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## EDITORIAL

The development of scientific agriculture in India has made phenomenal progress since the days when Agriculture was one of the many subjects administered by the Land Revenue Department. The inauguration of separate departments of Agriculture and the consequent separation of the functions of the Revenue and Agricultural Departments was the inevitable outcome of a well-conceived policy of the Government of India and the provincial governments to improve the agricultural conditions of the country. The paramount need for special study and research into specific agricultural problems necessitated the establishment of a net-work of agricultural research stations and the employment of a specially trained staff for manning them. The collection of knowledge from experiment and research is however, only the first phase of the battle. The dissemination of the knowledge to the cultivators and the fight against ignorance, prejudice and superstition constitute a protracted struggle. The willing co-operation of sister departments in this endeavour is an asset of inestimable value. With its ramifications even through the remotest villages, with its unique opportunities of contact with the cultivating classes and with the influence it commands on the life of the rural folk, the Land Revenue Department has remained a potent force for the spread of the agricultural gospel. With the expansion of the functions of the Agricultural department and its ever-increasing contributions to the advancement of scientific agriculture, the desire has often been expressed for a greater co-ordination of the work of the two departments of Government directly concerned with the basic industry of the land. The problem of effecting such co-ordination has apparently been the serious concern of the Government of Madras for some time past. We are glad that a Government Order, the text of which we publish elsewhere in this issue, makes the Collector and the District Agricultural Officer jointly responsible for the agricultural programme of each district and formulates several ways and means to ensure greater contact and co-operative effort between the officers of the two departments. One remarkable feature of this new scheme is that the ways and means suggested have emanated from a conference of District Collectors. It is a happy augury that the most influential section of public officials has shown a new orientation in its outlook and has committed itself to its willing co-operation.

Yet another proof of Government's desire to work this ideal is found in a recent amendment to the *Indian Civil Service Manual*, making provision for a period of training for Assistant Collectors at the nearest Agricultural Research Station and for another period of tour with the Agricultural Officer of the District, so that they may 'acquire a knowledge of crops, seasons, and agricultural practices of the Province' The Government of Madras are to be congratulated on being the first in the field to translate their convictions into action. If Madras succeeds in its endeavour, her success will be an object lesson to other Provinces and States in India. To ensure success, it will be the duty of both Departments to implement Government's desire faithfully and in the true spirit of co-operation. Decadent ideas of prestige, should vanish and all opportunities availed to lend a helping hand. We feel confident that when this is done, the hope recently expressed by His Excellency the Governor of Madras 'that the results of various researches will be put across to the ryots in a more effective manner and that the help of the Department to the ryot will take a far more practical shape' will not be long in fulfilment.

**A Refresher Course for Agricultural Demonstrators.** The proposals made by the Director of Agriculture to institute a refresher course lasting for a month at the Agricultural College and Research Institute, Coimbatore for the benefit of Senior Agricultural Demonstrators have received the acceptance of the Madras Government. The wisdom of this measure is undisputed. There has occurred several developments in the Agricultural sciences and new subjects of instruction have been added to the curriculum of studies since the earlier batches of Agricultural graduates left their College. Those engaged in district work have seldom had opportunities to go back to their *alma mater* and if they did, they did not have the time or the opportunities to acquaint themselves with the more recent developments in agricultural research. Despite accumulated experience gained in specific lines of work carried out in their own jurisdictions, these officers have been labouring under a handicap. The course of instruction provided in the refresher course which is at once comprehensive and almost wholly practical, seeks to remedy the handicap and to equip the district worker with better ideas and more practical knowledge in the improvements he has to urge on his clients. We welcome this measure as one calculated to strengthen the propaganda wing of the Department.

# Banana Figs and Banana Flour with special reference to Madras Varieties.

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**Banana Figs.** Ripe bananas when dried are known as banana 'figs'. They are prepared in the following manner:—

Ripe fruits are peeled, split longitudinally into two halves and each half again cut across into three or more pieces about an inch in length according to the size of the fruit, with a stainless knife or a sharp blade made of bamboo. The cut pieces are dried by exposing them to hot sun in wooden or bamboo trays with mosquito net coverings to keep off flies, or wooden trays with glass tops provided with ventilators for free passage of air. If suitable coverings are not used, maggots appear in the figs as the result of eggs laid by the flies on them while exposed for drying. The figs have to be dried for four or five days in a place free from dust when they will be ready for use. These may be packed in butter paper and stored in closed containers. They keep well for three to four months.

Under-sized banana bunches, which may not fetch good prices, normal bunches when there is a glut in the banana market due to over-production and those grown in out-of-the-way places with limited transport facilities, may with advantage be utilized in the preparation of these figs.

Varieties, the fruits of which are rather juicy, are generally preferred for making banana figs. The best Madras varieties suitable for this purpose are *Chokkarakeli*, *Nendrans*, *Pey kunnan*, *Poovan*, *Suganthi*, *Kostha bontha*, *Vamanakeli*, *Peyan*. etc. *Chokkarakeli* being a very costly fruit is too good for this purpose even though it makes the best figs. *Nendrans* also make very good figs but are available only in the West Coast where there is a ready market for them and may not be profitable for this industry. Figs prepared of the varieties *Vamanakeli*, *Peyon* and *Sirumalai* manifest a deliquescent tendency besides being also too costly for this purpose.

The varieties, that are used for banana fig making, should, in addition to their juicy nature, also be heavy yielding and be easily grown anywhere even under adverse conditions. The varieties answering all the conditions are only very few. The best Madras varieties are *Pey kunnan*, *Kostha bontha*, *Poovan* and *Suganthi*. All these varieties can be easily grown under diverse soil and climatic conditions. *Pey kunnan* and *Kostha bontha* thrive even in alkaline soils though bananas in general are very susceptible to alkalinity.

Banana fig making by drying in the sun may be done during summer months or whenever there is a fairly long break in the monsoon. It should not be tried during the monsoon season when the unfinished products get mouldy and become unsuitable for the purpose.

A dehydrator for preparing banana figs quickly was tried at the Agricultural Research Station, Samalkot, Godavari District, during 1937—38 and compared with the sun-drying process. The figs of *Chakkarakeli* were ready in about 10 hours by the dehydrator at 54°C—65°C, while it took 5—6 days at 40°C—45°C by the sun-drying process. Though the finished product was obtained much quicker in the dehydrator the quality was found poor and the cost of production high.

Only well ripe banana fruits should be used for making figs; otherwise, the figs will be hard and less sweet even though the quantity obtained will be slightly high due to some starch left in the under-ripe fruits. In the variety *Pey kunnan* under-ripe fruits gave 28%, ripe fruits 24% and well ripe fruits 21.5% of figs. The last one was very soft, sweet and of the colour of honey.

The percentages of banana figs to fruits at different stages in the varieties *Chakkarakeli* and *Pey kunnan* are given below:—

	Percentage.	
	<i>Chakkarakeli</i>	<i>Pey kunnan</i>
The rachis (6" of peduncle, axis and 3" of axis of inflorescence above fruits) to unripe fruits in bunch soon after harvest. . . . .	11.3	6.7
Ripe fruits in hands to unripe fruits in hands . . . . .	88.3	88.1
Pulp to ripe fruits in hands . . . . .	65.9	76.2
Banana figs to pulp . . . . .	27.6	30.25
Banana figs to bunch (with 6" of peduncle, central axis and 3" of axis of inflorescence above unripe fruits) soon after harvest . . . . .	12.6	17.7
Banana figs to unripe fruits in hands . . . . .	15.8	19.0
Banana figs to ripe fruits in hands . . . . .	18.2	21.5

It will be seen from the above that *Pey kunnan* yields a higher percentage of figs than *Chakkarakeli*.

Banana fig is a highly concentrated food suitable for travellers. Weight for weight banana figs are more nourishing than wheat bread. A pint of milk and six ounces of banana figs make a good meal (Fawcett). In places where fresh bananas could not be easily and economically obtained, banana figs can very well take their place. If the banana figs are sufficiently advertised and popularized in parts of Northern India where bananas are not grown or easily obtained, a good market can be found for banana figs produced in South India.

Standardized bunches of 8 or more hands and occasionally of 7 are exported to America and Europe from the West Indies. The undersized bunches fetch only one-fourth the normal price and are therefore not exported. These bunches are therefore converted into banana figs with profit. There are several factories at work in Jamaica for banana fig manufacture. The figs used to be exported to European countries at 42 shillings per hundredweight. Banana figs were used as part of army rations in Austria; and for all purposes where it was of consequence to have food in small compass (Fawcett).

Analyses of the banana figs of varieties *Chakkarakeli* and *Pey kunnan*.\*

	<i>Chakkarakeli</i> .	<i>Pey kunnan</i> .
Moisture	10.85	8.20
Ash	3.48	2.88
Proteins	5.48	2.91
Sugars { Reducing	43.29	53.68
{ Non-reducing	10.66	1.05
Fat, fibre, etc.	26.24	31.28
	100.00	100.00
Lime (CaO)	.116	.123
Magnesia (MgO)	.11	.194
Potash (K <sub>2</sub> O)	.195	.141
Phosphoric acid (P <sub>2</sub> O <sub>5</sub> )	.306	.202
Nitrogen	.82	.47

**Banana flour.** Banana flour is made from fully mature unripe bananas, i. e., before the starch is converted into sugar by ripening. Unripe fruits are peeled, cut into thin slices and sun-dried. It is difficult to peel green bananas, but with some experience it can be easily done. If the green bananas are thrown into scalding water (176°F) for four or five minutes the peel is easily removed. Ordinary steel knives should not be used as they turn the cut surfaces of bananas black; nickel blades or stainless knives should be used. These slices are dried in the sun for about four days when the percentage of water contained in them will be reduced from 70 to 15. These chips are then milled in flour mills and sifted. There are factories in the West Indies with vacuum apparatus for the manufacture of banana flour. The flour is packed in boxes or barrels lined with paper. It is also exported to England as banana chips as milling, sifting, etc., are better done there.

The percentage of banana flour to unripe fruits varies slightly with different varieties. The percentage of flour to unripe fruits in hands in the variety *Poovan* is 1.75 and in *Adakka kunnan* 21.2. The percentage of flour to unripe fruits in bunches in *Poovan* is 15.2 and in *Adakka kunnan* 18.3.

## Statement showing the analyses of banana flours of five Madras varieties as compared with those of rice and wheat:\*

	<i>Poovan</i>	<i>Pey ladan</i>	<i>Kunnan</i>	<i>Then-kunnan</i>	<i>Adakka kunnan</i>	<i>Rice</i>	<i>Wheat</i>
Moisture	10.9	10.3	10.5	10.8	10.2	11.6	12.3
Ash	2.5	2.2	2.5	2.0	3.0	1.2	0.6
Crude proteins	2.8	2.8	2.9	2.9	4.9	6.6	10.2
Ether extractives	0.8	0.5	0.6	0.4	0.9	0.1	1.3
Crude fibre	0.8	0.9	1.3	0.7	1.4	0.1	0.3
Carbo-hydrates	82.2	83.3	82.2	83.2	79.6	80.4	75.3
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

\* The analyses were done by the Government Agricultural Chemist, Coimbatore.

Banana flour is also known as banana meal. It is rich in carbohydrates and mineral matter, but poor in protein. The starch of banana is more easily digestible than cereal starches.

The British Medical Association recommends the use of banana flour in infant feeding. It is cheap and wholesome, possessing a high nutritive value. It can be made in a few minutes by mixing up a heaped table spoonful (one ounce) of banana flour with a pint of water and then boiling for five minutes. A gruel made in this way has excellent colloidal properties when added to milk in equal quantity; it thickens the milk and prevents formation of a leathery coagulum of casein and satisfies the appetite of hungry infants more effectually than simple milk dilutions. Banana gruel is particularly suited for patients recovering from typhoid fever and is excellent in cases of dysentery and similar abdominal complaints. In cases of chronic dyspepsia and gastritis properly prepared banana flour is easily digested.

Banana flour is a common infant food in the West Coast of the Madras Presidency (Malabar, Cochin and Travancore). The flour of the varieties *Adakka kunnan* and *Nendran* is used for this purpose. Non-juicy varieties are generally preferred. The flour of *Kunnan* series (*Adakka kunnan*, *Kunnan*, *Venneettin kunnan*, *Then kunnan* and *Thattilla kunnan*) is considered superior to that of other varieties. The flour of *Nendran* has a high percentage of calcium and phosphoric acid. The food stuffs and fodders of the West Coast are generally deficient in these two minerals; but nature has so adjusted the requirements of people by making this variety of banana an important article of food in this coastal region, while it is not much liked by people in other parts of the Presidency. The *Adakka kunnan* contains double the quantity of protein that is usually found in any other variety of banana and it is a happy coincidence that the flour of this variety has for long been in use in Malabar as an important infant food.

