

Farming will never be a success unless the farmer
had more voice in the disposal of
his produce—P. Morrel.

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EDITORIAL.

A Magnificent Gift :—On the occasion of the private visit of Pandit Madan Mohan Malaviya to the Agricultural College Estate on 4th May Principal Tadulingam made a handsome donation of Rs. 1000 towards the nucleus of the funds of the Agricultural College, Benares University. We believe this is the largest single contribution from any educationist from South India for this purpose. We hope and trust that such benefactions will grow in volume and numbers by real lovers of education.

Rice.—Elsewhere is extracted an article on rice in the Pacific Islands from that very useful monthly bulletin of Agricultural Economics and Sociology, issued from the International Institute, Rome. India is a very large rice producing country and is also a great consumer. At the same time it exports rice also to other countries. Its importance therefore to the Indians is great and a study of the subject in all its bearings would be helped by a perusal of the extract. Western nations especially America seem to be forging ahead in the way of increased production and higher acre yields. The lessons which each rice growing nation has to learn from other nations have enormous value. China and Japan are now the importers of rice. The time may perhaps not be distant for India to come to that plight and it should be the endeavour of every rice grower to keep abreast of the times. What the Agricultural depar-

ment can do is being done but it will not go a long way unless the actual cultivator changes his methods and follows what would be advantageous to him.

Family allowances.—In a few industrial countries of Europe, the system of giving allowances to families of workers so as to keep them above starvation and want is in vogue. This is to some extent supposed to be remedied in England by old age pensions, thereby an invalid or decrepit person has had some provision made for him. This however may not go far in thickly populated countries with slender finances and in a country like India where industrial labor and agricultural labor are placed under diverse conditions, it would be necessary to devise some schemes whereby their sufferings and miseries may be alleviated in their old age. We believe the Royal Commission on Labour will consider this aspect of the question and make effective recommendations in this regard. The lot of the agricultural laborer is pretty bad and his case deserves all the attention that anyone can give. Of course from the nature of work he is doing, an agricultural laborer can have no organisation and this is a disadvantage insuperable in his case from which he has to be rescued by wellwishers of agriculture.

Study of Insects.—The advantages of a study of Entomology and the utilization of the services of Entomologists are at present not much known to Indians. The few officers scattered over the country are busy investigating and suggesting remedies for pests that may be reported on to them. In other countries the services of Entomologists are requisitioned in more ways than one and the people have come to realise the benefits. If India is to be free from the several scourages that are doing havoc, the Entomologist must be much more in evidence than he is now and increase in numbers. It is not enough that Governments alone employ a few, in which case there is little scope for spread of knowledge amongst a larger number of men. Universities in this country should offer post-graduate courses and introduce this subject in the University examination in order that a large number may pass and increase knowledge of this subject.

Bellary Onions.

BY M. SATYANARAYANA, B. A., B. SC. AG.

Onions in this Presidency are extensively cultivated and exist in various kinds. Bulbs with shades of colour varying from pure silvery-white to deep crimson and of sizes ranging from the small Gollaprolu variety growing in cluster to the big single-bulb type of the Bellary District are all met with. The Ceded Districts abound in the single-bulb variety and the typical Bellary onion is red in colour with a mild agreeable flavour and a sweet taste and entirely devoid of the pungency of the small-bulb varieties. Even in the Bellary district, the crops in the western taluks are a mixture of the white and the red variety and as the Mysore frontier is reached, the white is found to replace the red completely. The white is locally supposed to have medicinal properties while the red is the best for the culinary and highly valued in the market.

Onions in various parts of the Presidency are commonly grown in several seasons during the year. For instance, there are three seasons to raise this crop in the Pollachi taluk. The Bellary onion has two well-marked seasons for its growth (1) the Monsoon crop from July to December and (2) the hot weather crop from the middle of October to the middle of May. These periods include the duration of the nursery as well for the respective crops. Of the two, the hot-weather crop is the highly valued for several reasons. It commands higher prices in the market and gets a ready export to Madras from the demand prevailing there. Its bulbs keep long and do not have as much dryage on keeping as in the case of the Monsoon crop. Again to raise a crop for seed, bulbs of this summer crop alone require to be planted and not those of the other (*vide infra*).

Onion, in this locality, is generally grown in a two course rotation with irrigated sorghum or ragi or irrigated Italian millet or fodder Cumbu. The first of the above mentioned viz., the rotation with irrigated sorghum is the one that is commonly obtained.

The onion crop for bulbs is as a rule raised from seedlings in this tract while this system is rarely known or slightly obtains in other parts of this presidency. The seedlings for both the hot-weather and the Monsoon crops are raised from nurseries the seed for which is derived from an altogether different crop (vide infra).

The bulb crops of the Monsoon and the hot-weather raised by transplanting seedlings:—‘Fine as an onion bed’ is a common English saying. To ensure good germination and a healthy nursery, the land intended for the nursery is well worked with picks and all clods fully crumbled till a fine tilth is obtained. Heavy dressings of cattle manure are applied and incorporated into the soil. Beds of about one-eighth cent in area are then formed. The seed is sown in lines in small groove-like furrows made with the fingers of the hand at intervals of four to six inches. After sowing the seed is covered by gently passing the hand on the soil surface. Water is then let into the beds. Four pounds of seed sown in three to four cents will produce enough seedlings to transplant an acre. To help the thickening of the stalk or stem of the seedling, its top, nearly an inch or two from the tip, may be scissored after a month or forty days’ growth. The scissoring may be repeated a second time after another short interval, if necessary. The judgment of the time of lifting may be exercised when the majority of the seedlings have assumed sufficient thickness to allow convenient holding with the fingers for transplantation. July and October are the months when the nurseries for the monsoon and the hot-weather crops are started.

The main field is prepared as any other garden field in the Ceded districts. Round about Waneyanoor, an important centre of onion cultivation, the field is deep ploughed with the Bellary plough, the local iron plough, and a heavy blade harrow (Pedda guntaka) is passed to crush the clods and level the field. Further levelling and tilth are obtained with the ordinary four span *guntaka* which is worked weighted with that of the driver on the beam. In between these later guntaka workings cattle manure, or the same supplemented with village heapings, is applied at 20

to 25 cart loads per acre and the same incorporated into the soil by working a gorru with the hopper and the tubes removed. Sheep penning or the direct application of sheep manure is not resorted to as this is found by experience to have a deleterious effect in retarding the development of the bulb. But indirect application by manuring the previous ragi crop with the same is not held in disfavour and is actually resorted to by several ryots that grow onions in rotation with ragi. There however, being large areas under garden cultivation, the demand for manure is never fully met. Some ryots near Thornagal, another important centre of cultivation, are content with applying eight cart-loads of cattle manure per acre.

After the land is thus prepared a *bodhi-guntaka* is then drawn to mark out channels with intervening beds. In most places the area within the bed is thrown into ridges and furrows to expose greater surface to and increase the capacity for irrigation water. The beds with the ridges and furrows in them are all rectified with *madi-guntakas*. Water is then let in and the seedlings are transplanted on the sides of rides. The operations of lifting, carrying and supplying seedlings, of irrigating the land and transplanting take 16 men and 40 women per acre.

An irrigation is given the next day after transplantation and subsequent irrigations and hoeings with hand hoes are alternated at intervals according to necessity.

After the crop established itself sometimes a bacterial disease may appear during heavy rains or under humid weather conditions when a spraying with Bordeaux mixture may usefully avert the malady.

In the monsoon crop, in about two months after transplantation, the above ground vegetative part or the stalks run to rank growth. These may be trampled with the feet at about two to three inches from the ground level to prevent abnormal nutrition to the stalk to the detriment of the bulb. This operation needs of course to be done when the land is dry and not immediately after an irrigation. The stalks again assume an erect position in two or three days after the trampling is done. The trampling

may be resumed without harm a second or third time at intervals of a week. As the ripening stage approaches buds and flowers also appear and these require to be nipped off at once so as to leave all the nutrient to the progressive development of the bulb

On no account should there be a similar performance either of trampling the stem or of nipping the flower stalk in the case of the hot-weather crop as such practices are attended with diminutive or rotten bulbs. The reason is not far to seek. In the summer notwithstanding proper irrigations, the vegetative part is not so succulent as in winter and when dealt with in the above manner, it is unable to return to normal conditions so as to function physiologically and photosynthetically for bulb development.

The time of harvest may be judged from the colour of the stalk and the size of the bulb. A well developed bulb may be up to three or four inches in diameter. The crop is irrigated two days before harvest. The bulbs may be pulled out with the stalk or dug with hand hoes or other suitable implements according to the condition of the soil. After harvest the shoot and the root may be cut off with a knife or a sickle or *அறுவாடகை*. Thirty women are required per acre for the harvesting operations above noted. The yields vary from 600 maunds to 1000 maunds per acre. Twenty thousand pounds is a fair yield per acre.

The crop to obtain seed by planting bulbs.—At the time of the harvest of the hot-weather crop, bulbs are carefully selected as material for planting to raise a crop for seed. The roots of bulbs intended for such a purpose are not cut off at the time of harvest as in the case of produce got ready for marketing lest the shoots may be damaged in the operation. These bulbs are next preserved till the time of the sowing season (middle of October) in an invert position, in plaited wicker work, on raised platforms in shade, in the open. This 'Puri', as it is called, is opened only at the time of planting lest the bulbs may shoot forth on exposure to air in humid weather. The arrangement of the bulbs in an invert position for preservation is also to prevent them from sending forth shoots during the period.

Bulbs of the monsoon crop are not used for planting to raise a crop for seed. These bulbs also shoot forth, flower and produce seed. But when a nursery is raised with this seed and the seedlings transplanted, these latter in the main field produce lean elongated bulbs inferior in quality and taste and not the big, round and wholesome bulbs. Here is thus another instance to add to that long list of crops that grow best with the material obtained under the driest conditions.

For planting the bulbs to raise crop for seed, the field is prepared in the same manner as in the case of the monsoon and the hot-weather crops for bulbs. Instead of beds, the whole field is thrown into regular ridges and channels, preferably across a slope if the field has one, the distance obtained between the centres of two consecutive ridges being one and a half feet. The bulbs are next planted only on one side of the ridge at intervals of a foot in the row. The soil is loosened with hand hoes and a bulb is put in each spot so chosen and then covered. The ryots at Wanayanur cut the bulb into two horizontally before planting. The bottom portion containing the shoot is planted while the top is utilised for cooking. An acre requires two thousand pounds of bulbs for planting.

After planting, the crop needs only timely irrigations and hoeings. During flowering time the umbels are sometimes subjected to a severe attack of thrips. In former years spraying with paraffin emulsion was used with success at the Hagari Experimental station to remedy the evil. The proportions for use are as follows:—

| | | |
|--------------|------|------------|
| Soap | ... | 16 lb. |
| Paraffin oil | ... | 4 gallons. |
| Water | .... | 60 „ |

The soap is cut and boiled in two gallons of water. The oil is then added and the whole stirred for fifteen minutes. The rest of the water is finally added to the mixture. For use, this emulsion is diluted with nine times its volume of water. The emulsion is always prepared for immediate needs and is not stocked as it would not keep.

Bordeaux mixture, now commonly used equally answers the purpose.

From February onwards the umbels get ripe with black seed and are ready for picking. Sometimes a second flush is induced with rains in February—March when the pickings may prolong till the end of April. The picked umbels are heaped for a day and then dried in the sun on the two succeeding days. The seed is obtained by beating the umbels with stricks. Besides the seed some bulbs are obtained from the same crop. These are neither wholesome nor of any preserving quality; they fetch only a poor price. A crop which I planted for seed at the Hagari Experimental Station on 14-10-1928 on an area of 0.85 acres in the field No. G. 14 gave on harvest at the rate of 194 pounds of seed and 2,964 pounds of bulbs per acre. The crop gave a phenomenal return of Rs. 645 net per acre.

