse of the nation so to speak and note how it beats, agriculture or industry—and act accordingly.

Another axiom not always realised as fully as it should be is that money is not wealth—you cannot eat money. I remember when the cotton boom was on some years ago how there was a rush to grow cotton all round Coimbatore and how it was planted on all kinds of land suitable and unsuitable at the expense of food crops. The ryots in those years had more money than they had ever had before but no food. Outside holders of food raised the prices and people were worse off though they had more money. They soon learned the lesson and have now replaced many of the food crops.

Statistics help us to solve much bigger problems than this and I will take as an example the case of the Cotton situation. I choose this because it is one which is before the public just now and one in which the Agricultural Department is particularly interested.

The problem is purely an economic one and may be stated thus. There is a world shortage of cotton. To meet it which is the better policy for India—to endeavour to increase the quantity of cotton grown in this country irrespective of quality, or to try and increase the output of long stapled cotton. In other words is an increase of 100,000 bales of good stapled cotton more important to the world than an increase of a million bales of short stapled cotton.

The Indian Cotton Committee stated very plainly that there was a genuine demand for Indian long stapled cotton and we know that such cotton can be produced in this Presidency. Now an Agricultural Department has to decide on a policy to suit its own particular area. Admitting that Madras should grow more long stapled cotton is there an area on which it will PAY? To what extent is improvement necessary? Will a moderate increase in staple be profitable or should an effort be made to grow something new? Will the extra price for staple pay for decreased ginning percentage? and a possible lower yield? These you will at once see are questions of economics. They must be answered because to isolate, test, multiply seed, and establish a new strain of cotton is a matter of years whatever method be adopted to gain the desired end—hybridisation or selection.

To answer the above questions in a satisfactory way it is necessary to know the trade demand for different cottons and the trend of the changes which are taking place, and here statistics come to our aid.

Turning to those statistics we find that India in an average year consumes internally rather more than half her cotton crop and the surplus is sold for export to some country or other. Further statistics

show where it goes. I need not trouble you with these figures, but an examination of them makes it very clear that the principal demand at present is for cotton spinning counts of 20s. upwards—that is for long stapled cotton and the groups of counts above 20s. include 50 per cent. of the total yarn spun in Indian Mills, while cotton of sufficiently long staple for these counts forms only 33 per cent. of the Indian crop.

It is clear therefore that in an average year the production of our short stapled cottons is more than double the requirements of Indian Mills. What becomes of it? An examination of statistics again—this time those of Japan show that Japan takes most of it. But these statistics also show another thing and that is that not only has the percentage of yarn of higher counts increased steadily in Japan of recent years, but that recent additions of spindles have been for medium and fine counts, i. e., to utilise long stapled cotton.

Our examination of statistics therefore leads us to this conclusion that so long as India depends on foreign markets for buyers for approximately half her crop of cotton it is clear that she must cater for the needs of those markets or lose them. Unless India in fact takes steps to increase the staple of her cotton she will find herself with cotton to sell which no one wants to buy. As my Cotton Specialist recently put it India will be in the position of a man with onions to sell in a market where all the people want eggs. India must be prepared to produce eggs.

This then is the economic problem which the Agricultural Departments in India have to face and in this Presidency we are doing our best to increase the staple of our cotton and to make and introduce new strains.

But this is not all the problem. If it were it would be comparatively simple. The task of lifting the Madras cotton to a higher plane of excellence is beset with difficulties—difficulties caused by practices of adulteration, i. e., the mixing of short stapled cotton with long staple and lowering the prestige and good name of Madras cotton in the world's markets—difficulties of pests and diseases which attack these long stapled cottons which are more delicate than the country cottons. The question arises whether it is not better from an economic point of view to take only one picking and then uproot the crop and replace it with a food or fodder crop.

Here again we are faced with another problem. In how far are you justified in introducing legislation to control adulteration and

disease, legislation which interferes with the liberty of the subject for the good of the community ?

As you see it is a complicated problem and one which your Association might well study. It will I hope serve to illustrate the value of statistics and the wide issues which are involved and how closely economics and agriculture are related.

I will now turn to another phase of my subject and give you another example of this close connection between the two subjects in which you and I are interested.

Farming is almost entirely an economic problem. The farmer wants to get a living and the best possible monetary return out of the crops he grows. His problem is how he can best utilise his land to that end. Now let us consider the great question of manuring from its economic point of view. It is quite easy to prove and to demonstrate that the addition of manure produces an increase of crop. For instance experiments carried out on one of our Experiment Stations (Samalkota) show that by the addition of 300 lb. of bonemeal the yield of paddy can be increased by 289 lb. of grain per acre and by the addition of 500 lb. of bonemeal that increase can be raised to 455 lb. per acre.