Bread and biscuits are made of banana flour in foreign countries with the addition of wheat flour. The banana bread is uniform in texture, permanently moist, of a golden colour, and very nutritious. Banana flour is particularly suitable for the manufacture of yeast used in breweries (Arguelles).

There is ample scope for the development of banana fig and banana flour making, as cottage industries in many parts of this Presidency where conditions favourable for their manufacture prevail.

The following are the various local names for some of the important varieties suitable for banana fig and flour making.

*Chakkarakeli* (*Musa paradisiaca* Linn., var., *Chakkarakeli*).

*Shahaja* in Isikki lands near Vizagapatam, *Saja aratti* in Simhachalam, *Tella chakkarakeli* in Tanuku, *Manch chakkarakeli* in Vellattur in Repalle taluq of the Guntur district, *Pedda chakkarakeli* in Siruvalanka, *Rajakili* in Pudupatnam near Sadras, *Kari uaxhai* in Trichinopoly, *Mysore Rasthali* in Mettupalayam, *Then*

*kadali* in Erode, *Rasthali* in Srivilliputtur, *Chakkara kadali* in Trichur, *Aa bale* in Virarajendrapet, *Raja vazhai* in Kulittali,

Largely grown in Godavari district.

*Poovan* (*Musa paradisiaca* Linn., var. *poovan*).

*Vasana chettu* in Gopalpur, *Ginni*, *Karpura chakkurakeli* in Piridi near Bobbili, *Chakkarakeli* in Velpur near Tanuku, *Karpura* in Peravalli near Tanuku, *Rasthali* in Challapalle, *Soan mowse* in Kurnool town, *Sugantham* in Kalava near Kurnool, *Yerra sugantham* in Giddalore, *Sugandhi* in Rampuram near Tungabhadra, *Rasa balai*, *Salem* in Hospet, *Bengala* in Allipuram near Nellore, *Yerra aratti* in Godugumuru near Chittoor, *Navarai* in Madurantakam, *Poo vazhai* in Modikuppam near Chittoor, *Raja vazhai* in Gudiyattam, *Dora vazhai* in Kallar Government Gardens, *Kallath vazhai* in Mettupalayam, *Erode poovan* in Coimbatore, *Puluppu kai*, *Korangu vazhai* in Pollachi, *Mysore poovan* in Gudalur, *Adukku namarai* in Pannakkadu, *Pulneys*, *Kadali* in Thangachimadam, *Puliohan kadali* in Thisayanvilai, *Cheru kai* in Alwaye, *Palayan kodan* in Trichur, *Mysore kadali* in Ponnampet, *Mysore bale*, *Mysore kadali* in Moodbidri, *Mysori* in Kumaranallore, *Mysore* in Mangalore, and *Chesna bale* in Bangalore, *Kari gaddi* in Channapatna, *Rari rasa bale* in Kyatsandra, *Kari bale* in Palhalli, *Othu rasa bale* in Nagavalli, *Kari puttu bale* in Jayacharmarajapura, *Vilayithi bale* in Kowsika, *Huli bale* and *Nanjangud bale* in Ambuga, in the Mysore State.

It is grown throughout the Presidency.

*Pey kunnan* (*Musa paradisiaca* Linn., var. *pey kunnan* K. C. Jacob).

*Sambrani* in Yercaud, *Shevaroy*s, *Awak legor* in Trichur.

Largely grown at Yercaud in the Shevaroy hills.

*Nendran* (*Musa paradisiaca* Lin., var. *nendran*).

*Ettakka* in Alwaye, *Chengazekidan* in Trichur, *Nendra bale* in Virarajendrapet, *Coorg*, *Thiruvonan*, *Thiruvonan* in Tellicherry.

Largely grown throughout the West Coast.

*Adakka kunnan* (*Musa paradisiaca* Linn., var. *adukka kunnan*).

*Cheru kunnan* in Trichur, *Pakada kunnan*, *Chara kunnan* in Kongad near Palghat, *Venneettu kunnan*, *Mutti kunnan* in Perintalmanna, *De kunnan* in Manjeri, *Mundi kunnan*, *Venneer kunnan* in Pulamanthol near Pattambi.

Largely grown in the Malabar District.

*Kunnan*. (*Musa paradisiaca* Linn., var. *kunnan*).

*Madras aratti* in Piridi near Bobbili, *Chakkarakeli* in Isikki lands near Vizagapatam, *Ginni* in Chatikona summit, *Neechu* in Kbandavalli near Tanuku, *Karpura chakkarakeli* in Velattur near Bhattiprolu, *Amritapani* in Siruvalanka, *Sanna akkulu chettu* in Nidubrolu, *Chinna sugandham* in Giddalore, *Chitti balai* in Kampli near Hospet, *Sugantha* in Musanur near Kavali, *Vellai kadali* in Sankarancoil, *Nar kadali* in Sendamaram, *Kannan* in Alwaye, *Valiya kunnan* in Trichur, *Jirike bale* in Kallamandkur near Moodbidri, *Tirunolli kadali* in Kasargod, *Adukku poovan* in Nileshwar, *Adukkvan* in Kurumathur near Taliparamba, *Nadan kunnan* in Perintalmanna, *Adukkun* in Tellicherry.

Largely grown throughout the West Coast.

### Bibliography.

- Fawcett William (1913). *The banana, its cultivation, distribution and commercial uses*, Duckworth & Co., London p. 121.
- Eduardo Quisumbinguy Argi ielles (1919). *Studies of Philippine Bananas*. *The Phil. Agr. Rev.* 12: 71.
- Jacob K. Cherian (1934) *South Indian Bananas* *The Mad. Agr. Jou.* 22: 41-57.
- Reports on the work of the Agricultural Stations in the Madras Presidency for 1937-1938*; Government Press, Madras, p. 105.

# Distribution of Paddy Varieties in Palghat Taluk.

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**General.** The wide-spread use of a host of varieties is a striking feature of paddy cultivation in the Malabar district. The practice has probably been found necessary because of the absence of regular irrigation systems, the peculiar distribution of rainfall and the uneven contour of the land. As regards the requirements of the soil and the limitations of water supply every ryot seems to know his lands so intimately that the different varieties are perhaps chosen only to reduce the local irregularities of soil and water supply. The multiplicity of varieties may therefore be taken as an index of the diverse conditions of paddy cultivation prevalent in the locality. Besides this, the type of land and land tenure, resistance to pests and diseases, season and rainfall, the demands of the markets and the mills, also exert a powerful influence on the choice of varieties that are grown. In 1938—39 Palghat taluk raised 207,445 acres of paddy, which represents 71·2 per cent of the annual cultivated area. Farming in the taluk is practically confined to the cultivation of rice in wet lands.

**Season and rainfall.** There are two regular harvesting seasons for the paddy crop, the first falling about the month of *Kanni* (September-October) and the second about *Makararam* (January-February) and the two are therefore distinguished as the *Kanni* crop and the *Makararam* crop respectively. The *Kanni* crop is sown broadcast in April, while the *Makararam* crop is invariably transplanted from nurseries, separately raised in the month of July. The entire crop is rainfed. The average annual rainfall of the tract is 90 inches of which about 65 inches are received during the South-West monsoon, while the North-East monsoon brings in about 15 inches and the dry, hot weather about 10 inches of rain.

**Types of wet land.** The wet lands of Palghat, where paddy is regularly grown as a rainfed crop, fall under two distinct types. There are the 'double-crop' lands which raise two successive crops of paddy annually; there are also what are locally known as *pottas* or 'single-crop' lands, which grow only one crop in the year. Of 207,445 acres under paddy (1938—39), the single crop lands constitute 33,981 acres, the remainder being composed of double crop area in its two fairly equal harvesting seasons. The single crop lands form nearly a third of the double crop area in the *Kanni* crop season. Sometimes even a third crop of paddy is raised in summer in the double crop lands which have the benefit of springs or other irrigation sources. But such favoured areas are very rare and their cultivation is of little importance.



**Cultivation.** In December—January, there is sufficient moisture in the fields after the harvest of the paddy crop. This moisture is taken advantage of to plough the land. Subsequently, cross ploughing, breaking clods and getting the soil into fine tilth, collecting weeds and stubbles for burning on the land are all attended to by way of preparatory cultivation during the hot weather months. On receipt of the first pre-monsoon rains in April, the crop is generally sown broadcast in the dry field, though portions of the single crop lands are also transplanted during the south west monsoon in June-July. The varieties sown in the double crop area are of a comparatively shorter duration than those sown in the single crop lands. The crop is off the double crop lands by the end of August or early in September and is immediately followed by a second crop. In the single crop area, the harvest may get prolonged to October partly due to the late planting and partly because of the cultivation of long duration varieties.

The varieties cultivated in the second crop season are comparatively longer in duration than in the first crop and are therefore sown in separate nurseries in July-August. The success of the second crop depends as much on the quickness with which it is planted before the North-East monsoon rains as on the distribution of the rains in the North-East monsoon itself. The second crop is harvested by December or January and the land is again prepared for the same crop in the succeeding year.

**Varieties.** The important varieties for the *Kanni* crop are *Chambaan Chornali*, *Thavalokkannan Kazhama*, *Areeri* etc., while *Chitteni* and *Anakkomban* are the main types in vogue for the *Makaram* crop. They vary in duration from 3½ months to 5 months in the case of the *Kanni* crop and 5 to 7 months for the *Makaram* crop. The superior strains evolved by the Agricultural Department are popular for the *Makaram* crop season and the strains in use were reported to be GEB. 24, Co. 1, Co. 2, Co. 3, Co. 5, Co. 8, Adt. 5 and Adt. 8. Their distribution in the six Revenue *Firkas* of the taluk, as revealed by the enquiries made in 1939-40, is shown by the plus sign (+) in Table 1 below.

TABLE I  
Distribution of paddy varieties in Palghat Taluk (1939—1940).

Local name of variety.	Revenue Firkas.					
	Palghat Town.	Elapulli	Kollengode	Alathur.	Coyal-mannam.	Parli.
<i>Kanni</i> Crop (April—September)						
CHAMBAAN	+	+	+	+		+
Matta-chambaan		+	+		+	
Anna-chambaan		+		+		
Chinna-chambaan					+	
Irippapoo-chambaan		+	+			+
Poo-chambaan			+	+	+	

## Revenue Firkas.

Local name of variety.	Revenue Firkas.					
	Palghat Town.	Elapulli.	Kollengode	Alathur.	Coyal-manna.	Parli.
CHORNALI	+	+	+	+	+	+
Kata-chornali		+				
Valiya-chornali		+				
Kottayi-chornali						+
THAVALAKKANNAN	+		+	+	+	+
KAZHAMA			+	+		
Chen-kazhama	+				+	
Karin-kazhama		+				+
Veluthari-kazhama			+	+	+	+
Raja-kazhama						+
AREERI	+	.				+
CHEERA		+	+	+	+	+
KARUPPALI					+	
ARYAN	+					
Pen-aryan				+		+
CHOTTURAYAN					+	
ERJMAKKARI					+	
PARAMBUVATTAN				+		+
NAVARA		+				
<i>Makaram Crop (July—January)</i>						
CHITTENI		+	+	+	+	+
Balan-chitteni	+					
ANAIKOMBAN	+		+			+
VRICHIKAPANDI	+	+		+		
ORUMANIYAN					+	
PAPPARUMANIYAN		+		+	+	
MUNDONPALA				+		+
Karuthamundonpala						+
Chokanna-mundonpala						+
KARANI					+	
VELLARI						+
VELLETHAN					+	+
VELLAKOLI					+	+
VELLARYAN					+	
ARIKKIRARI						+
VALIAVEMBALA						+
KUMBALONE						+
GEB. 24	+	+	+	+	+	+
Co. 1		+				
Co. 2	+	+		+	+	
Co. 3			+	+		+
Co. 5	+			+		
Co. 8	+	+	+			
Adt. 5		+	+			
Adt. 8		+	+			

As there are many varieties under cultivation in every holding, the mixing up of types is inevitable and it is indeed a problem to select seeds free from mixtures with other varieties. The economic disadvantages of sowing mixed seeds are realised, though imperfectly, by many ryots but rigorous avoidance of mixtures is seldom practiced. However, in an otherwise undiversified farming, where paddy follows paddy in necessary repetition, the innumerable local varieties are in a way pleasing as well as useful from the occupational standpoint.