Bellary Onion Seed :—Onion seeds in India will not keep for more than a year and renewal from proper sources is quite necessary to raise fresh crops year after year. Seed from a dry tract like Bellary is sure to acquit itself in very many soils and climes. The regular indents received at the Hagari Experimental station every season and without exception from the Superintendents of all the Jails in the Presidency, from private parties in the Nilgiris and the Nizams' Dominions, from Prome in Burma and Karachi in Sind is itself a conclusive proof that the Bellary onion seed is able to hold its own in different soils of far distant places and possessing great variations in climate.

A word of caution regarding the seed is here necessary. Tempted by the high price of onion seed ruling in the market, certain ryots raise a seed crop, plant the bulbs of the monsoon instead of the hotweather crop, either on account of the cheap rate at which the bulbs of the monsoon crop are obtained or from their inability to procure the preserved bulbs of the hotweather crop. Again sometimes under unfavourable seasonal conditions, certain plants in the Monsoon crop for bulbs do not develop good bulbs and then are left in the field even after the remaining are harvested. As this period synchronises with the time

of maturing of the seed crop, these above referred plants also flower and seed. As all such seed is passed off as genuine seed, buyers should take care in obtaining their supply from honest and reliable sources.

Lastly, it may here be considered whether it is economical and worth the pains to grow crops for bulbs from seed instead of from bulbs. Propagation by seed is always conducive to healthier and more vital products than vegetative propagation. It is certainly economical and to great advantage if the primitive method of growing bulb from bulb is abandoned and the raising of crops by the transplantation of seedlings is resorted to instead. As the prices of seed and of bulbs are ever fluctuating in the market, it is not possible to give exactly the excess amount needed to purchase bulbs, when these are used as the propagating material, over the cost of the nursery required for the same area when transplantation is adopted. This difference within ordinary limits will clearly be about Rs. 10 to Rs. 15 per acre. Even when there is no difference, the advantages are all on the side of the transplanted crop. As in most crops and so with the onion, the size and quality of the produce are improved by transplantation: and the degree of disease resistance from insects, fungi and bacteria is much the greater when such a system is adopted.

EXTRACTS.

The Rice Problem in the Pacific Countries.

The question to be dealt with in this article is one of special interest at present on account of the coming Fourth Pacific Science Congress which will be held at Bandoeng (Java) from 16 to 25 May 1929. It relates to the production and consumption of rice in the Pacific countries. The problem of the food supply in rice of these countries has undoubtedly become of the greatest interest in the course of the last few years and particularly in regard to questions of production and trade. This article may serve as in some sort an introduction to further and more exhaustive investigation.

The countries and colonies forming the subject of our enquiry are the following :

1. In *America* : the United States of America, Guatemala, Costa Rica, San Salvador, Panama, Honduras, Nicaragua, Columbia, Ecuador, Peru and Chile.

2. In *Asia* (i) : Kwang Tung, China, Hong-Kong, Macao, Corea, Formosa, the Philippines, Japan, Brunei, Sarawak, the Dutch Indies.

3. In *Oceania* : New Guinea, Papua, Queensland, New South Wales, Fiji, Hawaii, Guam, Marianne Islands, the Caroline Island, New Hebrides, New Caledonia, Samoa British Oceania and the French Establishment in Oceania.

There are many gaps in our information as to the production, consumption and trade in rice in these countries. Precise information exists only for the countries shown in the following tables. It is impossible to give figures in reference to Honduras, New Hebrides, Samoa, the caroline and Marshall Islands, New Guinea, Marianne Island and Guam. Such figures would however have but little importance, as in these countries there are in all only 1,200, 000 inhabitants and they are not large rice consumers.

(1) Siam and Indo-China are not counted as countries situated on the Pacific Ocean

Rice in the Asiatic countries.—In these countries rice is a food of prime necessity and consequently indispensable. This is shown from the fact that the average consumption per day and per person is 375 grammes for China, 470 grammes for Japan, 275 grammes for the Dutch Indies. In the following table the high production of these countries is shown. Unfortunately for want of precise documentation this table cannot be made to include all the Asiatic countries situated on the Pacific.

It will be at once remarked that these statistics should be accepted with a certain reserve since they only refer to one period of a year and therefore cannot reflect the important fact of crop fluctuations. For example the figures for Japan, Java and the Philippines are extraordinarily high for this period 1927—28.

It will also be seen from the figures of production per hectare that the same crop conditions do not prevail in the different Asiatic countries and that cultivation is not developed to an equal degree in each. Although the averages relating to a series of years are not available, it is possible to gain an idea of the natural and technical conditions for rice cultivation. The yield per hectare, for instance, for British Borneo, indicates that there is scope for crop improvement. Rice is grown in this country in accordance with the customary cultivation methods of all the islands of the Archipelago, a small proportion without irrigation and the remainder on flooded rice fields. A special feature of the methods followed in these islands is that no fertilisers are applied. Soil regeneration has to be effected at the expense of the nutritive substances contained in the water of irrigation. Another feature of the rice growing in the flooded rice fields is the transplanting of young plants from special seed beds. Speaking generally intensive work is given to the wet rice fields involving a considerable supply of labour. On the other hand the dry cultivation is frequently primitive and the lands when exhausted are left fallow for several years. In 1927—28 there was an excess of rice imports into British Borneo of 460,998 quintals. Hence it appears that this country cannot feed its population from its own production.

TABLE I.

| | Population. | Period. | Hectares under crop. | Production quintals. | Yield per ha. quintals. | Kg. produced per person. |
|----------------|-----------------|---------|-------------------------|-------------------------|-------------------------------|--------------------------------|
| British Borneo | 298,0000 | 1927-28 | 28,959 | 454,997 | 15.7 | 150 |
| Corea | 19,015,526 | 1927-28 | 1,558,998 | 31,282,961 | 19.7 | 160 |
| Formosa | 3,934,810 | 1927-28 | 585,040 | 12,511,630 | 21.4 | 320 |
| Philippines | ... 11,583,000 | 1926-27 | 1,807,060 | 21,776,630 | 1.11 | 190 |
| Dutch Indies | 51,511,688 | 1927-28 | 3,542,616 | 54,489,000 | 15.4 | 100.5 |
| Japan | 60,521,600 | 1927-28 | 3,147,244 | 112,302,611 | 35.7 | 180 |
| Kwang Tung | 1,089,678 | 1927-28 | 2,647 | 17,803 | 6.7 | 1.5 |

In the Dutch Indies, the native agriculture is based on rice. The same methods of cultivation prevail as in British Borneo, *viz.*, irrigated and non-irrigated fields. In the first class are included: rice fields that can be flooded at will, those that depend on the rainfall, and those situated on marshy ground. Only in certain localities is there a systematic use of fertilisers; as a rule no fertilisation is attempted and a large quantity of organic matter which might be highly fertilising is completely wasted. In comparison with Japan and Hawaii the yields per hectare are lower. In the Dutch Indies the costs of rice growing should not be high and the cultivation is so far extensive, but on the other hand if the quantity of labour applied is considered it is intensive. As in Borneo improvements in cultivation are required. Among these the principal are: 1. the systematic utilisation of fertilisers both natural and artificial; 2. selection of productive varieties; 3. use of improved implements. There are however a number of factors militating against the improvement of native agriculture the chief one being that the cultivators own only very small plots, the average area not exceeding 0.75 hectares for irrigated rice, and consequently their economic position is precarious. In 1927-28 this colony had to import 968,603 quintals of rice.

The cultivation of rice in the Philippines does not present any special feature as compared with its cultivation in other Asiatic countries. The great extension of dry cultivation may however be noted due to the low crop yields. In many of the islands the cultivation is still extensive, but an adequate yield per person is assured. There is a small excess of imports *viz.*, 121,648 quintals in 1927-28.

As regards China, no sufficient data exist on rice cultivation, production and yield. All that is known is the total excess of imports which in 1927-28 amounted to more than 11,000,000 quintals of cleaned rice. Generally speaking, Chinese methods of cultivation resemble Japanese. Farms are small, but absorb considerable labour; fertilisers, especially organic, are largely employed. Kwang Tung, Hong-kong and Macao, though of little importance agriculturally, have rice fields of the Chinese type, and import large quantities of cleaned rice, more than 150,000 quintals

being imported by Kwang Tung in 1927—28. A considerable quantity of rice is used by the Chinese in the manufacture of alcoholic drinks (brem, samsan, arak).

In Japan, including Formosa and Corea, rice cultivation is much more developed than in the islands of the Archipelago, and nearly as much as in China. As throughout the Far East, labour is very freely applied, but in Japan large capital expenditure is also made on the crop. Systematic use is made of artificial and natural fertilisers for regeneration of the rice fields, and in consequence the average yields per hectare are very high (see Table I). The yields are lower in Formosa and Corea as the methods of cultivation are more backward. The high yields of Japan are not entirely due to sound methods of cultivation but also to the effect of a subtropical climate with summer rains which are especially favourable. Japanese rice growing presents no other special features and is as elsewhere an intensive cultivation with nurseries and transplanting. Most of the varieties of rice cultivated in Japan are distinguished by their short straw and their high yield. In spite of these satisfactory good conditions, Japanese rice growing is not adequate to meet the consumption demands of the country and the export to the colonies. Moreover large quantities exported from Formosa and Corea into Japan—respectively four and seven and a half million quintals in 1927—28—have not proved sufficient and it has been necessary to import a total of 17 millions of (cleaned) rice. These very large rice requirements are due to the large demand of the manufacture of saké, an alcoholic beverage made from rice residues, of which about 6,820,000, 000 litres are manufactured annually.

Since 1928 the zone of rice production has been pushed considerably further to the north. In the north-east of Asia rice cultivation has advanced to Lat. 51° N. as the result in the first instance of Corean enterprise. In 1927 there were in Manchuria alone more than 15,000 hectares of ricefields to the north of Lat. 44° N., and in the Russian Far East more than 25,000 hectares. The average yield is more than 3,200 kg. of paddy or rough rice per hectare. Estimates for the future development amount to an area of 4,000,000 hectares in ricefields.

TABLE II

| | Population. | Period. | Area under crop (ha.). | Production (quintals). | Yield per ha. | Kg. produced per ha. |
|---------------|-------------|---------|---------------------------|---------------------------|------------------|----------------------------|
| Colombia | | 1926-27 | 17,850 | 159,330 | 8.6. | 1.9 |
| Costa Rica | ... | 1925-26 | 7,059 | 41,507 | 5.9 | 9 |
| United States | ... | 1927-28 | 400,238 | 8,211,952 | 20.5 | 7 |
| Guatemala | | 1927-28 | 1,550 | 15,198 | 9.8 | 0.07 |
| Mexico | | 1927-28 | 45,031 | 695,958 | 15.5 | 4 |
| San Salvador | | 1924-25 | 5,200 | 100,000 | 19.2 | 6 |
| Peru | | 1926-27 | 26,175 | 397,870 | 15.2 | 8 |

Rice in the American countries.— In none of the American countries under review here does rice occupy an important place either as a food or as an industrial product. The figures of average consumption are in fact very low: in the United States, for example, they are 10 g. per day per person. In these countries rice growing is looked upon as a useful element in rotation of crops rather than as a crop of first importance as in the Asiatic countries. In Table II the figures are given which relate to rice growing in the American countries on the Pacific.

The small importance of rice growing in these countries is easily seen from this table. Although the average quantity per inhabitant is very small, it is in excess of the needs and the United States, Mexico, and even Ecuador (which does not appear on this table) are rice exporting countries: in 1927–28 they exported respectively 881,713; 98,473 and 3,043 quintals of cleaned rice.

The American countries situated on the Pacific having an excess of imports are shown in the following table.