Here you have an example of the Law of Diminishing Returns which simply means that if 100 lb. of manure give an increase of crop of 96 lbs an application of 500 lb. of the manure will not give an increase of 5×96 but something less and that a point will be reached ultimately when no further increase in yield will be produced by the further addition of manure. The limit has been reached and any further increases in yield can only be produced by improving the inherent yielding capacity of the crop by hybridisation. However this is a fascinating side-line which I must not now stop to follow. What I want to show you is the economic aspect of the question.

Last year the average price of rice was 16'2 lb. to the rupee so we can calculate the value of the increase in crop produced by the manure. We also know the cost of the manure—bonemeal cost Rs. 120 per ton—and if we subtract the one from the other we shall arrive at the profit obtained by the farmer. And here you see an extraordinary economic position, Despite the fact that the use of manure increases the crop very materially the value of the crop is so low compared with the cost of the manure required to get this increase that it hardly pays to use it and were the price of rice to fall by a very little, one would manure at a loss.

Suppose however the price of the manure could be reduced. In 1910 bonemeal only cost Rs. 80 per ton. Then a very different state of affairs appears and it pays well to manure.

Manure Bonemeal in pounds.	...	300	500
Increase in crop pounds.	...	289	455
Value of Manured crop Rs. as.	...	17-13	28-1
Cost of Manure at Rs. 120 a ton	...	16-1	26-12
Profit	...	1-12	1-5
Percentage	...	10	5
Cost of Manure at Rs. 80 a ton Rs. as.	...	10-11	17-13
Profit	...	7-2	10-4
Percentage	...	66	55

Now the price of bonemeal rises steadily year by year because it is exported to European countries who can afford to pay big prices for it because they are using it to produce crops which have a much bigger market value than rice. Now here is your economic problem. Which is the better for India (1) to export her bones getting a big price for them, money which does not reach the farmer but goes to the scavengers, the middle men, and the exporting firms—or (2) keep the bones in the country at a low price and turn them into food thus increasing the total quantity of food produced the profits from which will go to the farmer. Can such an effect be produced by legislation such as prohibiting the export of bone?

That is a problem which needs very careful consideration at the hands of economists. As an agriculturalist I am no doubt prejudiced and I say the bones should be kept in the country and turned into food. I should like economists to tell me whether I am right or not and if I am right then it is no good talking about it, something should be done at once and the necessary legislation introduced.

There are other economic problems which I could expound to you. Agricultural improvement does not end with increased outturn from the land. The cultivator needs assistance to provide him with the necessary capital at a reasonable rate of interest to free him from a state of perpetual bondage to the moneylender, to aid him in the marketing of his produce to the best advantage, and many other things. But I will not weary you with any more. My purpose will have been served if I have succeeded in indicating that Agriculture and Economics are very closely allied and that they have to solve similar problems.

In conclusion I will quote one paragraph from the proceedings of the Board of Agriculture Meeting held at Bangalore last January.

"The goal of each department (agricultural and co-operative) should be aimed at by the study of economic problems, for the ultimate end of all such study was that some economic good should accrue to the people of India. It was therefore necessary to study rural economics and the Punjab would seem to be the only Province that had attempted this. There was an increasing tendency in the Universities to study local problems. Directors of Agriculture could make suggestions to students for enquiries during their holidays".

[An address delivered before the Indian Economic Association, Madras Section, in September 1923 and published here through their kind courtesy.]

The Viceroy—Lord Reading—on Cotton Trade Prospects.

It gives me the greatest pleasure to take part in this inaugural ceremony today for several reasons. In the first place I am enabled to express my high appreciation of the value of technological and other forms of research connected with cotton with which this ceremony is primarily concerned and, in addition, there is the wider subject of the activities of the Central Indian Cotton Committee and the general question of the cotton industry in India as a whole, in which I take the warmest interest and to some aspects of which I desire to draw the attention.

The Indian Central Cotton Committee lost no time after their formation in carrying out the recommendations of the Special Indian Cotton Committee of 1919 regarding the appointment of a technologist and the erection and equipment of laboratory and experimental weaving installation in which accurate tests can be made and correct judgments concerning the value of varieties of cotton sent for test can be reached. The spinning test represents the main avenue to all technological research in cotton and the experimental spinning plant erected here now enables the most satisfactory method of ascertaining the value of cotton by actual spinning test to be carried out under expert control. These tests will be supplemented by other scientific processes directed towards classifying the properties of various types of Indian cottons and these results will be correlated with the results from spinning tests. The properties of fibre and yarn are also to be investigated. For some of these processes a laboratory will be required where physical, chemical and microscopical examinations can be conducted. A building has been designed and begun for these purposes, but, meanwhile, thanks to the kindness of the trustees of the Victoria Jubilee Technical Institution, the actual laboratory tests have not had to wait upon the completion of the building and are already being carried out in the premises of the Institution. I need not emphasise