**Spread of strains.** Out of 26 holdings examined at random in the Palghat taluk, ten were found using small quantities of improved strains of the Department. The strains found popular were GEB. 24, Co. 2, and Co. 3 and they were confined to the *Makaram* crop. The Coimbatore strains have spread in the tract since they fit in well between the local *Chitteni* and *Anakkomban*. From planting to harvest they take about 90 days for GEB 24, 110 days for Co. 2 and 115 days for Co. 3 while *Chitteni* and *Anakkomban* take 100 and 130 days respectively. *Chitteni* is grown in fairly highlevel fields whereas *Anakkomban* is raised in much lower situations with assured water supply. Between these two, many gradations could be noticed in the nature of the fields, where such small intervals as 5 to 10 days or even less in the duration of varieties are specially helpful to tide over conditions of drought. The Coimbatore strains, that have spread, fulfil this purpose and hence their popularity. Moreover, they fetch a better price in the market because of their superior quality. It is a disconcerting feature, however, that many ryots are tempted by the high prices offered for improved varieties and sell away their entire stock, even their seed material, and thus hinder the normal spread of strains. There is certainly scope for a more widespread use of strains and it will be obvious from the accompanying table that even each holding could increase its area under superior types.

**TABLE II. Distribution of improved strains in 10 holdings in Palghat taluk (1939--40)**

Cropping Season.	Total quantity* of seeds used in each holding.	Names of strains used.	Quantity* of strains used.	Percentage of strains to total seeds used.
July—August	25	GEB. 24	10	40.0
to	35	GEB. 24	4	11.4
	40	GEB. 24	9	22.5
December—January.	70	Co. 3	11	15.7
	78	GEB. 24 } Co. 2 }	8 } 25 }	10.3 } 32.1 }
( <i>Makaram</i> )	80	Co. 2	15	18.8
	100	Co. 3	25	25.0
	110	GEB. 24	60	54.5
	120	GEB. 24	10	8.3
	144	GEB. 24	10	7.0
<b>Average,</b>	<b>80.0</b>		<b>19.0</b>	<b>23.0</b>

(\* Quantities are expressed in *para*, a local measure, weighing 16 to 18 lb. of dry paddy)

As regards the *Kanni* crop, selections from the Agricultural Research Station at Pattambi in South Malabar have yet to gain a foot-hold. Their popularity in the tract is ultimately a matter of their ability to imitate the growth intervals of the local types. The main varieties and their many sub-types are of relatively short duration and are peculiar to the taluk, which is situated mid-way between the rest of Malabar and the dry regions of the Coimbatore district. Here, isolation and selection from among the local varieties and their spread seem to be the need of the hour.

**Acknowledgements.** The survey was made under the guidance of Sri. C. R. Srinivasa Ayyangar, Paddy Specialist and Sri. C. Ramaswamy, Deputy Director of Agriculture, IV Circle, Coimbatore. Their uniform courtesy and personal interest are gratefully acknowledged.

### **The Nizam Sugar Factory Plantation.**

By S. KRISHNANANDA SASTRY, B. A., B. Sc. (Ag.)

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**Introductory.** In the course of the last decade, India has been able to become self-sufficient with regard to her sugar requirements. But South India is far behind in contributing her proportionate quota of sugar as the number of sugar factories and large scale sugarcane plantations are few. The Nizam Sugar Factory Ltd, however, satisfies a longfelt need in the Hyderabad State.

This sugar factory is situated at Bodhan one hundred miles distant from Hyderabad city (Deccan). It possesses an extensive cane estate of about 8000 acres. The area is not a contiguous block but extends on the eastern and northern directions of the factory the farthest points being about seven miles in either direction. Of the total estate only about 3000 acres are planted every year. All the area is cultivated under the Nizam-Sagar project, one of the biggest in India. In this paper, an attempt is made to give a brief account of the plantation side of the sugar factory.

**Soil.** The soil varies from light red loams to medium and heavy black soils with a porous morram or light black subsoil.

**Climate.** Average rainfall is about 35—40 inches most of which is received during the South west monsoon. A few intermittent heavy showers, occur during the North west monsoon. The altitude of the place is about 1200 feet above sea level.

**Varieties of Cane.** The varieties that are chiefly propagated at present in the estate, are P. O. J. 2878; Co 290; Co 419; E. K. 28 and H. M. 230. Of these P. O. J. 2878 gives a very good yield in red loams provided all cultural operations are done properly and in time. Co. 290 is very useful in alkaline and in black soils; Co. 419 is very promising particularly in black soils and the area under this variety is gradually increasing. Out of 3000 acres, P. O. J. 2878 occupies half the area; Co. 290 occupies 1000 acres and the other varieties are planted in the rest of the area.

**Rotation.** The usual rotation is sugarcane sugarcane-fallow or green manure crop. Except growing green manure crops like sunnhemp no other crop is grown in rotation. The general principle is that the total area should be  $2\frac{1}{2} + 3$  times the standing crop. Since there are 8000 acres, every year about 3000 acres are planted. Where soils are good a ratoon crop is raised. Otherwise the land is ploughed and planted again either in the season or in the next according to the fertility of soil.

**Seasons.** There are two seasons for planting cane. The first planting is done after the receipt of the first monsoon showers from June up to August-September. This will mature in October of the succeeding year. This is called the *Adsali* or eighteen month crop. The second season is from November to January. It is called the *Ekasali* or twelve month crop. Planting after February is inadvisable because it increases borer attack. In the factory estate, of the 3000 acres, *Adsali* plantation occupies 2000 acres, *Ekasali* 500-600 acres and the rest of the area is ratoon. This major portion *Adsali* comes handy to the factory in early October, for crushing.

**Cultivation.** Three agencies are in operation human, animal and machine. Machinery is used for preparatory cultivation. All cultural operations are done both by bullock power and manual labour according to convenience and cheapness.

**Preparatory Tillage.** The land is first tractor ploughed by a heavy plough or subsoiler to a depth of 12-15 inches. If there are ridges of the previous crop, a heavy disc harrow is passed over to break the ridges and then the soil is ploughed. After leaving the field for weathering for a few months or weeks (as the case may be) a cross ploughing is done. After a week or two, disc harrows are passed over to pulverise the big clods and bring the soil to optimum tilth. Finally a two to three furrowed ridger which makes furrows and ridges at 3 ft. 6 inches or 4 ft. apart and 20 inches deep is passed. Planting is done in these furrows. Harrowing and ridging are done by light tractors while ploughing is done by tractors of heavy type. Up to this stage, all operations are done by machinery.

After ridging by tractors manual labour is employed to remove old stubbles, to do local levelling within furrows and to rectify ridges so that they may be straight and uniform. Then cross drains (1 ft.  $\times$  1 ft) are excavated at convenient distances of 33 feet or 40 feet and the whole field is divided into regular blocks of convenient dimensions, say 8-acre blocks. Each block is surrounded by drains and field roads. Drains and surrounding gutters are dug to collect run-off water from each block and carry it to a place beyond the entire field. Also deep subsoil drains are dug wherever necessary, particularly in black soils, to drain off subsoil water and thus prevent accumulation of salts which in the long run may lead to alkalinity. Good drainage is an important factor in cane cultivation. Each eight acre block is again subdivided into half acre blocks by strong bunds and cross-bunds. These will facilitate storage of water in the summer season. Field

channels and sub-channels are excavated from the distributary according to the level of the land.

**Planting.** Throughout the length of the furrows, grooving from 3 inches to 4 inches depth is made by a curved type or *Konki* made of wood, in the middle of the furrow, just a little high on the side according to the season. A slight dose of ammonium sulphate or super phosphate is spread in the grooves. After preparing beds in the above manner an irrigation is given if there is no rain. Healthy setts free from stem borer, red-rot etc. and which have good healthy green eye-buds are selected. As a precautionary measure they are dipped in Bordeaux mixture. Ten to fifteen thousand setts each with three eye buds are selected and placed end to end in the grooves keeping the eye buds on one side of the groove and then covered by a layer of earth. The small dose of manure serves as a starter for the young germinating shoots. After planting, an irrigation should be given unless there is rain.

**After-cultivation.** In two to four weeks all the buds germinate and young shoots sprout up. One mulching is given at this stage to hasten germination. After a month, if there are any gaps owing to failure in germination, fresh setts or young plants are planted. Within a period of two months, three or four mulchings are given by curved tynes or blade-harrows. The field is always kept free from weeds. Concentrated manures in the form of ammonium sulphate and castor or groundnut cake are given in two or three doses with an interval of one or one and half months between each application. Deep grooving throughout the length of the plant furrows is done before each manuring and manure is applied as deep as possible so that the roots may go deeper and tap the subsoil layers and not become lateral and feed on the surface soil. The oil cake is well powdered and mixed with ammonium sulphate before application. After each manuring a portion of the ridge is cut off and the plant is well earthed up to the collar. This will prevent borer attack and also encourage tillering. The final manuring is done five to six months after planting. Along with it the final earthing up is done by which operation the previous ridges are converted into furrows and furrows into ridges. The shoot portion is covered to about one to one and half foot height and the furrow is made one foot deep from ground level. Then bunds are formed in each half acre block so that water if left in the first furrow may flow to the last in a zig-zag manner without any interference. Where the level is not uniform and gradual, but steep and sudden the half acre block is further divided into two or four sub-blocks. Each sub-block is bunded strongly and beds made so that irrigation is done very efficiently and economically. No wrapping or propping is done for the crop. The crop is heavily earthed up to prevent lodging to a certain extent. Copious irrigation and free drainage are practised.

**Manures and Manuring.** Sugarcane is a crop that responds well to liberal manuring. Systematic green manuring during fallow and additions

of all available compost, farm-yard manure and poudrette before and after planting are beneficial to the crop. Molasses and press cake by-products in sugar manufacture are profitably utilised by their application to the soil during fallow and ploughing them in after a shower. This is specially useful for reclaiming alkaline and saline lands. Besides these, nitrogen, potassium and phosphorus are given in the form of oil cakes and ammonium sulphate. Superphosphate is specially used in alkaline patches. The usual quantity of manure is 2 cwts. of ammonium sulphate and  $2\frac{1}{2}$  tons of castor or groundnut cake given in 3 or 4 doses in the same proportion of 1:10 (nearly).

**Pests and Diseases.** Fortunately in this tract red rot and mosaic which have proved the bane of cane crops in several parts of India are still unseen and it is hoped that with a little care in the selection of material at planting time, these can be prevented in the future. Stem borer *Diatraea sticticrasis* and top borer *Scirpophaga nivella* are frequently found to infest cane in this tract. Their attack is minimised by timely planting and by copious irrigation during summer. Moths are collected at night by light traps, on a mass scale.

*Pyrilla purpusella* is another pest which makes frequent visits. It is found to be harmless if it attacks a grown up crop but in young plantation its damage is considerable. Bagging and other remedial measures are done to lessen the damage to the crop.

*Striga lutea*, *Striga densiflora* and *Striga euphrasioides* are rampant in the tract specially in black soils. All the sorghum fields have been brought under cane cultivation since the inception of the project. Therefore striga proved devastating in the initial stages. Regular and timely intercultural operations, uprooting the weed and preventing the plant from flowering whenever it appears in any nook or corner of the field have been successful in keeping the weed under control. This method of dealing with the parasite was expensive in the initial stages but all the same the experience at the place shows that the weed can be brought under control within a year or two.

**Harvesting.** Twelve or eighteen months after planting according to the season (*Ekasali* or *Adsali*) the crop is harvested after testing for maturity of the crop. From September onwards at regular intervals samples of cane are taken to the factory laboratory and tested for maturity. After the chemist certifies that the canes from particular fields have become mature to give good recovery, those fields are harvested. Harvesting is done by cutting the canes by a cane cutter to the bottom most portion or by uprooting the stools by crowbars. Then the canes are stripped of leaves, cut into bits of convenient size, 20-30 sticks made into a bundle and sent to the factory by carts or lorries or by factory's own railway line.

With cultivation on scientific lines an average yield of 40-60 tons for *Adsali* crop and 25-40 tons for *Ekasali* is obtained in these lands. After

harvesting, the same field is kept as ratoon without planting again, from which 15 to 20 tons yield is obtained. One ratoon can be profitably kept in rich soils while a second ratoon even in fertile soils is inadvisable as it will harbour pests. In a sugar factory estate it is not possible to have an alternative crop like paddy in rotation. Therefore after one or two successive crops the land is kept fallow and green manures are grown and ploughed in.

**Acknowledgements** I acknowledge my grateful thanks to Mr. Tarapore, the General Manager and Mr. Haquani, the Assistant General Manager of Nizam Sugar Factory Ltd., Bodhan, for their guidance in the preparation of this paper.