TABLE III.

| | Period. | Excess of imports | Kg. imported per person. |
|------------------|----------|-------------------|--------------------------|
| Costa Rica | ... 1925 | 21,034 | 0.4 |
| Colombia | ... 1925 | 185,600 | 2.3 |
| Chile | ... 1927 | 194,197 | 7.8 |
| Guatemala | ... 1927 | 4,158 | 0.2 |
| Nicaragua | ... 1926 | 13,914 | 1.9 |
| Panama | ... 1924 | 54,503 | 12 |
| Do. (canal zone) | ... 1927 | 13,096 | |
| Peru | ... 2926 | 314,985 | 6 |

Motoculture is applied to rice growing in the United States both for cultivation and for harvesting and in spite of the improved machinery utilised it is noticeable that the yield is somewhat low. Rice is in fact a plant which demands more attention and exactitude in its cultivation than can be supplied by the automatic working of machinery. In the other countries the methods of cultivation

are generally still somewhat primitive. The total production in the American countries under review is considerable if compared with that of the Asiatic countries, and amounts to about 10,000,000 quintals.

Rice in Oceania.—It is only within comparatively recent years that rice has been consumed in Oceania, and in consequence it has not yet reached the stage of a crop of the first rank. It may however be said that the use of rice is increasing every day in these islands in close relation with the development of agriculture in Oceania and its participation in world markets. As the native populations give up their earlier habits of eating tapioca, sago and millet, they take to rice. The trade in copra which is exchanged for rice also tends to encourage the consumption.

TABLE IV.

| | Popula- tion. | Period. | Area under crop ha. | Total pro- duction (quintals) | Yield per ha. | Kg. pro- duced per person. |
|---------------|------------------|---------|---------------------------|-------------------------------------|------------------|----------------------------------|
| Australia | 6,110,514 | 1926-27 | 1,605 | 58,476 | 36.4 | 0.9 |
| Fiji | 171,644 | 1925-26 | 3,936 | 85,104 | 21.6 | 50 |
| Hawaii | 328,444 | „ | 2,300 | 134,002 | 58.3 | 40 |
| New Caledonia | 53,000 | 1927-28 | 400 | 2,000 | 5 | 3.7 |

The principal data relating to the cultivation of rice in Oceania are shown in the table below.

TABLE V.

| | Period | Excess of imports (quintals.) | Kg. per person imported. |
|-----------------------|-----------|-------------------------------------|--------------------------------|
| Australia | 1927 | 171,638 | 28 |
| French Establishments | „ | 11,393 | 32.5 |
| Fiji | 1926 | 24,060 | 14 |
| Hawaii | 1927 | 309,136 | 96 |
| New Caledonia | „ | 18,493 | 34.9 |
| New Zealand | „ | 36,114 | 2.5 |
| Papua | „ | 22,348 | 9 |

From Table IV it will be seen that there is only a very small production of rice in Occania; it does not in fact exceed 280,000 quintals, the greater part being grown in Hawaii and Fiji Is. In the same way, Table V shows that the excess of imports is very small, about 600,000 quintals. Owing to excellent natural conditions and improved methods of cultivation the yields in Hawaii are high, more so even than in Australia where however the methods of cultivation are also of an improved type.

The trade balance of rice in the countries round the Pacific.—To show the balance between the production and consumption of rice, it is clear that figures are necessary showing the averages over a number of years, as the yearly figures are subject to considerable fluctuations following the natural conditions and the population requirements, which are constantly changing. With tropical peoples consumption will vary extraordinarily in accordance with possibilities of supply, much more so than with the populations of temperate countries. For this reason it is difficult to form a precise idea of the fluctuations which may occur in the consumption of the Pacific Asiatic countries.

So far it has only been possible to obtain a very few of these figures and accordingly a completely accurate balance cannot yet be established. Very careful investigation must be made on the subject in many of the Pacific countries with a view to thorough documentation. From the above tables however it is clear that it is only for the Asiatic countries on the West Coast of the Pacific that the question of rice is one of really great importance, and it is the more important because these countries are among the most populous in the world. Attention must however be given to consumption in other countries where the use of rice as a food, even though secondary, is on the increase. Moreover in these same countries the industrial uses of rice and its utilisation as a stock feed are increasing, and this is also the case in the islands of Oceania which have only lately entered modern life.

From the previous tables it can be shown that the total excess of imports into American countries for the

period 1927-28 was about 800,000 quintals, while the exports (from the three exporting countries) amounted to rather more than 900,000 quintals. This indicates that in these countries there will be no difficulty as regards the rice supply, the less so as these regions can obtain their rice also from other countries than those of the Pacific.

Oceania requires 600,000 quintals and the Asiatic countries on the Pacific coasts require about 30,000,000 quintals, of which Formosa can supply 3,000,000 and Corea 7,500,000 quintals. The 20 millions remaining have to be supplied by the three great rice exporting countries, Burma, Siam and Indochina, and 40 per cent of the production of these countries is used to meet these requirements. In the Far East the only exporting countries are Formosa and Corea. As has just been said Japan draws its supplies from them, and is obliged also to apply to California. It must not be forgotten that Japan exports a little to its own colonies, the Marianne Islands, Marshall Islands.

Although the production of Japan and her colonies is regularly increasing the rice imports of those countries are also steadily growing. In 1928-29, however, owing to exceptionally large crops, the situation has abruptly changed and the supplies within the country are in excess of requirements, and hence the Japanese Government has decided temporarily to prohibit all importation except from the colonies.

The Dutch Indies imported from India and also from Siam and India—China, to a total of more than 1,000,000 quintals in 1927. The Philippines draw their supplies of rice mainly from Indo-China, and a little from other sources. China imports from Indo-China more than half its rice. The ports of Hong-Kong and Singapore receive more than 3 million quintals from Indo-China, re-exporting a large proportion of imports.

On the whole it may be said that Japan and China depend on rice exports coming from countries not on the Pacific; of the two China is more dependent having to import more than 11,000,000 quintals from such sources.

If it is desired to establish a balance of rice in the future, attention must be given to the regions of Manchuria and of the Russian Far East where Koreans and Russians are devoting themselves with so much success to rice cultivation. There is little doubt that these regions are likely to become very important new exporting areas for the Asiatic countries of the Pacific.

Crop fluctuations and Losses.—In establishing a rice balance the extensive crop fluctuations must be shown which occur periodically from time to time. Rice more than any other cereal, is subject to good and bad seasons. Among the chief causes are; drought, floods, attacks of pests, root diseases etc. These disasters are in part the result of atmospheric conditions, but their gravity varies according to the greater or less degree of improved technique in the cultivation. Such periodic crop failures have a great influence on consumption, imports, exports and prices of rice. It is these fluctuations which give rise to the speculation which is so prejudicial to a well balanced trade. Systematic returns of all the diseases and other disasters which visit the Pacific rice crops are not yet made for all countries.

In reviewing a rice balance account must be taken of the losses due to the commercial preparation which is not uniform in all countries or even in all parts of the same country. On an average it may be said that 100 kg. of "paddy" or rough rice will give from 65 to 80 kg. of cleaned rice. The margin between the two figures depends on the cleaning process. When rice is prepared for home consumption the losses of nutritive substances are less than in the other case. Importations of rice may be reduced by a better preparation which avoids losses of nutritive substances.

Improvements.—The question of rice in the Pacific—and especially in the Asiatic countries of the region—will not be serious so long as that region can draw supplies from other parts and there is in consequence no food shortage. But certain difficulties are to be anticipated; as the economic conditions of the great exporting countries im-

prove there will be more home demand for rice which will progressively reduce their exporting capacity to the Far East. Certain political difficulties are also to be feared which might hinder regular export. China would be the first to suffer from any check on exports.

What means must be found to prevent the aggravation of the problem? It does not seem very possible to replace rice by other foods; it might be done, but it would only be an expedient for a time. The alternative is to increase the annual average production per head of inhabitants. This may be attained in two ways: by an extension of the areas under rice and by an increase of the yield per hectare. Certain States have taken measures for extending their rice-growing areas. For example in the Philippines immense areas are being divided into lots and granted for the purpose of rice growing. New land is however not always available and it is the second method which must call for attention. Improvement of yields can be effected either by the application of better methods of cultivation or by the selection of more productive varieties. In certain Asiatic countries the rice cultivation is already highly improved and a higher degree of cultivation should not be contemplated as there is a risk of exceeding economic possibilities. Even if this improvement was possible, speaking from the economic point of view, it would be essential to ascertain whether the additional production would suffice to feed the additional labour required, and whether the final result might not be a reduction in the average yield per person. As regards dry cultivation it is still more improbable that improvements could be economic. In certain countries such as Guatemala, Costa Rica and Colombia, cultivation methods stand in need of improvement, but for most of the others it appears to be uneconomic to make the attempts.

The same however does not hold good in regard to the systematic employment of fertilisers; in China and Japan they are already extensively used and the other countries would undoubtedly derive great advantage from their application to the rice fields. If there is a shortage of the natural organic manures, recourse should be had to artificial fertiliser.

The remaining type of improvement, the newest and least often adopted, but the most important is the selection of varieties. Up to the present a considerable number of varieties have been cultivated in the Far East, and as many as 6,000 in Indo-China alone. The number is not really so large as it would appear, since the same variety is frequently designated by many different names. Even taking this fact into account however it may be said that the native cultivators grow several hundred varieties, not all of which are of value whether from the point of view of yields or resistance to disease or from that of commercial value.

Moreover in all the dry regions quite inferior varieties are grown. It would seem that it is essential to limit cultivation to certain varieties which have been thoroughly studied and are well known universally if a good commercial product is to be obtained, responding well and completely adapted to climatic conditions. Where rice growing is not an old cultivation this has been clearly understood and in these countries, e. g., Java and many American countries, only certain well chosen varieties either Chinese or Japanese are always found.

It must be admitted that there is very little progress in improvements in strain although a certain number of experimental stations are already at distributing improved seeds to a large number of small cultivators in the Asiatic countries, but with little result so far.

It has not yet proved possible to find a really practical classification of the different strains, although there can be no selection without such classification. Among all the proposed classifications there is not one which is based on definite characters which remain constant. Thus for example without any good grounds a distinction is made between mountain and plain rice. But there is really no true distinction known between them. Varietal improvement can only be real and effective if a solid basis with due safeguards against future departures from type is successfully given to the section of strains.-(A.J.K. in the International Review of Agriculture Part II. February 1929).

Mosquito Control in England.

BY SIR GEORGE MAXWELL, K. B. E., C. M. G.

Mosquitoes nowadays are amongst the plagues of an English Summer. Except in two or three places, nothing is done to control them; and this is the more remarkable because so much is done with conspicuous success in other countries. An account of what might be done in any of our towns or suburbs may be of interest. The first step is to obtain a systematic and scientific record of the different species of mosquito found in the locality, and of their breeding grounds. Of twentyfive species found in the United Kingdom, some are rare, and only seven are really important from a "nuisance point of view". One breeds exclusively in holes in trees; another breeds in woodland pools, especially in pinewoods; another lays its eggs most frequently in water-barrels, tanks, and empty tins; another selects the shallow margins of weedy waters; another breeds in stagnant salt water; another in fresh, saltish or salt water; and the seventh breeds in swamps and ditches, and often in abominably foul water.

Until a mosquito has been identified, one does not know where to look for its breeding places. Two instances of this will suffice. At a children's Hospital, which was opened a few years ago for "open air" treatment, it was found that the children were so bitten out-of-doors that the cure could not be carried out. The hospital authorities screened all the water-butts and garden tanks with no effect. At last they sought expert advice. The mosquito was identified, with the immediate result that a pine-wood, hitherto unsuspected, was searched for breeding grounds. Several small ponds, all swarming with mosquito larvae, were found. They were filled in, and since then the children have had the open-air treatment, by night as well as by day, without further annoyance. In the second instance, a large Government institution on the south coast was suddenly infested with myriads of mosquitoes. The authorities examined all the fresh water within miles, but found nothing. Eventually, on expert advice, the mosquito was identified, with the result that stagnant salt water close to the building was searched, and found to be literally alive with larvae. It was put under control, and the nuisance thereupon abated.

When the mosquito is identified, its range of flight is known. It varies from only a few hundred yards for one species to three miles for another.

In America, where they have a far-flying mosquito, some municipal authorities control their nuisance by treating breeding-grounds twenty miles away from the town. Fortunately, we have not that difficulty.

In England, the first step to be taken by any municipal authority desiring to control mosquitoes systematically, is to have a 'Mosquito Survey'. It is an easy matter, and in many countries is carried out on a large scale. The whole of Singapore Island, for instance, covering 217 square miles, has been completely and minutely 'surveyed' for mosquitoes. In an ordinary English town, the Health Officer or Chief Sanitary Inspector would be appointed an officer in charge, Mosquito Survey. He would collect a staff of perhaps a dozen assistants, of whom many would be unpaid volunteers, and would allot a subdivision of the area to each. After a short course of instruction in identifying adult and larval mosquitoes and in keeping the necessary 'Registers' and after some practical field demonstration, the party is able to locate and examine all mosquito breeding-grounds, to record all necessary information relating to them, and to register the capture of adult and larval mosquitoes. If adult mosquitoes of the three-miles-range-of-flight species are found in any place it is necessary for the 'Survey' (and later for the 'Control') to cover a three-miles radius from that place. It is unnecessary to go into the details of the methods of survey. They will be found in many health journals, especially those published in America. Let it suffice to say that what is done in America, on the Continent, and in many British Colonies, as a matter of ordinary routine, can be done in England.

Armed with the information derived from the Survey, the municipal authority is able to prepare its schemes for the control of the various breeding-grounds. Frequently, of course, it may happen that investigation shows that the cost of remedial measures over an extensive swamp would be prohibitive. Even when this is the unfortunate result, the Mosquito Survey has not been wasted; the facts of the case, hitherto unknown, have been ascertained,

The Control operations take the form of filling, draining, oiling, and larviciding. Filling is generally expensive, and can be recommended only in respect of small areas. The cost and difficulty of draining depend entirely on local circumstances. Both filling and draining are in the nature of 'radical cures'; and afterwards maintenance, though essential, should be easy. Instead of filling in a swamp it is sometimes more convenient, and generally much cheaper, to convert it into comparatively high ground by the simple expedient of digging a pond in it, and spreading the excavated earth over the surface of the surrounding ground. An artificial pond with clean-cut edges, is easily oiled or larvicided. In Siam, many of the gardens in the European residential area around Bangkok have in this way been literally raised up from swamp rice-fields. The ponds are of ornamental shape, and are filled with water-lilies or lotuses; and the new-comer who expresses surprise at so many gardens having ponds is informed that, but for the pond, there would have been no garden, and that the soil for the tennis court was found by digging the pond a little deeper. In connection with any drainage scheme it is worth while to mention the increase to the value of the property. In the suburbs of Kuala Lumpur, the Federal capital of the Federated Malay States, drainage operations introduced solely for reasons of malarial control have resulted in wide areas of swamp being converted into building sites. In England, measures of mosquito control might provide, in many places, ground suitable for playing fields or for allotments.

Drainage completely alters the growing power of soil. Clover, for instance, which will not grow on wet or water-logged soil, grows freely on it when it is drained. There was recently some interesting correspondence on a supposed connection between mosquitoes and malaria. Sir William Willcocks has suggested, in connection with engineering schemes, that the profusion of clover-fields in the Delta of Egypt was saving the country from the malaria-carrying mosquito to which Palestine, undrained and unirrigated, was a victim. Sir Ronald Ross, on the other hand, could not understand why the presence of clover should prevent the mosquito from carrying malaria. My own suggestion

is that with the introduction of drainage into the Egyptian Delta the clover came in and the mosquitoes went out simultaneously and for the same reason.

Oiling and larviciding, which are the methods commonly employed in mosquito control, represent an annual expenditure which never diminishes. The oil floats on the top of the water, making a very thin film, which kills the mosquito larvae by preventing it from coming up to the surface to breathe. A larvicide is distributed fairly equally through the cubic contents of the water, and poisons the larvae. In deep water, therefore, oil is the more economical. Its disadvantages are that in strong winds it is blown to the lee side of the pond or swamp, and that in weedy water it is not equally distributed. A larvicide must be cheap, and water treated with it must be harmless to human beings or animals. At Hayling Island a preparation containing 20 percent of soluble cresol is used. A gallon costs six shillings (less, when bought in quantities), and will kill all the larvae in 28,000 gallons of water.

An example of what could be, but is not, done in so many English towns and suburbs is to be found at Hayling Island. At this well-known seaside resort the mosquito nuisance, which had increased year after year, became in 1910 so intolerable that the local residents were compelled to take action. A public meeting was called, and an association, which later developed into the British Mosquito Control Institute, was formed. For some years past the institute has kept the mosquito nuisance under complete control inside a radius of one and a half miles. Every possible breeding-ground inside this area is known, and regularly larvicided throughout the breeding season. I am informed by my friend, Mr. J. F. Marshall, the Director of the Institute, that the cost of the control (exclusive of office expenses) is now about £200 a year, and that the area under control is about six square miles.

Larviciding and oiling, which obviously are useful only when larvae are actually present in the water, may begin as early as the end of February with one species, and not until June with another. The eggs of most species first hatch out in March or April. One species generally

has one brood of eggs only; some species have two broods, or perhaps three; and others breed from spring until autumn. September, or sometimes October, sees the last of the larval mosquitoes. All the adults of some species die off with the short cold days of early winter, and the next generation spends the winter in the egg stage. One species lays its eggs on the stems of rushes and grasses in dried-up hollows, and trusts to these hollows being submerged in the water in which the eggs will hatch in due course. Adhering to the dry stalks, these eggs retain their vitality for two years or even longer. In some species all the males die off as winter approaches, and the females hibernate in warm dark places such as cellars and corners of kitchens and stables. The curiously diverse breeding-grounds have already been mentioned. This very brief account of breeding times and habits may serve to indicate how necessary it is identify the species before starting upon any systematic scheme of control by larviciding.

In a large municipal area any considerable swamp or any extensive system of open drains should be regarded as a separate 'Scheme Area'. Each should have its own working plan, setting forth.

- (a) A map of the area, with the breeding-grounds marked on it;
- (b) The nature of the work to be undertaken (i. e., filling, draining, oiling, or larviciding);
- (c) The initial expenditure (if any) on capital account;
- (e) The average cost per acre; and
- (f) The arrangement for defraying the cost.

Where mosquitoes are present in such numbers as to become a 'nuisance', the liability for taking action is on the proprietor of the land on which they breed. This is established by Section 91 of the Public Health Act, 1875, which, in the definition of a 'nuisance', includes "any pool, gutter, watercourses, sink, cistern, cess-pool, or drain so foul or in such a state or so situated as to

be a nuisance or injurious or dangerous to health." Under Section 92 of the Act, a definite duty is imposed on every local authority to cause to be made from time to time of inspection of its district to ascertain what nuisances call for abatement, and to enforce the provisions of the Act in order to abate them. The only court case of which I am aware was one in 1927 under a corresponding section of the Scottish Act. Certain ditches were in close proximity to a residential suburb of Glasgow, and it was proved in the Sheriff's court that in them mosquitoes breed in large numbers. The learned Sheriff found that the "bites of the said mosquitoes caused pain and swelling, occasioning in some cases temporary incapacity, and followed in some cases by septic sores, and that their presence caused reasonable apprehension and diminution of comfort in the community." The proprietor of the property was ordered by the court to clear the ditches of the silt and the vegetable growth, and thus to remove the nuisance from mosquitoes to which such conditions gave rise.

There seems, therefore, no doubt regarding the liability of the proprietor under one section and the duty of the local authority under the other. It is manifestly, therefore, a case for combination and co-operation.

Any 'Scheme Area' in respect of ground of any extent near any town or suburb will almost certainly affect a number of land proprietors; and, whether they be few or many, it is clearly essential that they should co-operate. Any action by one proprietor, so long as no action is taken by his neighbour, is obviously a mere futility if the same swamp or ditch is covered by both properties. It is suggested that if any local authority is satisfied that *prima facie* case has been made out for a 'Scheme Area,' a typed or printed memorandum should be prepared to set forth the facts established by the Mosquito Survey; the detailed proposals relative to the scope and estimated cost of the Mosquito Control in the Scheme Area under contemplation; and suggested allocation of the cost between the proprietors. In many cases the local authority, in order to gain a ready response, would be well-advised to offer to give, free of cost, the services of its own staff for the supervision of the work,

and to bear the entire cost of any office expenses connected therewith. An officer should then be deputed to interview the proprietors. He would inform each proprietor that the local authority was satisfied that there was a *prima facie* case, and that, having prepared a constructive scheme for dealing with it, it desired to have the views of the proprietors concerned regarding the merits of the scheme. Whilst the officer would refer to the duty imposed on the local authority by the law, he would make it absolutely clear to each proprietor that his instructions went no further than to ask for criticisms, and, if possible, to obtain a promise of support of the scheme, if it had the support of the other proprietors. If the case were well and tactfully put, there would seem to be no reason why favourable replies should not be received. Possibly alterations to the scheme would be suggested by certain proprietors, and would lead to an improved or modified scheme; but, somehow or other, the probabilities would seem to be in favour of something being done, with the practical certainty of the result being not only advantageous to the proprietors and the local authority, but most beneficial to the community affected by the 'Scheme Area' In this article I have designedly laid stress upon the logical sequence of systematised action, leading up from the Mosquito Survey to the Mosquito Control, and thence to localised action in Scheme Areas. In doing so, I may have given the impression that it is inadvisable for an individual proprietor to take any action in respect of his own property until a long series of facts have been established. I would like to correct that impression. Any one who finds mosquitoes breeding near his house can be assured that he can add materially, and sometimes immeasurably, to his comfort by exterminating the breeding-grounds without worrying about a mosquito survey of his neighbourhood.

A municipal authority is in an entirely different position. It has to deal with a large area and many proprietors and interests. It must satisfy every one concerned that all the facts have been ascertained and studied. In any public scheme, therefore, a Mosquito Control must always be preceded by a Mosquito Survey.

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(R. D. A.)