### Appendix.

#### Cost of cultivation of sugar cane per acre of Adsali or 18 months crop.

##### Preparatory Cultivation.

###### Ploughing by machinery:—

Double ploughing, harrowing and ridging	...	...	Rs.	25	0	0
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###### Preparing beds:—

Making plot bunds	...	...	...	Rs.	2	0	0
„ field channels	...	...	...	Rs.	2	0	0
„ field drains	...	...	...	Rs.	3	0	0
Dressing of furrows	...	...	...	Rs.	3	0	0

##### Seed and sowing:—

Harvesting for seed (a) Harvesting stripping etc.	...	...	...	Rs.	0	12	0
10000—15000 setts. (b) conveying into field for 2½ tons...	...	...	...	Rs.	0	8	0
Cost of seed (2½ tons @ Rs. 20 per ton)	...	...	...	Rs.	50	0	0
Planting	...	...	...	Rs.	4	0	0
Weeding: 3—4 times. 1st and 2nd weeding @ Rs. 1—8—0	...	...	...	Rs.	5	0	0
each and 3rd and 4th weeding @ Re. 1 each	...	...	...	Rs.	5	0	0
Mulching and hoeing—4 times @ Rs. 1—4—0 each	...	...	...	Rs.	5	0	0

##### Manuring:—

Cost of manure—2 cwts of Ammonium sulphate	...	...	...	Rs.	22	0	0
@ Rs. 11 per cwt.	...	...	...	Rs.	88	0	0
2½ tons of oil cake @ Rs. 55 per ton	...	...	...	Rs.	10	0	0
F. Y. M. compost, green manure etc.	...	...	...	Rs.	6	0	0
Application of 3 doses @ Rs. 1—8—0 per application	...	...	...	Rs.	6	0	0
Rs. 4—8—0 powdering cake and conveying within field as. 8 per application.	...	...	...	Rs.	6	0	0

##### Irrigation:—

35—40 times in red soils 20—25 in black soils	...	...	...	Rs.	24	0	0
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Maintenance of drains and field channels	...	...	...	Rs.	2	0	0
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##### Harvesting a 40 tons crop and transporting up to factory site @ Rs. 2 per ton

0—12—0 for harvesting and stripping, 0—4—0 for conveying up to rail site Re. 1 Loading in bogies and cost of transport (per ton)	...	...	...	Rs.	80	0	0
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Assessment (including watercess)	...	...	...	Rs.	48	0	0
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**Supervision charges :—**

1 supervisor	Rs. 75	} per month for 300 acres.	...	Rs.	13 5 0
3 fieldmen	Rs. 75				
6 maistires	Rs. 72				

**Miscellaneous :—**

Watchmen	...	...	...	Rs.	3 0 0
Pests and diseases control	...	...	...	Rs.	5 0 0
				<b>Total Rs.</b>	<b>401 9 0</b>
				or Rs.	400 0 0

40 tons crop valued @ Rs. 13 per ton.	Rs.	520	
Expenditure.	Rs.	400	
	<b>Profit.</b>	<b>Rs.</b>	<b>120 per acre.</b>

For Ekasali (12 months crop) the margin of profit will be reduced to about Rs. 70 while for ratoon it will be Rs. 50 nearly.

*Note.* All the above calculations are done in terms of O. S. Rupees. 116 O S. Rupees are equivalent to Rs. 100 in British Indian currency.

**SELECTED ARTICLE****Economic Factors in Agricultural Development.\***

By K. C. RAMAKRISHNAN, M. A.

(Continued from Vol. xxix, p. 197).

**III. Effects of Land Tenure and Taxation.** Conditions of tenure and taxation of land play an important part in promoting or impeding agricultural improvement. For more than a century in Great Britain leadership in farming was in the hands of landlords who had enlarged and enclosed their estates by buying off the numerous strips of yeoman farmers, often with the profits made in trade and invested capital in long-term improvements like drainage works and farm buildings and did pioneer work in the cultivation of better crops and the breeding of pedigree stock. It is the success of these ventures that made Britain the pioneer of modern agriculture, as well as of large-scale manufactures. This period of prosperity lasted for over a century—from 1750 to 1870. After 1870, however, American competition killed cereal farming; there was a continuous fall in rents, while the cost of cultivation, particularly wages, increased. Arable farming gave place to grass farming and stock-raising. Industries were more paying than agriculture. Industrial magnates bought land more for its amenities and social prestige than for its profits as a farm enterprise or for the love of agricultural research. Research indeed passed into the hands of several specialists and it was beyond the capacity of any landlord to set himself up as a leader in science or technique. Continuous increase in income-tax and death duties led to the break-up of big estates and many old farmers became, in the first thirty years of this century, occupying owners with the help of the State. But a decade of falling prices has impoverished these owners too, who have little capital left to work their farms. Small holdings in certain specialised lines of agriculture like dairying, fruit culture and vegetables are still favoured, but for staple cereals large scale mechanised farming with State ownership of land and control of cultivation is advocated.

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It is strange that when such radical changes have been going on in Britain for many years now, so many British administrators coming over to India even in recent years should harp upon the British tradition of landlord-leadership in scientific agriculture and appeal to the landed aristocracy in India to give a lead in agricultural improvement.

We can understand Lord Cornwallis, the author of the Permanent Settlement in 1793, expressing the hope that the zamindars (in Bengal) would exert themselves to spread and improve cultivation in their estates, of which they had just then been made proprietors and assured immunity from enhancement of *paishkash* which they had agreed to pay. He had evidently in his mind the contemporary English 'improving landlord.' Some zamindars no doubt had the jungles cleared, canals cut, tanks dug, and temples and ghats built. The area of cultivation was extended. But there were few zamindars either in Bengal or in other provinces, where the Permanent Settlement was soon after introduced, who took any active interest in cultivation, even on their own home farms, of the better types of crops with better implements and fertilisers or in the improvement of livestock, the breeding and rearing of which were carried on by backward tribes. Most of the zamindars went on rack-renting with the growing competition for land, using their power to evict tenants as a lever to enhance the rents. Even after the enactment of tenancy laws the provisions for the commutation of kind rents, for the occupation of old wastes, and the summary recovery of dues were all abused to such an extent that tenants have been crying for reduction of rates to the levels prevailing in neighbouring ryotwari areas, which are themselves quite high.

The abuse of the system reached its worst in Bengal, where most of the zamindars became absentee landlords and a series of intermediate tenure-holders with rights of their own have sprung up between the zamindars and the actual tillers of the soil. The ryots in other zamindari tracts too are not all cultivators; many of them let out their lands, of which they have now occupancy rights, to impetuous labourers for a fixed or sharing rental. Such a dissipation of interests in cultivation is not conducive to any improvement in agriculture.

Nor are all the ryots in ryotwari areas cultivating their holdings. Big as well as small ryots have mostly fragmental holdings; little or no attempt is made to consolidate and improve them; and the different fragments are generally sub-leased to different petty tenants-at-will, most of whom live on the margin of subsistence. Those who cultivate on the *varam* or crop-sharing tenancy system—analogue to the metayage in Europe—either as tenants of zamindars or of ryots have the least incentive to effecting any improvement. Where, however, fixed cash leases are the rule, as in the case of valuable commercial crops, and the tenants are men of resources and spirit of enterprise, they invest capital in the purchase of better seeds and manures. Except in the case of tree crops, as in Malabar, such tenants are not anxious to stick to the cultivation of particular pieces of land. They move from one land to another paying rents according to soil, irrigation and market facilities.

The Royal Commission on Agriculture pointed out incidentally—land tenure was outside the terms of reference—that large scale farming 'though open to many is practised by few'. Among the reasons given, tenancy legislation, the primary object of which was to confer security of tenure on ryots in the estates, is said to have rendered it difficult for large land-holders to obtain unrestricted possession of compact blocks of land. But we wonder if many of them are yearning to practise scientific farming for the benefit of themselves and their ryots, after missing splendid opportunities to set up model home farms in the past.

Sir John Russell reviewing the progress of agricultural research and its application in India in 1937 lamented the lack of agricultural aristocracy

analogous to the British landlords or the large farmers, "rooted in the soil and ready to try any improvements suggested by experimental stations and anxious themselves to devise improvements, which are sometimes better than those of the experimental stations". Whatever the past might have been, recent investigations like those of Astor and Rowntree tell a different and distressing tale of large farmers in Britain.

In respect of dairy industry again, Mr. F. Ware, an authority on animal husbandry, has suggested that "the wealthy land-owning classes of the country might give their support by maintaining high grade herds of pure bred indigenous dairy cattle and by supplying approved sires for use in the villages."

Agricultural reform in other European countries took a different turn from that in England. After the Napoleonic wars, measures were taken to abolish serfdom on land in most of the Western European countries; and the Code Napoleon established equal inheritance of land among all the sons of a father. With the growth in population in the 19th century holdings naturally tended to become smaller in size. There were few landlords left of the type of English landlords, except in East Prussia. In fact the State offered little encouragement for the growth of big estates, while steps were taken to break them up and settle the workers as proprietors. Consolidation of fragmented holdings was effected by permissive legislation in most countries and the subdivision of holdings below the minimum economic unit was prevented by law. There was indeed little of the worship of the large estate as in England, though the economies of large-scale production and marketing were before long appreciated. Such economies were effectively realised by the variety of co-operative organisations, most of which were inspired by the spur of necessity to meet the American competition. It was found that in respect of production in certain lines, small holdings were by no means inferior to large ones, and much of the land was devoted to such specialities. The processing and marketing of such crops demanded more of co-operative effort, and hence it is that all over Western and Northern Europe, co-operation has been treated as a necessary complement to peasant proprietorship. For instance, in Denmark it is not the big farmer that is reputed to breed and rear good cows. More than 90 per cent of the herds consist of less than 15 milch cows each. Though Denmark took up the development of dairy breeds long after England, the red Danish cow is not inferior to any English breed in respect of yield of milk and butter fat. This has been achieved by the co-operation of the State department and the peasant co-operatives for milk recording etc. Progress has been achieved in smaller lines—in the production of oats, barley and potatoes by Belgian peasants and in the raising of wheat fruits and vegetables by the Dutch peasants almost entirely by their multifarious co-operative organisations. Scandinavian and Baltic States achieved equally remarkable progress by co-operative methods. An agrarian reform amounting to a revolution was effected in Central and Eastern States of Europe after the last war by the conferring of ownership rights on cultivators and by the break-up of big estates, which were not fully compensated; and even here co-operation was called in to the aid of the new peasant proprietors.

With such splendid models before them of progress achieved by peasants co-operatively organised, we wonder why the British authorities should still go on appealing to effete landlords instead of earnestly helping to build up a sound, all round, co-operative movement, which has been the greatest instrument of agricultural progress all over Europe. Perhaps as Mr. L. D. Gammans of the Malayan Civil Service says: "The Englishman in the East is probably more ignorant of co-operation than most other Europeans. With the exception of

consumers' store, which does not appeal to any great extent to the educated classes from which the British official is largely recruited. Co-operation in Great Britain is little developed. The ordinary Englishman is apt to know little of its other possibilities and is less conversant with the co-operative organisation of agriculture than the German, the Dutchman, or the Dane."

Though peasant proprietorship is on the whole the best system of tenure in India where capitalistic or socialistic large scale farming is out of the question on account of the nature of crops, the scarcity of land and the abundance of labour, it is neither possible nor desirable to do away with tenant-farming. There are good cultivators who do not like to have their little capital locked up in the purchase of land, which is better used in working the farms that they take up for lease from time to time. An impartial tribunal that will fix up fair rents and compensate for loss for any premature eviction, combined with facilities for co-operative credit, supply and sale would for them be ample substitutes for the 'magic of property' in land.

In fact co-operative societies may be organised by tenants who can take on lease a large piece of land or several pieces from one or more landlords. Joint farming may be tried or at least an attempt may be made to consolidate cultivation units and each member may take charge of one unit. The bargaining power of such co-operative ventures will be greater than that of petty individual tenants competing among themselves. The advantage may not be on the side of tenants alone. Many an absentee landlord and institution owning land, not to speak of reasonable local landlords, would be pleased to deal with a well-knit co-operative organisation than with a number of poor tenants. Agricultural graduates can play a great part if they can organise and manage such societies taking on lease the lands of temples, endowed charities and institutions and the lands that have come into the hands of co-operative banks, insurance companies, etc., even as their confreres in America have organised themselves into agricultural management companies for a similar purpose. They can serve as managers and share the profits of the enterprise with all the working members. They can set a higher standard of cultivation and reduce the evils of a recklessly competitive and wasteful tenancy system.

Land revenue in ryotwari areas, assessed on the theory of State landlordism and revised only in 30 years, was felt to be a heavy burden even in periods of rising prices. It is certainly oppressive in a period of falling prices and intolerable in years of drought, when remissions are by no means liberal. At any rate the rigidity of the rate with no automatic provision for remission in years of scarcity of rains or of fall in prices is not conducive to the investment of capital in agricultural improvements except of the kind, like sinking of wells for which provision has been specially made for exemption from enhancement of rates. This exemption has surely given a great fillip to the digging of wells and the mechanical lifting of water in some districts. The exemption need not indeed be permanent, but may be reduced to a period of 30 or 40 years as in the Punjab, without detriment to improvements.

The comparatively well-off ryots dissipate their extra earnings got in years of better yield or higher prices, or divert them to the purchase of more land rather than invest them in any substantial improvements on the land they already have. Agricultural experts should look for such opportunities and induce such earnings to be invested in improvement of land or purchase of plant like the water-lift, tractor-plough, cane-crusher etc.

Land revenue is said to be a tax on land and not on persons and is being imposed on all alike. It is a regressive tax pressing unduly on the poor, who have in good years little left to spend on improvements. Taxation of higher

agricultural incomes, over and above a reduced flat rate of revenue, is bound to be introduced in all provinces, as it has already been done in Bihar and Assam. With a view to encourage greater productivity on land, concessions may be shown for improvers of land and crops by making liberal allowances for expenditure on improvements of approved types.

The existing system of taxation of water is not scientific and it leads to a lot of waste of water and injury to the land. But volumetric taxation of water would be costly to administer without a system of co-operative distribution of water among the users. Exemption of charges now granted for the use of water in growing green manure crops may well be extended to use of water for raising fodder crops in areas with a deficiency of fodder. A part of the local land cesses now spent by local bodies on a variety of objects may be earmarked for agricultural improvements by the organisation of propaganda, demonstration and systematic instruction by itinerant teachers employed by District Boards, even as County Councils are doing in Great Britain.

Export duties on manurial resources like oilseed, bones and fish have been time and again recommended by agricultural experts with a view to bring down their prices and induce greater use within the country, so as to conserve soil fertility and produce better yields. Such duties might in the first instance hit producers of such materials, though the merchants would be hit more; but in the long run they would stand to gain by greater demand within the country and the reduction of middlemen's profits in internal trade.

Import duties on competing foreign produce with a view to stabilise the prices of home produce have been freely resorted to in almost all European countries. But for over a century the free trade policy of Great Britain has stood in the way of any similar protection to her crops, and incidentally to our crops too even when the need has been felt for it in recent years. South Indian producers, having to incur greater costs of cultivation on older soils and irrigated lands, have been crying in vain for protection from Burma and Siam rain-fed rice and Ceylon plantation copra. The greatest and the most successful departure from free trade tradition has been made in the case of sugar—though more in the interests of manufacturers than of cultivators—and this accounts for the sudden expansion of sugarcane area even in South India, which really is better fitted to grow cane than North India, but suffers from want of factories to absorb the canes grown. An extension of such protection to other crops may be opposed on the score of the poverty of consumers. There is also the danger that it may remove an important spur to improvement; for the temptation to go to sleep behind the tariff wall is greater in this country.

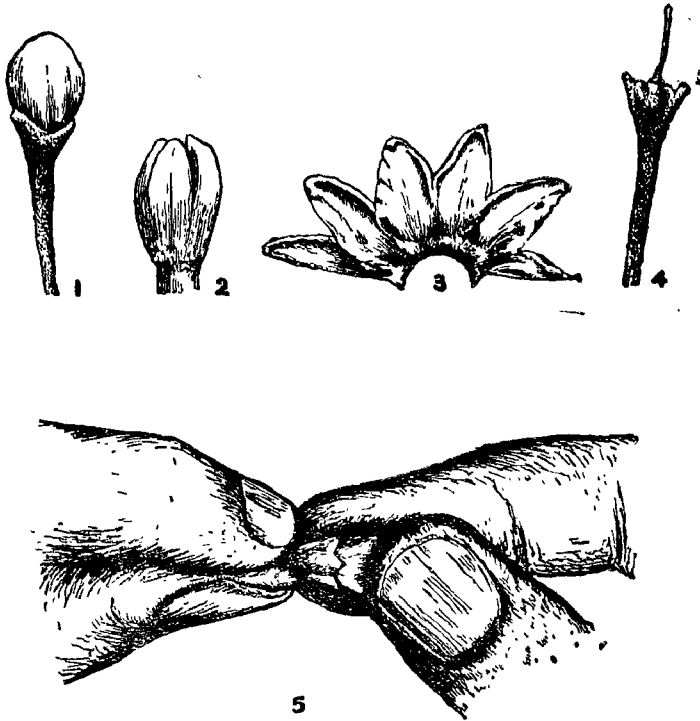
This course of lectures, it is hoped, has brought out the dominant importance of the economic factors in the development of agriculture, which educational and research workers will have to take into account. Nowhere has the importance of agricultural economics been so well recognised as in the United States. It would, therefore, be fitting to conclude this course with an extract from a statement made twenty years ago by H. C. Wallace, the famous Secretary of Agriculture, who organised the Bureau of Agricultural Economics.

"Help in their economic problems is now the most urgent need of our farmers. This is not to say that the Department is losing sight of production matters. The farmer needs all the help in his production problems that the Departments of Agriculture, Colleges and experimental stations can give him; but the need of the most importance now is the development of an entirely new realm of organized knowledge bearing upon the economic factors of agriculture, looking towards cheaper production, improved methods of distribution, and the enlargement of markets, all to the end that the prices the farmer receives shall be more fairly related to his cost of production."

# Research Notes.

## Emasculation in Chilli (*Capsicum annuum*).

Emasculation, the first and the most important operation, to be attended to during the process of hybridization entails a good lot of care and vigilance on the part of a plant breeder. Often it is done by completely removing the stamens one by one with a pair of forceps or scissors, before the anthers begin to burst. This method of removing the anthers takes time and often, in spite of the several precautions taken, one or more stamens are left in the flower, specially in those where several stamens have to be removed.



1. Chilli flower bud ready for emasculation. 2. The tubular corolla removed. 3. The corolla spread out showing the epi-petalous stamens. 4. The gynoecium as left intact after removal of the corolla. 5. A view of the process of removal of the corolla.

In chilli the stamens are all epipetalous, and the corolla is so brittle that the tubular corolla can easily be removed without any injury being caused either to the ovary, the style or the stigma. When the fully matured bud, which is expected to open the next day, is slit at the corolla to remove the anthers one by one, it was found that in some cases the tubular corolla came off easily leaving the gynoecium intact. This led us to try if the epipetalous corolla cannot be removed wholesale instead of attempting to remove the stamens by one.

The pedicel of the flower is held between the thumb and the forefinger of the left hand, having a careful and firm grip of the calyx enclosing the stigma. It is quite gratifying to note that this method of emasculation gives as much percentage of setting as the usual method of removing anthers

forceps etc. and one great advantage was saving time. Detailed data regarding the number of flowers that could be operated in a fixed time by both the methods and the percentages of setting are being collected. Even illiterate coolies, specially women were able to do this operation with the greatest amount of confidence giving a very good percentage of setting. Preliminary trials were conducted with tobacco flowers also where the results are quite encouraging. The method appears promising for most epipetalous flowers.

Agricultural Research }  
 Station, Guntur. }  
 1st. May, 1941. }

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## ABSTRACTS

**The Control of Lantana by a Sodium Chlorate Spray.** Griffith A. L. *Indian Forester* 47 (1941): 107-114.

Lantana is a well-known troublesome weed in many parts of Madras province, especially in the West Coast districts Coorg, parts of Nilgiris and hilly parts of many other districts. Some experiments on the control of this weed with chemical sprays are being conducted by the Madras Forest Department. Several chemicals were tried including sulphuric acid, copper sulphate, Atlas tree killer, arsenic acid and sodium chlorate. Of these, the most effective and at the same time economic method is the use of three sprays of sodium chlorate at intervals. The solution is prepared by dissolving  $\frac{1}{2}$  lb. of commercial sodium chlorate in one gallon of water. Two ounces of casein are added as a "spreader". A little slaked lime or a pinch of soda is sufficient to dissolve the casein in water. The first spray is best done about February at the commencement of the hot weather and consists of 24 gallons of solution sprayed evenly per acre. Withering of leaves is seen on the same day and within 5 to 7 days all leaves completely wither and the top twigs dry up completely to a length of 3 to 4 feet. The second spray of 8 gallons is done in April about three months after the first spray, when the regrowth and the seed germination are complete. The second spray kills most of the regrowth and the new germination but in some cases a third spray is necessary as some of the older stumps give rise to weak basal shoots. The third spray consists of about 2 gallons per acre and is done about September or October i. e. roughly 9 months after the first spray. If the cleared area is left as it is, it takes two to three years before birds and animals have brought back the pest. The total cost of these operations (at pre-war prices of the chemical) is estimated at Rs. 10 per acre which compares favourably with other successful methods viz. Rs. 15 for girdling the stems and poisoning them with arsenicals or Rs. 13-8-0 for cutting and burning the growth and controlling regrowth with sodium chlorate spray.

K. C. J.

**Does Fertilizer Affect the Arrowing of Cane?** H. W. Kerr, *Cane Growers' Quarterly Bulletin, Queensland*, 8 (1940): 76.

Inspection of a field that had received various fertilizer treatments showed that the percentage of arrowing was abnormally high on some of the plots, and that this difference had some relation to the differences in fertilizer treatment. Counts were therefore carried out and figures obtained in respect of the individual fertilizer treatments. The results showed that where the cane received no sulphate of ammonia fertilizer, the percentage of arrowed stalks was 71; where 200 lbs. sulphate of ammonia per acre had been applied, the percentage of arrowing was 54, and where 400 lbs. sulphate of ammonia had been used, the percentage was only 11.

These figures illustrate strikingly the influence of sulphate of ammonia on the degree of arrowing of the crop and emphasize the importance of applications

of the correct manures in the correct proportions for best results. A stalk which has arrowed can make no further growth (except by "side shooting"), no matter how favorable the growing conditions may be. In a favorable spring season, unarrowed stalks may take advantage of beneficial growing conditions until they are harvested.

Varying amounts of phosphate and potash were also included in the experiment referred to, but these plant foods appear to be without influence on arrowing. (*Facts about Sugar* 36: 39).

**Sheep breeding research in India**—Sahahi, H. B. *Indian Farming* 2 (1941): 61–65.

According to the Livestock census of 1935, there were over 25 million sheep in this country, of which 12 million were to be found in Madras, first in rank in India. The Indian sheep industry, if systematically organised and developed, is capable of yielding far better returns. There have been in the past a few spasmodic and intermittent efforts to improve sheep breeding, but no account is available of the progress made or why the efforts were abandoned. Some cross-breeding experiments were conducted with imported rams. There was an increase in the wool yield from 1½ to 7 lb per head, per annum. Nothing could, however, be done to stop the tendency of the cross-breeds of the second, third, and fourth generation to lose size. The Imperial Council of Agricultural Research, has now taken interest in this question and schemes are financed in Madras, Punjab, Bombay, Kashmir and Mysore. The details are as follows:—

(a) *Madras*. The lambs of the Bellary breed consist of black-faced lambs and a few white-faced lambs. The latter are delicate in constitution and cannot stand up to adverse conditions. The object of the breeding research is to raise a flock which will yield 4 to 5 lb. of wool per sheep, per annum. It is also proposed to use rams of Bikaner breed, with the hope of producing a breed which will not only yield more and better wool but also respond to feeding and fatten easily. The other items of study are, the effect of two lambing periods in a year on the constitution of the ewes, the best time for castration, the effect of shearing twice on the wool yield.

(b) *Punjab*. Systematic improvement of Bikaner breed is in progress at Hissar. The best methods and times of mating, docking, shearing and castration are being ascertained. A study of the effects of washing on the growth of wool is also in progress.

(c) *Bombay*. Studies are made on mating, shearing, docking, castration of Deccani flock and the husbanding of grazing resources. The work carried out so far has shown that the Merino is adaptable to the Deccan environment but certain precautions are necessary. The best time for docking is found to be when the lambs are 14 days old.

(d) *Kashmir*. Cross-breeding experiments are proposed to be conducted with selected local ewes and imported rams.

(e) *Mysore*. Special studies will be undertaken on the relation of feed to quantity and quality of wool, longevity and wool production of the mother and progeny and the effect of castration on mutton and wool, etc. The scheme relating to analysis of wool is being undertaken by the Technological Department of the Bombay University. It will be a news to many to learn that Australia built up its present world renowned wool trade from a foundation stock of Indian sheep. The Merino is stated to owe its origin to the fat-tailed Dumba of Northern India. There seems no reason, therefore, why India should not follow the example.