The Reform of Indian Land Tenure.—(Continued)

BY RADHA KAMAL MUKERJEE, LUCKNOW
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The status and rights of the tenants on the permanently and temporarily settled estates should gradually approximate to those of the ryotwari cultivators. A permanent and heritable right of use and occupancy of land will gradually accrue, either by continuous occupation for 12 years combined with regular payment of rent, or by a specific grant of the State as in the case of the Central Provinces cultivator. Such a permanent right was enjoyed by the cultivator under time-honoured customs in India. The present condition of agriculture demands, however, a modification of the occupancy status in one or two directions. Undercultivation and misuse of the land are too common in the case of permanent tenure-holders and occupancy tenants who are entrenched within their own rights; and cases are also frequent where landlords, desirous of making a permanent improvement of the land, cannot undertake such a measure on account of the ignorance or perversity of the tenant, who refuses to recognise such an improvement and pay an enhanced rent for it. In the interests of scientific agriculture, the occupancy system should be altered so that the tenant may not acquire a permanent heritable right to neglect and impoverish the soil. Perhaps the recent share tenancy agreements of Italy, which defines the duties of both landlords and tenants might be helpful in prescribing the conditions of permanent tenure. The agricultural drawbacks of a system in which the legally protected peasant becomes a mere rent-receiver, are also obvious. At present the occupancy status can be enjoyed only by one person in a long chain of sub-infeudation. We have seen already that the right frequently passes into the hands of a person other than the cultivating tenant resulting in friction and economic wastage. The framers of the Bengal Act of 1885 contemplated the ryot to be a person who would actually till the soil. They laid down that there should be one grade of ryot, the genuine cultivator. Measures were devised to discourage subletting by ryots, but these have failed in their object. As a result of the license given for subinfeudation, there is a great danger of the extinction of all occupancy privileges

with the genuine ryot class. The so-called ryots have been converted virtually into middlemen and the actual cultivators into underrryots without any security, almost into tenants-at-will in the eyes of the law as it now stands. The practice of subletting and subinfeudation has grown considerably, not merely in Bengal but also in all zamindari provinces, in spite of various restrictions imposed upon this practice. The capture of occupancy privileges by the middle and money-lending classes and the lowering of the status of the peasantry now have social as well as political significance. The situation can only be remedied by more thorough-going measures for the prevention of subletting and by the recognition of the inferior class of underrryots and agricultural partners as occupancy tenants with all the privileges belonging to them. Occupancy rights thus should accrue to several grades of tenants simultaneously. An excellent precedent is afforded by the Central Provinces Tenancy Act.

Restriction Of Lease, Mortgage And Sale:—One of the chief causes of agrarian complication has been a policy of drift with regard to the transfer of protected tenant right. Unrestricted transfer is a newly acquired right imported from the West and is entirely opposed to ancient tradition and custom. On the permanently and temporarily settled estates, the privilege of the landlord to refuse his consent to transfer and withhold recognition of the incoming cultivator's status has encouraged illegitimate exactions as well as litigation. Such legal restriction as exists has contributed only to lower the money value and lessen the security of the protected tenant right. For example, while an arbitrary enhancement of rents is checked by the civil courts in Bengal and Bihar and the settlement operation in Agra, Oudh and the Central Provinces, the landlord has everywhere sought to defeat the tenancy law by allowing rents to continue at a low figure and to exact premiums on new leases of surrendered holdings or on the leasing of the land for the first time. Such premiums represent capitalised rent, and the opportunity of premium-hunting varies with the privileges of the landlord. Thus a periodical tenancy or the right of the landlord to refuse transfer or lease has been accompanied by the practice of levying illegal, exactions. This practice is now well-nigh universal but has

grown with the new protective tenancy legislation. On the other hand free transfer has led to agricultural unsettlement in the Deccan, Punjab Chota Nagpur and the Central Provinces. As long back as 1879, the Deccan Agriculturists Relief Act was passed to cope with agrarian discontent in 4 Deccan districts—Poona, Satara, Sholapur and Ahmadnagar. The Act provided for the appointment of a special judge and numerous councillors who were empowered to investigate mortgages and similar alienations of land, to revise the terms of contract and to arrange for an equitable settlement of claims with a view to restore the original rights of the occupants. The greater part of the Act was extended to the remainder of the Presidency in 1905. Reports indicate that the Act has had the desired effect of protecting the revenue-paying classes from the encroachment of non-agriculturists and that although it had restricted credit, it has not done so to the extent of hampering agricultural operations. The Bombay Land Revenue Code Amendment Act of 1901 created a special tenure known as the restricted or non-transferable tenure. Under this Act the Collector is authorised to grant the occupancy of lands to limited periods or on such conditions as he may think necessary, the principle of these being that the occupant cannot alienate his land without the previous permission of the Collector. The conditions of the non-alieable tenure are designed to meet the circumstances of the wild tribes, the depressed castes and other classes of cultivators who are known to be backward or improvident. The Panjab Land Alienation Act, the Central Provinces and Chota Nagpur Tenancy Acts all seek to check the serious evil arising from the transfer of the land from the agriculturist to the money-lending and professional classes. In the Panjab Agriculturist money-lenders however have grown in proportion and the Act has not served its entire purpose. The measure has been extremely popular among the agriculturists and unpopular amongst others. In the Central Provinces, occupancy right can be transferred to certain heirs only. Transfer to others requires the *malaguzar's* consent, and if made without such consent is voidable. It can also be annulled through the Deputy Commissioner on application by the heirs of the transferring tenant. Though sublet-

ting for a year is permitted occupancy tenancies cannot be mortgaged. Both in the Central Provinces and Chota Nagpur the Act in the main has succeeded though there has been some contraction on the cultivator's credit. In the new agrarian legislation which has created small family holdings in Central and Eastern Europe, sale or transfer has been restricted most rigidly. The law of Prussia makes state approval compulsory for transfer of real properties. In many cases in order to create a charge on the family holdings the consent of the State is necessary. Mortgages and land debts may only be entered in the form of debts repayable by instalments and not capable of being called in; the mortgage of land debt as a rule is discouraged or its amount limited by legislation. The grantee of the family holding may require the consent of the State to the entry of a right of Usufruct (tenancy), a land easement, a limited personal easement or a real encumbrance, when it is compatible with the rules of normal working and it does not diminish or impair essentially the effective character of the family holding. A limit of indebtedness may be entered for mortgages, land debts and land revenue encumbering the family holding. Distraint on the family holding in respect of a personal debt may be disallowed.

In Bombay the restricted or non-alienable tenure has already been created by the State. In the Central Provinces the subletting of land is prohibited as drastically as in the Russian Agrarian Code. The prohibition of mortgages containing a foreclosure clause is already a part of the Punjab Land Alienation Act. The Usurious Loans Act of 1917 and other measures have enabled the civil courts to go behind the contracts and mitigate the hardships of the indebted peasantry. In different provinces the transfer of the cultivator's holding is sought to be restricted to agriculturists of the same village. In Bengal as far back as 1880, the Rent Law Commission recommended that occupancy holding should not be mortgaged and that the right of occupancy though saleable in execution of a decree for its own rent should not be saleable in execution of any other decree.

Gradually but surely measures restricting transfer, mortgage and lease will be deemed necessary in every province if the small cultivating proprietor is not to give

place to a non-cultivating, rent-receiving and moneyed class. The distribution of land among the several classes, the character of the people, the facilities of credit to which the cultivators have access all these will determine both the form as well as the character of such restrictions. In the ryotwari tracts the legislation to protect small holdings by means of restrictions on lease and transfer and by agricultural loan grants and subsidies will be in keeping with the theory of State Landlordism. In a country inhabited by dense population economic adjustment can be brought about only by intense small farming. The State can assist a great deal through agricultural associations, credit banks and direct subsidies. But small farming cannot thrive unless and until we accept the principle that no one may own any greater area of land than he can cultivate by the labor of his own family. This is the dictate of agricultural economics to which we must listen if we wish to rescue our agriculture from its present stagnation.

Reform versus Revolution There is a growing recognition by means of varied political and economic predictions that changes in the Indian land system are imperative. The opinion has now spread to all classes of society. Under the pressure of an enormous population upon the land the holdings have come to be so small and fragmented that they can neither utilize the full labor of a family nor can support it even under the existing low standard of subsistence. At the same time the landlord has become a rent-receiver rather than a wealth-producer having ceased to play his old and honorable part in the agricultural combination. Today he neither supplies agricultural capital nor controls farming operations. Below him are developed a class of intermediaries who have profited from the complexities of the present land system and make the difficult position of the actual cultivator still more precarious. This is no criticism but a summary of the facts. The old system has broken down and it is imperative that a new system be created in its stead which is adapted to the present conditions and requirements of agricultural and social life. To delay the process of adaptation, whether from fear of angering "vested interests" or from apathy towards the unvocal classes, is to sow the seeds of drastic reform and it may be even of revolution.—(From Indian Jour. of Ecms. Jan.' 29).

Land Rights in Bengal.

BY I. C. GOSH.

During the debate on the Bengal Tenancy Amendment Bill of 1928, the Honorable Member in charge of the Bill (Sir P. C. Mitter) said:—"Rightly or wrongly, from 1793 onwards the zamindars have been the proprietors of the soil." And again "Today what is the legal position of the Zamindar and the Raiyat? In 1793 the Zamindar was made the proprietor of the soil." Anybody who reads the discussions on the Amendment Bill cannot but be surprised at the conflicting opinions expressed on this important and fundamental matter. It is desirable that the confusion of thought should be removed and we should have clear ideas about land rights in Bengal.

In English law, there cannot be any absolute property in land, in the sense in which it applies to other things. There can only be an ownership of an estate in the land, i.e., one can only enjoy the incidents of some definite interest in the land. But the term 'proprietor' has long been used in Indian Tenancy laws and whatever may be the legal implications of the term for practical purposes we may safely speak of 'proprietary interest in land' so far as Bengal is concerned, without giving rise to much confusion of thought. In this connection three classes stand out in Bengal; the State 'the Zamindars, independent Talukdars and other actual proprietors of land' with whom the permanent settlement was made and the Raiyats. The vast number of intermediary interests between the Zamindar and the Raiyat, that has grown up in Bengal also stand out as a separate class; but so far as their relation with the raiyats is concerned they may be treated on the same footing with the Zamindars as the landlord class.

For quite a long time the question has been discussed whether the State owns the land and with it the connected question whether land revenue is a tax or a rent. Eminent authorities have given their opinion that the State in India, in the early Hindu and Muhammadan days had no

pretensions of being proprietors of the soil, and that its right to the land revenue depend for its sanction on immemorial custom, which always had been a potent factor in the East. The extravagant claim of the State being the sole owner of the soil is a comparatively later growth and one of the results of the decline of the Mogul rule. Recently the Indian Taxation Enquiry committee thoroughly reviewed the historical and legal aspects of the question and came to the unanimous conclusion that "In the case of land under Permanent Settlement, the Government have now no proprietary right, and that as regards Khas Mahal estates and waste lands outside the permanently settled areas, they have full proprietorship."

One thing is clear. The right of the State to a share in the produce of the land is undisputed; and all land is in a manner hypothecated as security for land revenue. Apart from that it is now of little practical importance whether the state may technically be called proprietor of land or not. Hence the two main classes whose interests in land are to be considered are the landlords and the tenants.

The Permanent Settlement of Bengal (Regulation I of 1793) was the beginning of the systematic attempt to put property in land in Bengal, from a basis of law and contract. It declared that the Zamindars, independent Talukdars and other actual proprietors of land, with or on behalf of whom a settlement had been concluded with the Government and their heirs and legal successors will be allowed to hold their estates at the stipulated assessment for ever. The wording of this declaration has been a more fruitful source of confusion and misunderstanding as to the status of various parties that have an interest in land in Bengal than perhaps anything else.

In issuing instructions for the permanent settlement the Court of Directors had suggested that the settlement should be made with the landholders but at the same time maintaining the rights of all descriptions of persons. The Act of 1793 certainly put the zamindars on a definite legal basis as regards property in land. But the rights which the Government possessed and those possessed by the zamindars were admittedly not exhaustive of all interests in land.

The fact remains that many of the cultivators had been in possession of the soil from before and they did not owe their position to the zamindars who were now declared 'actual proprietors'. They had their rights in land created and recognised by the Common Law and Customs of the country. During the discussions which preceded the enactment of the Permanent Settlement, it was evident that the authorities were fully aware of these rights and of the necessity of protecting them. But in the regulations of 1793 no clear and definite laws were enacted defining the rights of the raiyats and having them adjusted once for all. The Government contented with reserving to itself the right to interfere in future. This omission is certainly to be accounted for by the extreme intricacy and difficulty of the subject and has been candidly expressed by Sir John Shore in the minute of 8th December, 1789 as follows:—

'The most cursory observation shows the situation of things in this country to be singularly confused. The relation of a zamindar to government and a raiyat to zamindar is neither that of a proprietor, nor a vassal, but a compound of both. The former performs acts of authority unconnected with proprietary rights the latter has rights without real property; and the property of the one and the rights of the other are in a great measure held at discretion; much time will I fear, elapse before we can establish a system perfectly consistent in all its parts. Nor am I ashamed to distrust my own knowledge since I have frequent proofs that new enquiries lead to new information. Perhaps, circumstances of the time justify the diffidence of Sir John Shore, and explain the inaction of Government, but it did not and could not take away the existing rights of the raiyats, As the late Mr. Justice Ameer Ali says: "Though the rights and obligations of the raiyats were not definitely ascertained and recorded before the conclusion of the Permanent Settlement, their rights were not altered or affected in any way by that settlement". The history of subsequent legislation in Bengal shows that this was recognised and acted up to by Government. In introducing the 'Tenancy Bill in 1885, the Hon'ble Mr. Illbert said in this connection":—It was said, that at the time of the permanent settlement and as part of the same agreement, a formal declaration was made declaring the property in the soil to be vested in the zamin-

dars. And throughout the regulation of 1793. which confirmed and gave effect to the Permanent Settlement, the zamindars are described as "proprietors" and actual proprietors" of land; and that this declaration and description are inconsistent with the notion of proprietary right in the land being vested in any other class of persons. As to the use of the term "proprietor" no serious argument can be based on it.

I have heard magic of the property, But I have never understood that there was any such magic in the phrase "proprietor" as to wipe out any rights qualifying those of the person to whom the phrase was applied and it would be especially difficult to show that it had any such effect in the regulations of 1793. In the next place the term was freely applied to the zamindars of Bengal and other persons of the same class, in regulations and other official documents of a date anterior to 1793 and therefore could not possibly be taken as indicating or to use a technical term connecting rights created at that date.

But the spirit of active legislation in settling the law of landlord and tenant in Bengal on a proper basis had not come on the government much too soon. In 1793 the only provision made was as regards the grant of *pattas* by the landlords, and the expression of pious hopes that the zamindars would act in the best interests of the tenants. Both the zamindars and the tenants were unwilling for their own reasons to have the *pattas*; and what is worse these were turned into instruments of oppression in a way which the framers of our early laws could never contemplate.

Soon after the settlement many zamindars were unable to discharge their liability to government and the latter in its turn became restive about the revenue. The necessity of putting its revenue on a secure basis had first set the government thinking about settlement and definition of land rights. The same necessity set it strengthening the hands of the landlords. Promises of safeguarding the rights of the raiyats were forgotten. Till 1859 the history of tenancy legislation in Bengal is the history of continuous absorption of the tenant-right by that of landlord-Of these, Regulation of 1799 is perhaps the most notorious and the most ruinous as to its effects.

The inevitable reaction came and Act X of 1859 was passed which had been well called "the first modern tenant law in Bengal." From that time onwards a sustained effort was made to improve the Tenancy Law in Bengal and the Great Tenancy Act was passed in 1885 which had been with slight alterations the law of landlord and tenant in the province till substantial changes were introduced by the Amendment Act of 1928.

A review of the present legal position of landlord and tenant as regards the most important attributes of proprietorship does not reveal the zamindars and other landlords as absolute proprietors of the soil. The most important incidence of proprietorship in land is the right to the economic rent as evolved by competition for land and this can only be secured by the power of the landlord to enhance the rent and eject the tenants at his will. In all these respects we find the essential elements of proprietorship lacking in the position of the Bengal landlord. There is nothing like competitive rent in Bengal. Rent has been defined by the Bengal Tenancy Act of 1885 as lawfully payable by the tenant to his landlord for the use or occupation of the land" And this amount being controlled by the provision of the Tenancy Act is far from being the economic rent as evolved by the process of natural competition. Some raiyats hold at rents or rates of rent fixed in perpetuity; and the rent of any tenant who has an actual or presumptive possession of his holding since the Permanent Settlement cannot be charged except on the ground of an alteration in the area of the holding. The rent of an occupancy-raiyat can be enhanced only up to $12\frac{1}{2}$ per cent. by contract and by suit in a court only under certain specific conditions fixed by law. As the law stands at present no tenant can be ejected except in execution of a decree and there can be no ejectment for non-payment of rent.

It is further important that the interest of a raiyat who holds at a fixed rate of rent is capable of being transferred or bequeathed in the same manner and to the same extent as any other immovable property, and by the recent Amendment Act of 1928 the interest of an occupancy-

raiyat has been made transferable on payment of a fixed landlord's fee.

Thus we find that the tenants in Bengal—at any rate the great majority of them, comprising those who hold at fixed rates and those who have occupancy rights—have substantive interest in their holdings originating in many cases in the customs of the country and not by any act of, or contract with the landlords and now recognised and protected by the existing law of Landlord and Tenant in the land. The correct view of land rights in Bengal is that the several classes have divided ownership in land; they own separate and distinct interests in it. More than 40 years ago, Baden-Powell wrote: "The actual right of the landlord as it now exists, is an estate in the soil ...limited by the rights of tenure-holders and raiyats.....and of course by the government's right to its revenue." This still remains the position today. Every holder in Bengal is of the nature of a firm of which the actual cultivator is the active and managing partner. He gives the landlord not the economic rent but, what is his due as a share in the profits of the transaction. And this is strictly regulated by law and the circumstances of each case.

(From Indian Journal of Economics. April 1926)

The Dutch East Indies.

There are two distinct types of agriculture followed, the native and the estate. While the former is essentially bound up, except in the case of native rubber, with the production of an adequate food supply, the latter's chief object is the growing of crops for export. Both types of agriculture have been thoroughly organised and their prosperity is undoubtedly due to the efficiency and smooth running of private and Government research and educational schemes.

In no tropical country has it been possible to obtain a perfect connection between the plants and the research worker, and the methods employed for attaining this object are liable to considerable variations. Where a primitive system of agriculture is followed and where the plantocracy is illiterate, most of the investigational work is done by the Government. "In more advanced countries the tendency has been for work which relates to peasant crops to be carried out by the Government while that which is related to plantation crops is being placed more and more into the hands of special technical assistants who may be employed by the Government or by the planting community.' In the still more advanced countries, estate interests and companies finance their own technical specialists and the Government are left mainly with the task of improving native agriculture. In this respect, the Dutch methods are especially advanced. For instance, the scope of their Agricultural Departments work in Java, is extremely wide. Forming part of what is known as the Department of Agriculture Commerce and Industry, it functions both as an experimental and administrative body. Its experimental section comprises a botanical garden, a general agricultural experiment station, veterinary and forest stations, and a phytopathological laboratory. The information gained by these experiment stations is distributed through their administrative services. Besides the Government Department are two other types of research organisations, of which one is devoted to research in special crops and is supported by syndicates of planters, and the other, which is

also devoted to scientific research is financed by individual companies. Amongst examples of the former there are the two Sugar Experiment Stations at Pasoereean and Cheribon, the Tea and Rubber Research Institutes at Buitenzorg and the Coffee Research Station at Malang in East Java. Among the latter may be mentioned the work of the research division of the staff of the Boenect Rubber Estate and the work of improving the yields of Oil palms and Hevea Rubber by the Societe Financiere Belge.

Pasoereean affords an interesting example of Dutch investigational methods. Entirely supported by private

sugar companies, the station is managed by a Director and a Board composed of the representative from the larger companies. The agricultural, engineering and chemical aspects of sugar production are studied in three separate divisions, the aim of the research work as a whole being to find optimal conditions in sugar production from the time the cane is in the soil to the time it is exported as sugar. Research is aided by the fact that sugarcane growing is confined to one district in the island and that as all cane is exclusively planted by the factory interests, experimental work can also be effectively controlled.

Extracted from "Tropical Agriculture"—Vol.—VI No. 2
p33-34 February 1929.

Y. R. RAO.

**Growth of Seedlings in Light and in Darkness in
Relation to Available Nitrogen and Carbon.**

BY MARY E. REID.

General Summary 1. Growth of the seedling is influenced by the nature and relative amounts of the food reserves of the seed, as well as by differences in the external environment such as light and darkness, and the presence and absence of nitrates in the nutrient solution. When the seedlings are grown without nitrogen from an outside source the following responses have been found: (a) Seeds having a high nitrogen and relatively low carbon content produce seedlings with a large top in proportion to the roots. (b) Seeds having a low nitrogen and high carbon content produce seedlings with a relatively small top in proportion to the size and weight of the roots. (c) Seeds intermediate in the proportions of their reserves of carbon and nitrogen produce seedlings with intermediate proportions of shoots to roots.

2. Nitrates are synthesised into growth promoting substances, both in light and darkness, but much more rapidly in the light.

3. Nitrates favour the growth of shoots more than of roots.

4. Light strongly favours the growth of roots.

5. (a) Seedlings developed from high-protein seeds benefit most under the influence of light. The roots and leaves are larger, more numerous, and much heavier than in the case of seedlings grown in darkness. This applies to high-protein seedlings grown with and without extra nitrogen, but the effect is greater in the case of the latter. (b) Seedlings grown from low-protein seeds without extra nitrogen are influenced less by light as to weight of different organs. Leaves of the very low-protein types grow even less in light than in darkness. When extra nitrogen is supplied these seedlings also benefit by the influence of light.

6. Seedlings with limited nitrogen supply undergo rapid differentiation and maturing of tissues in the light. The lower the nitrogen content of the seed the more rapid the process.

7. Light favours secondary thickening in stems and roots and deposition of strengthening materials in the cell walls.

8. The responses as to the effect of varying amounts of reserve carbon and nitrogen on growth of the seedling agree with results obtained with tomato cuttings having similar (although in some cases more extreme) variations in composition of the reserves.

(From Botanical Gazette—February 1929).

Helping The Cultivator—Madras Proposals—Agricultural Department Extension.

An era of new agricultural development in the Madras Presidency is proposed by the Government and our special correspondent is in a position to sketch briefly the main lines of the contemplated improvements. In June last, the Government instructed the Director of Agriculture to prepare a detailed programme of reorganisation of the Department and to lay down adequate and definite lines of development and to prepare a programme with reference to which the agricultural budget for this year could be framed bearing in mind, at the same time, the recommendations of the Royal Commission on Agriculture. The Director of Agriculture with the assistance of Mr. Munro, I understand, submitted a report last August and the recommendations contained in it have been accepted by the Government. The scheme contemplated by the Director makes provision for a ten year's gradual development of agriculture. It has been the complaint that the development of the department has not been sufficiently co-ordinated and that agricultural propaganda has been unsatisfactory and spasmodic. The efficiency of the Research staff has been lowered in recent years owing, it is understood, to their having become involved in administrative details and thus unable to devote themselves to research. The department has developed by fits and starts, without any co-ordination of the work as a whole with the result that it has become disorganised, and while it has gone ahead rapidly in some directions, it has lagged behind in others. The work of the Director himself has been so much added to that it has become impossible for him to handle the mass of work properly. The Director then, in response to the Government Order has made some very useful and interesting suggestions, which apart from relieving the research staff from administrative duties and co-ordinating the work, makes full provision for future development. His suggestions, so far as they relate to this year, have been passed in the Legislative Council.