M. K. R.

**Eleven years' results of continuous manuring of Paddy at Mandlay U-Tin.** *Ind. Jou. of Agr. Sci.* 11 (1941).

The object of the experiment was to study the influence of various manures on the soil of the Mandalay Farm and in particular the manner in which the soil fertility is affected by repeated applications of chemical and organic fertilisers. The different manurial treatments were (a) lime, 5 cwt. CaO per acre once in 4 years (b) sodium nitrate, 40 lb. N<sub>2</sub> per acre (c) Ammonium sulphate



40 lb. N per acre (d) superphosphate 40 lb.  $P_2O_5$  per acre (e) bonemeal, 40 lb.  $P_2O_5$  per acre (f) Potassium sulphate 40 lb.  $K_2O$  per acre. (g) Ammonium sulphate 40 lb.  $N_2$  per acre plus superphosphate, 40 lb.  $P_2O_5$  per acre (h) Ammonium sulphate, 40 lb. N per acre plus superphosphate 40 lb.  $P_2O_5$  per acre plus Potassium sulphate 40 lb.  $K_2O$  (i) Farm yard manure, 40 lb. N per acre. The manures were applied shortly before transplanting. The plots are irrigated, the average rainfall being only about 33 inches. The soil is a heavy black clay of the carbonate solontschak type having a pH of about 8.05. All the manures except lime, bonemeal and potassium sulphate show significant increases over the untreated plots. Of the effective manures sodium nitrate is just significantly better than no manure, while ammonium sulphate alone is very much better than sodium nitrate but inferior to all phosphatic manures and to farm yard manure. Superphosphate alone, though inferior in yield to the two manurial combinations, has given a greater increase in yield from year to year. The three manures applied on a nitrogen content basis differ from one another significantly. From the mean yields it seems that nitrogen in organic form is the best while nitrogen as ammonia comes second. The results of this investigation on the effects of cumulative doses of various manures in relation to the corresponding control have been summarised as follows:— (a) it has been observed that the relative efficiency of manurial treatments shows significant variations from year to year. (b) Of the three nitrogenous manures, organic manure is the best with respect to the yield of paddy grain, while ammonium sulphate is much superior to sodium nitrate. (c) Bone meal shows no significant increase. This was to be expected in a soil of about pH 8.0. (d) It has been observed also that of all artificials only superphosphate applied alone at the rate of 40 lb.  $P_2O_5$  per acre has shown a significant upper trend (e) Farm yard manure shows a similar effect to superphosphate, though not so highly significant (f) Sodium nitrate and ammonium sulphate show negative trends. The former's trend is quite insignificant but that of the latter only just fails to reach significance. (g) The combined manures ammonium sulphate plus superphosphate and ammonium sulphate plus superphosphate plus potash show positive trends, but they are quite insignificant. It is suggested that the negative effect of ammonium sulphate has largely counteracted the significantly positive effect of superphosphate

K. R

**The effect of pruning at varying ages upon the yield of Ramai Rice.** Ramon D. Rojas (*The Phil. Agri Jour* 29: 1941; pages 851—860).

There is a popular belief among the farmers of the Philippines that pruning the leaves of rice seedlings would increase the yield of the crop. If leaf pruning has really the effect it is believed to have, it can become one of the most economic ways of increasing the yield, with the added advantage that it will provide the farmers with feeding materials for their work animals in the form of rice tops to supplement the rice straw which constitutes the main feed before the crop is harvested. The objects of the present study were: (a) to determine the relative effects upon the yield of Ramai rice of cutting off the leaves of the rice plant at different ages; (b) to find the age of plants at which cutting off the leaves would give the best yield and (c) to determine the influence of cutting upon the dates of flowering and maturity. The average duration of the variety under trial was 180 days—sowing to harvest—and the transplanting was done when the seedlings were 40 days old. The experiment consisted of the following treatments (1) control—(no pruning at any stage); (2) pruned at transplanting—no pruning later; (3) pruned at transplanting and 60 days later; (4) pruned at transplanting and 75 days later; (5) pruned at transplanting and 90 days later. The following conclusions have been drawn from the results of the experiment: (1) Lodging occurred immediately before and after planting in all the control

plots, although the degree varied. A higher degree was observed in plots where there was more water. In plots where the plants were topped when relatively young, they lodged about two weeks after blooming, whereas in plots where they were topped when old they lodged only just before harvesting. (2) Pruning the leaves affected slightly the dates of blooming and maturity. (3) Cutting the leaves in young plants not more than 115 days after planting increased the yield of grain. Thereafter, the yield decreased. The plants pruned at 100 days of age gave the highest yield; the plants that were pruned (seedlings) just before transplanting and that had no subsequent topping gave the second highest average. The third highest yield was obtained in the 115 days old treatment with an average computed yield. The last treatment which was pruned at 130 days of age was the lowest. (4) The difference in yield between 100 days old treatment and control was highly significant. The same was true of the 130 days old treatment and the 100 days old. Other comparison with significant differences are 130 days and the control; 130 days and 40 days; 100 days old and 115 days; 115 days and 130 days. All others were insignificant. (5) The highest computed net gain was obtained in lot III—100 days old. The second was obtained in lot II. The other lots received less. (6) Based on the results obtained, it may be concluded that under conditions existing in Los Benos pruning the leaves of rice at an early stage of development would be profitable, because, besides the increase in yield, the cut tops represent an additional gain since they can be used as fresh succulent feed for animals.

K. R.

## Gleanings.

### Unscientific Potato Storing Involves Enormous Losses.

**Agricultural Marketing Adviser's Report.** Losses incurred owing to unscientific methods of storing potatoes, particularly seed potatoes, are described as enormous, in the report on the marketing of potatoes in India and Burma issued by the Agricultural Marketing Adviser to the Government of India. The Report estimates the annual loss in storage and during the process of marketing at 8,553,100 maunds valued at Rs. 1,65,79,000. The percentage of loss increases with temperature. In five months, the loss due to the transpiration and respiration processes alone at a temperature of 60 degrees Fahrenheit is 11.56 per cent. The loss would be still greater at a higher temperature at which potatoes are normally stored in India. So heavy are their losses that cultivators have to take special pains to carry over the stock of seed potatoes from one season to another. In certain cases, it is almost impossible to preserve the seed potatoes from one season to the next. This loss in storage seriously affects prices and militates against a reduction in the cost of production.

**Seasonal rise in Prices.** Although the seasons of harvesting in different parts of India overlap to some extent, considerable gaps remain, rendering it necessary for growers and merchants to store potatoes in order to meet the demand in the off season. The seasonal rise in the price of potatoes is a well-known tendency. During February and March, they sell at Rs. 1-8-0 to Rs. 2-8-0 per maund but from July to November prices go up to nearly double. The rise in the price of seed potatoes is even higher. At harvest time, prices range from Rs. 1-8-0 to Rs. 2-8-0 per maund, but after six months, prices go up in most of the markets, particularly in the United Provinces, Bengal, Bihar and the Punjab from Rs. 5-0-0 to Rs. 14-0-0 per maund.

**Why prices rise.** In spite of such high prices, however, merchants and growers who store potatoes do not make much profit as more than 50 per cent is generally lost during storage. If this loss could be reduced, prices would not

rise so steeply, producers would obtain seed at a cheaper rate, and costs of production generally would be reduced. The problem of storage, the Report continues, is rendered difficult by the fact that the main crop is followed by a long and hot summer, and it is necessary that proper arrangements should be made for storage under low temperature. The main problem is to protect stored potatoes from high temperature in the summer months. Cold storage facilities exist at the ports, but they are not generally availed of, except at Karachi.

**Reasons for apathy.** There are several reasons for this apathy, the Report states. "Firstly, people have not yet realised the advantages of cold storage and few have seriously thought of utilising the cold stores for storing a cheap and semi-perishable commodity such as potatoes. Secondly, the ports are at long distances from the main producing centres and the cost of transportation to the cold stores and rents for storage have been rather high. The importance of cold storage of potatoes is however being realised gradually and in recent years cold stores have been erected exclusively for potatoes in important producing centres such as Meerut, Sialkot, Patna and Jammu. In Sind, the main producing area is within a few miles of Karachi and growers have freely made use of the available cold storage facilities both for table and seed potatoes. The cold storage of potatoes on a commercial scale was started in Karachi as early as 1932. The prices of potatoes in most markets are low from January to May and high from June to November, the difference in some cases being as high as Rs. 2-0-0 per maund. Taking the cost of cold storage at four annas per maund per month, and the average period of storage at two months, the cost of storage at two months, the cost of storage *plus* other incidental charges, such as interest on capital, would come to about 12 annas per maund, which leaves a margin of more than a rupee per maund.

**Greater Seed Potato Losses.** Seed potatoes have to be preserved for six to seven months, and losses in their case are enormous under present methods. The differences in the prices of seed potatoes at harvest time and at planting time, ranging from Rs 2-0-0 to Rs. 9-9-0 per maund indicate the possibilities of using cold storage for seed potatoes. A considerable amount of research work has been done on the effect of storage temperature under the cold storage scheme at Poona, financed by the Imperial Council of Agricultural Research.

**Advantages of cold storage.** Potatoes fetch a very low price during the harvest season, and while growers would score from storing a part of their produce and releasing it to the market gradually, it is not always possible for them to do so under existing conditions. The grower does not have sufficient funds to finance his own produce and has to depend largely on money lenders and commission agents. Apart from his rent, he has to meet many other financial liabilities after harvest. This results in an abundance of supply and a consequent fall in prices. A widespread use of cold storage facilities appears, therefore, to be the only way of regulating supplies and prices. (*Indian Information* 8 (1941) : 246)

**A recipe for fungus diseases.** The following recipe is highly recommended in an English horticultural journal as being almost infallible for mildew, scale, mealy bug, red spider and thrips 2 oz. flowers of sulphur worked into a paste with water ; 2 oz. washing soda,  $\frac{1}{2}$  oz. common shag tobacco, and a piece of quicklime the size of a duck egg. Pour them all into a saucepan with one gallon of water, boil and stir for  $\frac{1}{2}$  hour. Then let it cool down and become clear. Then pour off and leave the sediment. The mixture will keep a long time if kept closed up. When spraying, use the mixture undiluted. —*Jou. Jam Agr. Soc.* 44 (1940) 439.

**Egypt Interested in Indian Tobacco.** Egyptian firms and factories, which showed little interest in Indian tobacco in the early part of 1940, have now begun to examine the question of importing Virginia flue-cured tobacco from India. Prospects are promising in view of the curtailment of other sources of supply and of the increasing popularity of Virginia cigarettes. Importers in Egypt have been introduced to exporters in India by the Indian Government Trade Commissioner, Alexandria. Much of course will depend upon satisfactory contacts to establish a good reputation for Indian tobacco and to make supplies according to samples. (*Indian Information* 8 (1941) : 242.) \* \* \*

**Indian Tea.** India is the third largest supplier of tea to the United States, the leaders in the trade being Ceylon and the Netherlands Indies. (*Indian Information* 8 (1941): 207.) \* \* \*

**Potatoes.** The latest report on the marketing of potatoes in India and Burma places at 8,553,100 maunds, valued at Rs. 1,65,79,000 the annual loss involved in storage and the process of marketing potatoes. The higher the temperature the greater the loss, says the report. (*Indian Information* 8 (1941) : 207). \* \* \*

**India Ships 3,000 Tons of Timber in Fortnight** To meet war supply demands nearly 3,000 tons of timber were shipped from India during the fortnight ending March 25, 1941. Capacity and output for lorry body building and nearly all branches of munitions are steadily increasing. The manufacture of field artillery tractors is to be undertaken in Government railway workshop. The chief orders received by the supply Department during the previous fortnight are jute webbing, cloth for anti gas clothing and khaki drill for Australia and numerous items of engineering and general stores for India. (*Indian Information* 8 (1941) : 238).

## Correspondence.

To

The Editor, Madras Agricultural Journal.

### A Ryot's Testimony.

The Madras Agricultural Department has extended its aid to the ryots by posting one Demonstrator for each Taluk. It is regrettable that their acts and advices are being viewed with suspicion by a large section of the ryots who do not care to study facts and figures. I take pleasure in putting before the public the following experience to prove how in a tract like mine the sorghum strains of the Department can help the peasant.

The Agricultural Demonstrator, Kandukur supplied me with three varieties of Jonna viz. T. 1; T. 6 and M. 47-3 to compare with the local varieties. I gathered four local varieties and all the seven were sown in half acre plots of uniform fertility on the same day. Owing to the heavy rainfall which was more than 50 inches for the year and of which 10 inches were received after sowing, my trial resulted in very poor yields. But this seasonal factor did not affect the results, because all the strains were grown under the same conditions.