Relief For Research Officers:—The problem will be solved by relieving research officers of a lot of administrative work by first of all consolidating the routine work at the Research Institute, Coimbatore in a central office under one gazetted officer and by providing in the future for the gradual addition to the staff of gazetted assistants, secondly by relieving district officers by providing them with gazetted staff in charge of groups of agricultural demonstrators and of experiment stations, and lastly by adding to the staff of the Director of Agriculture a second Personal Assistant of the grade of a Deputy Director of Agriculture. One of the important recommendations of the Director of Agriculture, which has been accepted by the Government, is the redistribution of circles. This consists of the formation of a new circle in the Telugu districts and another in the Nilgiris in separate administrative charge of two Deputy Directors. In order to make agricultural propaganda more effective, it has been decided to appoint two Assistant Directors almost immediately. There will be extra agricultural demonstrators to run seed distribution farms. Though it has been recognised that there should be more experiment stations, it is proposed to open two new experiment stations for work on cotton and millete as an urgent measure. In order to man the experiment stations, it is proposed to appoint one or more superintendents for each station. Ten of these superintendents are contemplated immediately while ten more are provided for as new stations are established,

New Experiment Stations.—Thus this year a combined cotton and millet section will be opened at Adoni, an oilseed station and agricultural station at Salem, Ganjam and Trichinopoly. Two research officers, three crop specialists and four Deputy Directors together with three Assistant Research Officers, four Assistant Crop Specialists eleven Superintendents of Farm and ten District Agricultural Officers in addition to the already existing eight will be appointed in due course. The reorganisation of the clerical staff of the Director's office, the centralisation of officers at Coimbatore with one Personal Assistant to the Principal and the addition of more assistants will take place this year. These improvements will involve Rs. 1,72,394.

Side by side with the strengthening of the administrative side of the department, it is also decided to augment the research side. This will be done by the appointment of an Oilseed Specialist during the current year. A Live-Stock Improvement Officer to be in sole charge of Government breeding stations will also be appointed this year relieving the present Deputy Director. In the Millets section more attention will be devoted to cholam, ragi, cumbu and tenai in addition to four other minor millets by the appointment of an Assistant Crop Specialist. In 1936-37 a Pulses Specialist is provided for. In view of the size of the subject and the dependence of other sciences on Chemistry it is proposed that the Chemistry section should be divided up, beginning in 1930-31 with the appointment of a biochemist who will take over charge of biochemical work and bacteriology. In 1935-36, it is proposed again to divide up the work by the appointment of soil-physicist. The Entomological, Mycological and Teaching sections will continue as they are at present. All these improvements will ultimately increase the agricultural budget of this Presidency from Rs. 20 lakhs to Rs. 30 lakhs and will work out at 10 pies per acre or 3.6 pies more than the present average.

(From Madras Mail dated 28th April 1929).

Imperial Council of Agricultural Research.

Composing of the council and Method of Financing it.

The following is a resolution (No. 826-Agricultural, dated 23rd May 1929) of the Government of India in the Department of Education, Health and Lands :—

In Chapter III of their report, the Royal Commission on Agriculture in India held that agricultural research in this country is still in its infancy ; that however efficient the organisation which is built up for demonstration and propaganda, it cannot achieve a full measure of success unless it is based on research ; that lack of co-ordination in agricultural

research has prejudicially affected progress; that there is a wide field open for the co-operation of the Government of India and of provincial Governments in regard to agricultural research; and that it is the duty of the Government of India, in the discharge of their ultimate responsibility for the welfare of the vast agricultural population of this country, to advance research in every way possible without encroaching upon the functions of Provincial Governments in that sphere.

2. The Royal Commission, after discussing possible methods by which closer contact might be established between scientific investigators working in institutions under the Central Government and investigators employed under Provincial Governments, recommended the establishment of an Imperial Council of Agricultural Research to which the Imperial Agricultural Research Institutions and the Provincial Research Institutions would stand in exactly the same relation. The duties of the Council would be :—(a) the promotion, guidance, co-ordination of agricultural and veterinary research throughout India. The Council would not however maintain research institutions directly under its control nor would it employ its own staff of experts. It would merely determine whether a particular scheme of research was of all-India or of local importance and whether it could be best carried out at an Imperial or provincial research institution or by some other agency such as a university or a private individual and would then, after subjecting the scheme to examination by its expert advisers make such grant as it considered suitable. (b) the training of research workers under a scheme of research scholarships or in other ways. (c) the collection and dissemination of information in regard not only to research but to agricultural and veterinary matters generally. (d) publication of scientific papers etc.

3. The Royal Commission recommended that the Council of Agricultural Research should consist of the following members :—

(a) Three whole time members appointed by the Government of India of whom one should be an experienced

administrator with a knowledge, if possible, of Indian conditions; one should be an eminent scientist who had specialised in some branch of crop production and one should represent the interests of animal husbandry including animal nutrition and veterinary matters. It was suggested that the administrator should be the Chairman of the Council. (b) 36 other members, viz., the Director of the Agricultural Research Institute at Pusa; the Director of the Imperial Institute of Veterinary Research at Muktesar; one representative of the minor administrations under the Government of India; one non-official elected member of the Council of State; two non-official elected members of the Legislative Assembly; one representative each of the European and Indian business communities; three representatives of Indian universities nominated by the Inter-University Board; one representative of the Indian Central Cotton Committee; one joint representative of the Indian Tea Association and the United Planters' Association of Southern India; the nine Directors of Agriculture and the nine Directors of Veterinary services in the major provinces and five other non-official members nominated by the Government of India on the recommendation of the Council by reason of their scientific or other special qualifications.

The Royal Commission recommended that the Council should constitute sub committees to deal with special activities. They further recommended that Provincial Governments should establish committees to work in close co-operation with the Council and to assist in maintaining touch between that body and agricultural activities in the provinces. They considered that Provincial Governments should have full discretion regarding the constitution of the provincial committees.

4. As regards finance, the Royal Commission held that, only if the Council were placed in a secure financial position beyond the possibility of being affected by financial vicissitudes, would it be able to embark upon a programme of ordered advance. They therefore recommended that an agricultural research fund should be constituted by a grant of Rs. 50 lakhs from central revenues to which

additions should be made from time to time as financial conditions permitted. They also recommended that the Council of Agricultural Research and the Agricultural Research fund should be constituted by an Act of the Imperial Legislature.

5. The Government of India have given their most careful consideration to the proposals of the Royal Commission and are of opinion that they are on the whole admirably designed to secure the objects for the attainment of which the establishment of the organisation outlined above is recommended. They feel however that the composition of the Council and the method of financing it proposed by the Royal Commission might with advantage be modified in certain respects. It appears to them that a council of 39 members would be too large to be really effective and that it is not desirable that the Legislative Assembly should be deprived of its normal constitutional control over an activity which affects the staple industry of this country as it would be, if the method of financing the Council proposed by the Royal Commission were adopted. To meet these objections the Government of India have decided to make the changes in the structure of the Council and the method of financing it which are explained in the subsequent paragraphs of this resolution.

6. The central organisation will be divided into two parts with executive and advisory functions respectively. The executive part, which will be known as the Governing Body will have the management of all affairs and funds of the Council subject to the limitations mentioned in para 7 below. This body will consist of the Honorable Member of the Governor General's Executive Council in charge of the portfolio of agriculture who will be ex-officio Chairman, the Principal Administrative Officer of the Council who will be appointed by the Government of India and who will be ex-officio Vice-Chairman, one representative of the Council of State, two representatives of the Legislative Assembly, one representative of the European business community elected by the Associated Chambers of Commerce of India and Ceylon, one representative of the Indian business community elected by the Federation of

Indian Chambers of Commerce and Industry, one representative nominated by the Government of each major province, two representatives elected by the Advisory Board and such other persons as His Excellency the Governor-General in Council may from time to time appoint.

At the conference convened by the Government of India in October last to consider the report of the Royal Commission, the Provincial Ministers of Agriculture expressed the view that the provincial representatives on the Governing Body should be the Ministers of Agriculture. This proposal had been referred to provincial Governments for opinion and has met with general acceptance. The Government of India entirely agree that the presence of the Provincial Ministers of the Governing Body will contribute very materially to the successful working of the Council. They consider it desirable however that provisions should be made in the rules and regulations of the Council permitting a provincial Government to nominate a representative to attend any meeting of the Governing Body at which the Provincial Minister of Agriculture is unable to be present.

The Hon'ble Mr. V. Ramadas Pantulu has been elected by the Council of State and Messrs Mian Mahamud Shah Nawaz and Chaudri Mukhtar Singh have been elected by the Legislative Assembly as the representatives of those bodies on the Governing Body. The Associated Chambers of Commerce of India and Ceylon and the Federation of Indian Chambers of Commerce and Industry have elected Sir Joseph Kay and Mr. Walchand Hirachand, C. I. E. respectively as their representatives in the Governing Body.

The functions of the Advisory Board will be to examine all proposals in connexion with the scientific objects of the Council which may be submitted to the Governing Body, to report on their feasibility and to advise on any other questions referred to it by the Governing Body. It will consist of all those whose inclusion in the Council was recommended by the Royal Commission with the exception of the representatives of the Central Legislature and the representatives of the European and Indian commercial communities

who now find a place on the Governing Body. It does not appear necessary that the latter should also be members of the Advisory Board which will be a body of experts. In view of their exclusion from the Advisory Board the Government of India after consultation with the Provincial Governments consider it desirable that the scientific and university representation on the Board should be increased and that, subject, where necessary, to the acceptance of the invitation to elect representative to the Board, it should be composed as follows: (1) the Vice Chairman of the Council, (2 and 3) two whole time expert advisers appointed by the Government of India (4) Director of the Pusa Institute, (5) Director of the Imperial Institute of the Veterinary Research (6) Director of the Indian Institute of Science, Bangalore, (7) to (15) the Directors of Agriculture in Madras, Bombay, Bengal, United Provinces, Punjab, Burmah, Bihar and Orissa, Central Provinces and Assam; (16 to 24) Representatives of the Veterinary department in Madras, Bombay, Bengal, United Provinces, Punjab, Burmah, Bihar and Orissa. Central Provinces, Assam; (25) a representative of minor administrations nominated by the Government of India; (26) a representative of the Forest Institute, Dehra Dun nominated by the Government of India, (27) a representative of the Co-operative movement nominated by the Government of India (28) a representative elected by the Indian Research Fund Association (29) to (32) 4 representatives of Indian universities elected by the Inter-University Board; (33) a representative elected jointly by the Indian 'Tea Association and the United Planters' Association of Southern India (34) a representative elected by the Indian Central Cotton Committee and (35 to 39) 5 non official members nominated by the Government of India on the recommendation of the Council on the ground of scientific knowledge or other special qualifications and such other persons as His Excellency the Governor General in Council may from time to time appoint.

Mr. P. H. Carpenter, Chief Scientific Officer Indian Tea Association's Experimental station, Tockaji, Assam, has been elected as their representative on the Advisory Board by the Indian Tea Association and the United Planters' Association. The Government of India have nomi-

nated Mr. G. K. Devadhar, C. I. E., President Servant of India Society, Poona as representative of the Co-operative Movement on the Board. The names of the nominees of the Government of India to represent minor administrations and the Forest Research Institute will be announced shortly. The Principal Administrator Officer to the Council will be *ex-officio* Chairman of the Advisory Board.

All the other features of the Royal Commission's proposals for the organisation of the Council viz., the three whole-time officers, the subject committee to deal with special activities and the provincial committees will remain.

As recommended by the Royal Commission, the duration of the appointment of the members of the Council other than the representatives of the council of State and the Legislative Assembly and of those members who are appointed by reason of the office of appointment they hold will be three years. The tenure of appointment of the Principal Administrative Officer and the two whole-time expert advisers will ordinarily be 5 years.

7. For the lump grant of Rs. 50 lakhs recommended by the Royal Commission, the Government of India have decided to substitute an initial lump grant supplemented by a fixed minimum grant annually. They have fixed the initial grant at Rs. 25 lakhs of which Rs. 15 lakhs have been provided in the budget for 1929-30. Commencing from 1930-31, the annual recurring grant will be fixed at Rs. 7.25 lakhs per annum, of which Rs. 5 lakhs will be devoted to the furtherance of the scientific objects of the Council, and the remaining Rs. 2.25 lakhs to the cost of its staff and Secretariat. A sum of Rs. 1.40 lakhs has been provided in the current year's budget to meet the cost of the staff and Secretariat in this financial year. The provision in the current year's budget has been made with the approval of the Legislative Assembly and the grants to be made in subsequent years will also be subject to its approval.

The Council of Agricultural Research will have an entirely free hand in regard to the expenditure of the grants made to it for research purposes subject to the condition that it incurs no liability in respect of such matters as

leave or pension contributions after the research for which the grant is given has been completed. In regard to the grant made to it to meet the cost of staff, establishment, etc., the Government of India have decided that, for reasons of administrative convenience, it should be in the same position as a Department of the Government of India Secretariat.

8. The broad outlines of the scheme were placed before the Conference of Provincial Ministers and other representatives in October last and met with general acceptance.

9. The Government of India have further decided that the Council should not be constituted under an act of the Imperial Legislature as recommended by the Royal Commission but should be registered under the Registration of Societies Act, XXI of 1860. In order to comply with the requirements of that Act, a meeting of those who will constitute the Council will be convened at an early date to consider the terms of the Memorandum of Association and the Rules and Regulations which have to be filed with the Registrar of joint-Stock Companies.

10. Proposals have been approved by His Majesty's Secretary of State regarding the appointment of the Principal Administrative Officer, the two whole-time expert advisers and the Secretary to the Council. The Government of India hope shortly to be in a position to announce the name of the gentlemen appointed to the first three of these posts. The officer selected for the appointment of Secretary to Council is Mr. M. S. A. Hydari, I. C. S. (Madras).

11. The Government of India trust that all provincial Governments will take early steps to constitute provincial committees, on the lines suggested by the Royal Commission subject to such modifications as may be considered required in the light of local conditions, to work in co-operation with the Council of Research.

(From The Indian Trade Journal, Vol. XCIII, No. 1197).

GLEANINGS.

Local Research Council.—We are very much gratified to learn that the Rajahsahib of Parlakimedi—one of our patrons—has been invited to serve on the local council formed to advise Government in giving effect to the recommendations of the Royal Commission on Agriculture. The Rajahsahib being a member of the Commission is fully aware of the implications of the recommendations and should be a better judge than most others as he is also one of the biggest Zamindars of the Presidency.

Copra.—This suffers loss on storage; experiments conducted in Fiji go to show that when it contains less than 6 per cent moisture, it does not deteriorate to any great extent when stored in sacks in bulk. Copra containing over 6 per cent moisture when stored under conditions, where it only loses moisture slowly (that is in a heap of sacks) deteriorates very considerably. A loss up to 20 per cent anhydrous copra may occur.

Sulphuring of semi-dry copra that is rapidly deteriorating, prevents loss by mould action and also burning of copra on open vatas in hot weather.

A Second Demonstration Van:—Last July the first agricultural van was started by His Excellency Lord Goschen at the Agricultural College Coimbatore on the occasion of the College Day. In April this year again, a second demonstration van has become possible mainly through the generous gift of a member of the Nagarathar community and is appropriately named "Lord Goschen Car." This we learn is intended chiefly for work in southern Tamil districts. The officers at the College fitted this up and it started at Tiruppur at the time of the Cattle Show on May 25th.

B. Sc., Ag. Results:—This year's results in the B. Sc., Ag. examinations both Parts I and II are very satisfactory. We congratulate those that have come out successful and we would hearten the few that have failed to try again and secure success.

April-May Season :—Weather during these two months has been rather wet. Over 8 inches of rain were recorded; it has helped the maidan to put on a cheerful appearance. Summer cholams have grown vigorously and the crops may be expected to give good yields.

Selection of Students :—This year as usual, the Selection Committee will visit Samalkota and Madras for the selection of students for the B. Sc. Course. It is believed that there will be a very large number of candidates to choose from. We cannot say whether the Ceded Districts will unlike in previous years send a fair number. We hope July 1st will be a very enjoyable day for students that are lucky enough to get admission.

Union Account for quarter ending 28th February '29.

RECEIPTS.

| | | | | |
|------------------------------|------|-----|---|---|
| Building Fund | .... | 18 | 0 | 0 |
| Journal Account | .... | 246 | 8 | 0 |
| College Day | ... | 20 | 0 | 0 |
| Furniture | .... | 0 | 8 | 0 |
| Recovery of Printing charges | .... | 17 | 0 | 0 |
| Total Rs. | ... | 302 | 0 | 0 |

EXPENDITURE.

| | | | | |
|------------------------|------|-----|----|---|
| Postage and Stationery | ... | 44 | 6 | 0 |
| Lighting charges | ... | 3 | 5 | 0 |
| Establishment | .... | 80 | 0 | 0 |
| Furniture | .... | 0 | 7 | 0 |
| Printing charges | .... | 503 | 9 | 0 |
| Miscellaneous | .... | 27 | 0 | 0 |
| Total Rs. | .... | 658 | 11 | 0 |

(i)

Departmental Notifications.

GAZETTED:—Mr. K. Ramayya, Assistant Paddy Specialist, extension of leave on average pay for 18 days from 15th March, Mr. Y. G. Krishna Rao, Assistant Director, III circle, leave on average pay on medical certificate for 6 months from 14th March. Mr. C. R. Srinivasa Ayyangar, Assistant Paddy Specialist, Maruter, leave on average pay for 3 months from 21st April; Mr. S. Jobitha Raj, assistant to officiate. Mr. H. E. R. Dunhill, Assistant Agricultural Engineer, extension of leave on average pay for 5 days from 24th March, and leave on half average pay until 23-5-29. Mr. C. Narayana Ayyar, Assistant Director, St. Thomas Mount, leave on average pay for one month from or after 1st May.

Mr. V. Narayanaswami Ayyar, to be Systematic Botanist in the temporary post outside the cadre of Madras Agricultural Service from date of joining.

NON-GAZETTED—*Appointments, transfer, resignation etc:* Mr. K. Thomas Benjamin to be Upper Subordinate, in the V grade on probation. Mr. M. C. Krishnaswami Sarma, assistant demonstrator to Athur subcircle; Mr. T. A. Rangaswami Ayyangar, assistant demonstrator, on relief to Rasipur; Mr. M. Gopalachetty, demonstrator, on relief to Tiruchengode; Mr. K. M. Venkatachalam Pillai, assistant demonstrator, to Namakal. Mr. V. Suryanarayana, Demonstrator is posted as Headmaster, Agricultural Middle School, Kalahasti, on completion of his L. T. training. Mr. A. Venkatarangam, Manager, Chintaldevi, to Hosur Cattle Farm; Mr. A. K. Annaswamy on relief to join duty at Chintaldevi. Mr. K. Ramanujacharya, Manager, on completion of Ongole survey work is posted to Chindaldevi Farm. Mr. T. Seshachalam Nayadu, on relief to Hosur Cattle Farm. The headquarters of assistant demonstrator, Kallakuruchi will be Vriddachalam from 1st May. Mr. K. Manga Raju, Manager is reverted to his permanent appointment in the Educational department from date of relief. The resignation tendered by Mr. T. V. Balasubramanyam, Manager is accepted from 26th February, 1929.

LEAVE, ETC:—First Circle:—Mr. T. Paramanandam, manager, leave on average pay for one month from 10-5-29.

SECOND CIRCLE:—Mr. V. Achutham, assistant demonstrator, leave on average pay for one month from or after 17-5-29.

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THIRD CIRCLE:— Mr. P. Naghadar Nayadu, assistant demonstrator, leave on average pay on medical certificate for 2 months and 29 days from 8-5-29; Mr. G. L. Narasimha Rao, assistant demonstrator, leave on average pay for 10 days from 3-4-29 Mr. S. M. Kalyanarama Ayyar, Cotton Assistant, leave on average pay for 11 days from 17-4-29. Mr. M. Krishnaswami Ayyangar, assistant manager, extension of leave on average pay for 15 days Mr. K. Jagannatha Rao demonstrator, Prodattor, leave on average pay for one month from or after 29-4-29 Mr. K. Rama Rao demonstrator, Coddapah, leave on average pay for 25 days from or after 3-5-29. Mr. P. V. Subba Rao, assistant manager, leave on average pay for one month from 13-5-29.

FOURTH CIRCLE;— Mr. A. S. Nithyakalyana reddy, assistant demonstrator, extension of leave on average pay for 2 months from 3-4-29. Mr. K. S. Krishnamurthi Ayyar, demonstrator, Cuddalore, leave on average pay for 3 months from or after 15-4-29; Mr. K. Varadachari, Manager, Palur, leave on average pay for one month from 20-5-29.

FIFTH CIRCLE:—Mr. T. G. Muthuswami Ayyar, demonstrator Nannilam, leave on average pay for 3 weeks from 4-5-29.

SIXTH CIRCLE :— Mr. K. K. Subramanya Ayyar, demonstrator, leave on average pay for 2 months from date of relief; Mr. A. Chinnathambi Pillai, demonstrator, Madura, leave on average pay for 20 days from 6-5-29. Mr. T. S. Venkatarama Ayyar, demonstrator, Palni, leave, for 15 days Mr. C. J. Balraj, assistant demonstrator, leave on average pay for 8 days from 21-5-29.

SEVENTH CIRCLE:—Mr. P. Kesavenunni Nambiyar, demonstrator, extension of leave on average pay for 11 days from 17-3-29; Mr. G. Sakharam Rao, demonstrator, extension of leave on average pay for 15 days; Mr. K. Soopi Haji, assistant demonstrator, leave on average pay for 11 days from 22-5-29.

EIGHT CIRCLE :—Mr. S. Viravarada raju, demonstrator, leave on average pay on medical certificate for one month from 20-4-29.

CURATOR'S SECTION:—Mr. P. Abhishekanatham Pillai, Manager, Nanjanad, leave out of India for 28 months from or after 24-8-29; Mr. T. D. Eswara Ayyar, Assistant manager, Sim's Park, leave on average pay for 2 months and 15 days from or after 1-6-29.

LIVE-STOCK SECTION.—Mr. T. Seshachalam Nayadu, manager, leave on average pay for one month and 15 days from or after 20—4—1929, Mr. A. K. Annaswami Ayyar, manager, leave on average pay for 3 weeks from or after 24—4—1929, Mr. M. Alagiriswami Nayadu, assistant manager, leave on average pay for 19 days from 25—5—1929.

PADDY SECTION.—Mr. M. Kamaswami Pillai, sub assistant, extension of leave on average pay for 18 days, Mr. M. B. V. Narasinga Rao, assistant, Maruter. leave on average pay for 26 days from 21—5—1928, Mr. S. Muthuswami Ayyar, Manager, Aduthurai, leave on average pay for 6 weeks from or after 3—5—1929, Mr. V. M. Ramunnikidavu, assistant manager, Pattambi, leave on average pay for one month from 3—4—1929, Mr. C. M. John, assistant Pattambi, leave on average pay for one month and nine days from or after 22—4—29.

G. A. C. SECTION:—Mr. S. Kasinatha Ayyar, assistant, extension of leave on average pay for 4 days; Mr. M. Suryanarayana, assistant, leave on average pay for 2½ months from 4—5—29.

PRINCIPAL'S SECTION:—Mr. K. K. Raghavan, manager, Central Farm, leave on average pay for one month from or after 29—4—29. Mr. T. S. Azizuddin Sahib, manager, Botanical garden, leave on average pay for 2 months from 17—4—29.

G. M. S. SECTION:—Mr. K. Krishna Menon, assistant, leave on average pay for 16 days from 3—5—29.

M. S. 's SECTION:—Mr. M. S. Sankara Ayyar, assistant, leave on average pay for 15 days from 18—4—28; Mr. P. Krishna murthi, assistant manager, leave on average pay for one month and 15 days from or after 6—5—29.

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