T-1 is the sweetest fodder and T-6 comes next. The grain of these two varieties is hard and does not produce as much husk as local varieties and the food also is sweeter than that of locals. In spite of the fact that these two varieties are more liable to attack by stem borer than others they excelled all in quality and quantity.

I appeal to my agricultural brethren to make use of this piece of evidence and regulate their professional efforts on modern lines.

Thumadu, Kandukur Taluk }  
Nellore Dt. 6-5-41. }

Yours etc.  
K. Sankaraiah.

# Review.

Report on marketing of grapes issued by the Agricultural Marketing Adviser to the Government of India. Manager of Publications, Delhi. Re. 1-4-0.

The grape vine belongs to the genus *Vitis*. In India there are about 25 species of *Vitis*. The varieties which are grown on a large scale are *Kishmish* and *Haitha* in Baluchistan, *Bhokari* in Hyderabad state and Bombay Presidency and *Tor* and *Bedana* in North-west Frontier Province. In the Madras Presidency the variety commonly grown in Madura and Krishnagiri areas is known as *Patchai drakshai*. The variety grown in Penukonda is a blue grape resembling the Bangalore variety. In India, grapes are available practically throughout the year though heaviest supplies are from July to October. In Madras and Bangalore, two crops are obtained in a year.

The total world area of table wine and raisin grapes is estimated at over 21,000,000 acres, the most important grape producing countries being Italy, Spain and France.

	(in 1935)	
Italy	9,654	(in thousand acres).
Spain	3,983	"
France	4,047	"

The area of grapes in India is about 4,170 acres and practically the whole of the produce is consumed as fresh fruit.

### Distribution.

Province or State	Year.	Area in acres.
Baluchistan	1936-1937	2,429
Bombay	1934-1935	957
North-west Frontier Province	do.	266
Madras	do.	250
Others less than 50 acres.		

The world production of all kinds of grapes in the year 1936 was 2,86,41,700 tons of which India produces 13,800 tons.

### Percentage of All-India production.

Baluchistan	49.7
Bombay	35.8
Madras	4.8
North-west Frontier Province	4.4
Mysore	1.7
Others	3.6
	100.0

The seasons for pruning and harvesting in India are as follows ;--

	Pruning.	Harvesting.	
Baluchistan, N. W. F. P. and Sind } }	March	June	One crop.
Bombay } }	April	November	First crop.
Madras } }	April	August	
Mysore } }	May	October	
Hyderabad } }			
Madras } }	September	February	Second crop
Mysore } }	October	May	

The yield of grapes in certain centres in India is far above that of other countries, of the world. The yields of table grapes in some of the grape growing countries of the world are given in the following table.

Country.	Yield per acre.
	lb.
United States of America (California)	7,678
Australia	4,220
France	4,064
Spain	2,405
<i>India.</i>	
Bombay	11,160
Mysore	11,610
Madras	6,000
North-west Frontier Province	6,000
Baluchistan	6,325

India's supply of grapes is very inadequate and she imports from foreign countries nearly as much as she produces. The average quantity of annual imports of grapes in India during the period 1932—37 was 8,300 tons of which 98 per cent was obtained from Afghanistan, the other sources of imports being the United States of America, Union of South Africa and Australia.

*Imports of grapes into India.*

	1932.	1936.
	(in thousands of tons)	
India	7.0	9.4

The number of vines per acre varies greatly from province to province according to the system of cultivation practised, from a minimum of 40 vines to an acre in Krishnagiri (Madras) to a maximum of 700 in Nasik (Bombay).

Baluchistan	300 to 450 vines per acre	
Bombay	700	" "
N. W. Frontier Province	160 to 200	" "
Madras	40 to 240	" "
Sind	300	" "
Mysore—local variety	135	" "
„ Imported varieties.	300	" "

The only country to which grapes are exported from India in an appreciable quantity is Burma. In the year 1935—1936 the amount exported was 2,194 maunds of which nearly 70 per cent was of Afghanistan and Baluchistan grapes.

In Baluchistan vines are grown in trenches 2½ feet deep running parallel to each other about 12 feet apart and the vines are trained on high ridges and therefore there is no need for wooden supports. In the North-west Frontier province the vines are trained on a low *pandal* of wooden poles usually 2½ to 3 feet above ground level. In the Bombay Presidency the vines are planted in parallel rows 7 to 8 feet apart each way and the vines trained on cuttings of *Erythrina indica* planted close to each vine. The crown is generally formed about 5 to 6 feet high. In the Madras Presidency the vines are trained on *panals* supported by stone-posts or bamboo stakes and in some cases brick.

The heaviest bunch of grape (Trebians) has weighed no less than, 26½ lb. In England where grapes are grown in glass houses, a bunch of Black Hamburg has weighed 21½ lb. and a berry of this variety has measured 4½ inches in circumference.

In the Madras Presidency, the cultivation is confined to three districts viz., Madura, Salem and Anantapur and the area in these places in 1934—1935 was

estimated at 150, 80 and 20 acres respectively. In the Madura district the chief growing centres are Michaelpatti, Vellodu and Kamalavaram villages situated near Kodaikanal Road Railway Station. In the Salem districts the centres are Krishnagiri and Dharmapuri, while in the Anantapur district there is a small acreage in Penukonda.

Mysore has an area of about 50 acres (1934—1938) of which 85 per cent is in Bangalore and in the adjacent villages.

Generally vines start bearing in the fourth year but they get into regular bearing stage in the sixth year. The age of grape vines in India is said to be the same as that of a man. In Penukonda there are vines of about 40 years of age bearing well. High winds, rains and disease affect the yield, very much. In 1933, in Krishnagiri the mildew disease was very severe and the entire crop failed.

**Prices.** Official figures regarding the prices of grapes are absent. The only source is the irregularly maintained account books of commission merchants. Prices are fixed either for the whole produce before harvest or per unit of weight of the produce obtained. The growers can get much higher prices by selling the produce direct in the local wholesale markets than by selling the produce to pre-harvest contractors. The highest average price of Rs. 1,350 per acre was obtained in Bangalore and the lowest of Rs. 300 in Baluchistan. In the Nasik, Kodaikanal Road and Krishnagiri tracts the average price per acre comes to Rs. 1,000, Rs. 845 and Rs. 355 respectively.

The growers are forced to sell their produce before harvest on account of pecuniary difficulties and the absence of a knowledge of marketing technique. The prices vary greatly from day to day, from year to year and from market to market. These enormous variations in daily prices create a serious marketing problem. A regular news service between producing and consuming centres and the provision of cold storage accommodation at important centres where excess supplies may be held over from one day to the next are very essential.

**Preparation for the market.** Much care and attention should be bestowed on how produce is prepared for the market. It is definitely better to clean and grade grapes than to sell them in mixed lots of bad, immature and good fruits. The system of 'topping' i. e. packing good fruits at the top and bad ones at the bottom of containers should completely be avoided. To reduce damage the bunches should be removed with a pair of secateurs and placed on trays with a smooth surface. The use of baskets which are very deep and which have a rough surface should be avoided since the berries get bruised. Soft, dry and inodorous packing materials such as paddy straw, rice husk, dry grass etc., should be used instead of leaves which generate heat during transit and damage the fruits. Cork dust is used as packing material for Australian, South African and Spanish grapes and saw dust for American grapes. While packing the bunches should be packed tight, otherwise they receive injury due to shaking. Due to bad packing the grapes do not remain in good condition.

**Grading.** Standard grade specifications for grapes grown in the Bombay Presidency and the North-West Frontier Province were fixed under the Government of India Agricultural Produce (Grading and Marketing) Act 1937. The results of experiments on grading and marketing grapes have definitely shown that higher returns are obtained by the sale of graded produce as against sales in the ordinary way.

**Assembling.** The system of assembling grapes by growers' associations is rare in this country. Two such societies are functioning in North-West Frontier Province and Madras Presidency and both these societies assemble the produce of their members, grade it for sale in different markets and the results achieved by them have been encouraging.

**Transportation.** The cold storage vans provided by the North-Western Railway have considerably helped in the distribution of grapes far and wide in the country. It is therefore desirable that similar facilities are provided by other railways.

**Storage and Preservation.** It is highly necessary to have cold stores in the important consuming centres where whole-sale markets are situated. In some in-land towns like Bangalore, Mysore, Hyderabad and Lucknow, cold stores have been erected. Irregular supplies at the consuming centres cause very high fluctuations in price. Hence there is a keen need for convenient storage facilities where excess supplies of one day can be held over to the next. Overseas grapes are kept in cold stores in port towns and released for sale as required. No attempts have so far been made for preserving and drying of grapes for the reason that the quantity of grapes produced now is readily disposed of in the green state. The manufacture of raisins, grape juice, vinegar etc. needs study and experimentation.

**Finance.** The commission agent plays an important part in the marketing of grapes. He finances the producers and the contractors and gives credit to the buyers. The village money lender also advances loans but charges high rates of interest. When the commission agents give advances to growers and contractors, the agreement entered into is that the entire produce is sold through them. Co-operative credit and sale societies might possibly be organised to give short term loans to producers and contractors who have become members of the societies. The system of granting loans for the development of fruit culture as is done in the Mysore State deserves the attention of other Governments.

In the Madras Presidency, loans on similar lines are granted under 'The Agriculturists' Loans Act' for planting fruit-bearing trees. In the United Provinces and the Punjab, fruit development boards have been organised with a view to advise members on technical matters, provide facilities in getting reliable plants, and arrange for the marketing of fruits of the members. Similar associations in other parts of the country would be of immense use in the marketing of grapes. The unit of sale varies from one market to another and sometimes even in the same market. For common understanding it is necessary that a standard unit of sale should be adopted in all markets. The passing of the standard weights act (1939) by the Central Government makes uniform progress possible throughout the whole of India.

**Research.** In India the classification of the different varieties of grapes has not yet been done. And very little work has been done in evolving new strains and varieties of grapes for more profitable yield than the existing varieties. Nothing has so far been done on improving the keeping qualities of grapes. Improvements on the yield and qualities of grapes are desirable and introduction of desirable varieties can also be undertaken. Experiments on grafting and budding should be conducted in the different centres of grape cultivation. The problem of training and pruning also deserves every attention. Experiments on methods of manuring with suitable manures for increased return should be undertaken. Pests and diseases levy a heavy toll upon the crops and hence suitable remedial measures should be devised to combat pests and diseases. The supply of reliable fruit plants to the growers are of very great importance. There should be a system of registering approved nurseries from which genuine plants could be supplied to the people. Much work in this direction has been done in Punjab. No attention has so far been paid towards propaganda and advertisement of fruits and fruit products. Exhibition of attractive posters, distribution of pamphlets, use of the cinema and broadcasting are the methods which may be explored. The Government of Baluchistan has done much work in this direction.



## Crop & Trade Reports.

**Cotton Raw in the Madras Presidency.** The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 30th May 1941 amounted to 269,262 bales of 490 lb. as against an estimate of 503 500 bales of the total crop of 1940-41. The receipts in the corresponding period of the previous year were 274,728 bales. 260,248 bales mainly of pressed cotton were received at spinning mills and 22,457 bales were exported by sea while 87,553 bales were imported by sea mainly from Karachi and Bombay. (*Director of Agriculture, Madras*).

## Mofussil News and Notes.

**Tuni.** An Agricultural Exhibition on a large scale was conducted at Annavaram from 7th to 12th May 1941, during the Kalyanam festival of God Sri Veera Venkata Satyanarayana Swami Vato. The important exhibits were various paddy strains of the Agricultural Research stations, Samalkota, Maruteru and Anakapalle, samples of honey, bee colonies and bee-keeping equipment from Pithapuram, samples of Malt received from Govt. Agricultural Chemist, Coimbatore, fruits of pine apple, papaya and Sapota and bananas. Entomological and Mycological posters and charts also were exhibited, in addition to various improved and labour saving implements, pruning sets, sprayers and spraying materials. The exhibition was well attended to by many Agriculturists of the neighbourhood, and they evinced keen interest in the various articles that were on show. D. H. R.

## College and Estate News.

**Students' Corner.** The College re-opened on the 16th June after the summer vacation and the second and third year students joined their classes.

**Association of Economic Biologists.** Prof. Mclean of Wilson College, Bombay delivered a lecture on the study and teaching of statistics on the 16th instant. Mr. M. C. Cherian presided.

**Personal.** We offer our congratulations to Sri. C. Ramaswami Naidu, Junior Lecturer in Agriculture on his appointment as Provincial Marketing Officer vice Sri. Rac Bahadur K. Gopalakrishnaraju on leave.

**Officers' Club.** The members of the Officers' Club entertained Dr. J. D. David, Lecturer in Animal Hygiene and Sri. M. V. Anganna Naidu, Teacher, Labour School, at dinner on the 16th instant. The former is posted to Kotagiri and the latter is leaving us for qualifying himself for the L. T.

**Visitors.** Mr. R. W. Littlewood, Livestock Development Officer visited the College Dairy for the inspection of dairy cattle.

**Association of the Upper Subordinates.** The Secretary of the Association of Upper Subordinate Officers of the Madras Agricultural Department writes: "The Annual General Body Meeting of the Association of the Upper Subordinate Officers will be held during the "College Day Week" in July 1941. All members of the Association are invited to be present at the function".

# Weather Review - MAY 1941.

## RAINFALL DATA

Division	Station.	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since 1st January
Circars	Gopalpore	0.3	-1.7	1.1	South	Negapatam	0.0	-1.6	4.7
	Calingapatam	1.1	-1.5	1.5		Aduthurai *	1.1	-1.0	5.2
	Vizagapatam	3.2	+1.2	5.9		Madura	0.8	-2.1	9.9
	Anakapalli *	4.4	+1.8	7.3		Pamban	0.7	-0.1	8.6
	Samalkota *					Koilpatti *	1.7	-0.3	5.5
	Maruteru *	0.3	-2.0	0.5		Palamkottah	0.9	-0.7	7.2
	Cocanada	2.2	+0.7	3.9					
	Masulipatam	0.4	-0.9	0.5					
	Guntur *	1.4	-0.6	1.5		West Coast	Trivandrum	17.3	+8.8
Ceded Dists.	Kurnool	0.5	-0.6	0.8	Cochin		17.2	+5.5	22.1
	Nandyal *	0.5	-1.2	1.5	Calicut		24.6	+16.1	27.8
	Ilagari *	1.5	-0.7	2.5	Pattambi *		26.6	+18.8	28.2
	Siruguppa *	1.0	-0.7	3.6	Taliparamba *		7.6	-1.1	11.0
	Bellary	4.0	+2.0	5.9	Kasargode *		5.2	-2.2	6.9
	Anantapur	0.9	-1.2	1.7	Nileshwar *		7.5	-2.0	10.3
	Rentachintala	0.8		1.3	Mangalore		4.3	-1.9	4.4
	Cuddapah	1.4	-0.2	3.1					
	Anantharajupet *	0.0	0.0	0.0	Mysore and Coorg		Chitaldrug	1.4	-1.7
	Carnatic	Nellore	0.0	-0.8		0.2	Bangalore	3.5	-0.9
Madras		0.0	-1.1	0.9		Mysore	6.6	+1.4	11.9
Palur *		0.0	0.0	0.0		Mercara	7.2	+1.5	10.4
Tindivanam *		0.1	-1.5	1.6					
Cuddalore		1.1	+0.4	6.5	Hills	Kodaikanal	3.8	-2.2	11.3
Central	Vellore	3.0	+0.7	3.5		Coonoor			
	Gudiyattam *	2.5	-0.3	3.1		Ootacamund *	7.1	+5.0	10.4
	Salem	5.7	+1.0	8.3		Nanjanad *	—	—	—
	Coimbatore	2.6	+0.2	5.7					
	Coimbatore								
A. C. & R. I. *	3.2	+0.6	6.3						
Trichinopoly	2.0	-0.9	3.5						

\* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated up to 1937 (published in Fort St. George Gazette).

### Weather Review for May 1941.

The weather over the peninsula during the first fortnight of the month was characterised by the usual hot weather conditions with high day temperatures and scattered thunderstorms due to convectional currents. The intense hot weather conditions that prevailed at the end of April tended to gradually merge into those favourable for an advance of the monsoon and with falling day temperatures.

On the 15th of the month conditions were unsettled to the west of Ceylon and continued till the 19th when the unsettled conditions either became unimportant or moved away to the north west.

On the 20th a temporary advance of the monsoon took place in the south of the Bay of Bengal, and a depression appeared in the Andaman sea by the 22nd,

on which date an advance of the monsoon occurred in the south east Arabian sea off Malabar and Ceylon. The monsoon appeared off Malabar on the next day accompanied by heavy rains, and also appeared in the south of the Bay of Bengal, when the depression intensified into a storm off Diamond Island. By the 24th the monsoon extended feebly into Konkan but the Bay storm weakened into a depression.

On the 25th a depression developed off the Malabar Konkan Coast and intensifying into a cyclonic storm crossed the coast on the 26th night near Calicut and by the next day had become unimportant. The Bay depression crossed the Bengal coast after weakening on the 26th. The combined effects of the depression off the Malabar coast and in the Bay of Bengal. occasioned heavy rains on the Malabar coast and adjoining regions from the 23rd till the 27th. Unsettled conditions in the west central Bay concentrated into a depression off the South Circars coast on the 31st of the month.

Rainfall was general over the presidency and in large excess in the West Coast and locally in the Hills and in slight excess in the Central districts, Circars and locally in the Deccan districts.

Temperatures were generally above normal at the beginning of the month but were about normal for the rest of the month. The highest day temperatures were recorded at Rentichintala (Guntur Palnad taluq) of  $115^{\circ}$  on the 1st and  $113^{\circ}$  on the 28th.

Chief falls of Rain reported in 24 hours were :

Pattambi	12.87"	27th.
Munnar (Travancore)	8.1"	..
Cochin	6.7"	23rd.
Angamali (Travancore)	6.3"	27th.
Calicut	5.7"	..
Quilon	5.7"	..
Calicut	4.9"	23rd.
Ootacamund	3.5"	27th.

**Weather Report for the Agricultural College and Research Institute Observatory.**  
Report No. 5/41.

Absolute maximum in shade	...	101.4°F
Absolute minimum in shade	...	70.0°F
Mean maximum in shade	...	95.3°F
Departure from normal	...	+0.3°F
Mean minimum in shade	...	75.6°F
Departure from normal	...	+1.6°F
Total rainfall for the month	...	3.15"
Departure from normal	...	+0.55"
Heaviest fall in 24 hours	...	1.67" on the 27th
Total number of rainy days	...	3
Mean daily wind velocity	...	1.87 m. p. h.
Departure from normal	...	-1.80 m. p. h.
Mean humidity at 8 hours	...	67.6%
Departure from normal	...	-2.6%

**Summary.** Intense hot weather conditions prevailed during the first three weeks with a few thundershowers. The passage of the depression near Calicut on the 26-27th gave a heavy fall of 1.67". Maximum and minimum temperatures were in slight excess during the month.

P. V. R. & S. V. K.

# Departmental Notifications.

## Gazetted Services.

### 1. Appointments.

Sri C. Ramaswami Nayudu, Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, Coimbatore is, on return from leave, appointed to officiate as Provincial Marketing Officer, Madras in Category 3, class I, Madras Agricultural Service, Vice Sri Rao Bahadur K. Gopalakrishna Raju, granted leave.

Sri C. R. Srinivasa Ayyangar, who is the seniormost Crop Specialist, is appointed as Paddy Specialist and Geneticist, Coimbatore, during the absence on leave of Sri Rao Bahadur G. N. Rangaswami Ayyangar.

Sri C. Vijayaraghavan, Permanent Upper Subordinate, Research Section and officiating Gazetted Assistant to Principal, Agricultural College, Coimbatore, is appointed to officiate as Millet Specialist, Coimbatore Vice Sri Rao Bahadur G. N. Rangaswami Ayyangar, granted leave.

Sri K. Raghavacharya, District Agricultural Officer, Madura, is appointed to officiate as Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, Coimbatore, Vice Sri C. Ramaswami Nayudu on other duty.

## Subordinate Services.

### 2. Transfers.

Name of officers.	From	To
Sri N. G. Narayana,	Asst. in Cotton, Mungari Cotton Station, Adoni,	Asst. in Cotton, Coimbatore.
„ S. M. Kalyanarama Ayyar,	Asst. in Cotton, Coimbatore,	Asst. in Cotton, Adoni.
„ K. Satyanarayana- murthy,	Asst. in Cotton, Adoni, Teaching Asst. in Agri., Coimbatore,	Asst. in Cotton, Nandyal.
„ K. Sanjiva Shetty,	A. D., Udipi,	A. D., S. Kanara Dt.
„ K. S. Ramanna Rai,	D. F. S., Hagari,	A. D., Kudligi.
„ S. Krishnamurthi,	Asst. in Cotton, Nadam Cotton Scheme,	F. R. S., Kodur.
„ P. N. Krishnaswami Rao,	Asst. in Cotton, Nadam Cotton Scheme,	Asst. in Cotton, Coimbatore.
„ M. Vaidyanathan,	A. D. (on leave),	A. D., Hadagalli.
„ M. G. Krishnaswami Sarma,	A. D., Sattur,	F. M. A. R. S., Palur.
„ D. S. Subrahmanya Ayyar,	A. D., Periakulam.	A. D., Devakottai.
„ S. Ramaswami Ayyar,	Asst. in Botany, S. B. S., Gudiyattam,	F. M., Central Farm, Coimbatore.
„ P. Krishnaswamy,	Asst. in Millets, D. F. S., Hagari,	Millets Asst., Coimbatore.

## Leave.

Name of officers.	Period of leave.
Sri N. Subramania Ayyar, A. D., Ambasamudram,	L. a. p. for 1 month from 30-5-'41.
.. V. Buchiraju, A. D., Chintalapudi,	L. a. p. on m. c. for 3 months from 14-5-'41.
.. M. A. Balakrishna Ayyar, A. D., Wallajah,	L. a. p. for 1 month from 4-6-'41,
.. K. K. Subramania Ayyar, A. D., Devakottai,	L. a. p. for 2 months from the date of relief.
.. M. J. David, Asst. in Soil Physics, Hagari,	L. a. p. for 4 months from 10-6-'41,
.. V. Ratnaji Rao, A. D., Sullurpet,	L. a. p. for 1 month and 14 days from 20-7-'41.
.. N. Krishna Menon, Sub-Asst. in Entomology, Coimbatore,	L. a. p. for 2 months from 16-6-'41.
.. K. Sitarama Ayyar, A. R. S., Pattukottai,	Extension of l. a. p. for 2 months from 23-5-'41

**CO-OPERATION BETWEEN AGRICULTURAL AND  
REVENUE DEPARTMENTS**

*[We publish below the text of a Government order on Co-operation between the Agricultural department and Collectors of districts. Ed. M. A. J.]*

**G. O. No. 745, Development, dated 16th April 1941.**

The following suggestions were made at the Collectors' Conference held on 24th January 1941 in connexion with the discussions on the subject of co-operation between the Agricultural department and the Collectors:—

- (1) That an Assistant Director of Agriculture should be appointed for each district to enable that officer to be in close contact with the Collector;
- (2) that a committee should be appointed in each taluk consisting of the tahsildar, the minor irrigation overseer and the agricultural demonstrator to report to the Collector on the extent of damage, etc., caused by soil erosion;
- (3) that each Collector should be provided with a discretionary grant of Rs. 500 each year to be spent on the award of prizes and rewards to non-officials in recognition of the help rendered by them to the Agricultural department in its propaganda work;
- (4) that village officers should maintain separate statistics relating to areas under improved strains of crops such as Co. 2 cotton and paddy strains;
- (5) that tahsildars and village officers should be required to render to the agricultural demonstrators the necessary assistance in their dealings with the ryots;
- (6) that the tahsildars and the revenue inspectors concerned should be supplied with information regarding the work on improved strains, etc., that is being done in each taluk;

- (7) that the Collectors should encourage Assistant Directors of Agriculture to meet them more freely and discuss agricultural matters; and
- (8) that the officers of the Revenue and Agricultural departments should bring to the notice of the ryots the evil effects of soil erosion.

2. His Excellency the Governor has considered these suggestions and is pleased to issue the following orders:—

- (i) *Suggestion (1).*—The Government have decided that each district should have an Assistant Director of Agriculture to be designated District Agricultural Officer. Orders in that regard have been issued separately.
- (ii) *Suggestions (2) to (5).*—These are under the consideration of the Government separately.
- (iii) *Suggestion (6).*—This suggestion is accepted. The Director of Agriculture is requested to see—
- (a) that the registers of the agricultural demonstrators, giving an account of the work already done, that in progress and that chalked out for the future, are sent to the tahsildars concerned for perusal at fixed intervals;
- (b) that agricultural demonstrators meet the tahsildars concerned at least once a month and keep them informed of the works of agricultural improvement undertaken by them in the taluk; and
- (c) that agricultural demonstrators communicate copies of their tour programmes to the tahsildars and the revenue inspectors concerned.
- (iv) *Suggestion (7).*—As the orders referred to in item (1) above make the Collector and the District Agricultural Officer responsible for the agricultural programme of each district, the District Agricultural Officer will necessarily have to meet the Collector more frequently than has been customary in the past. No further action on the part of the Government is therefore necessary with reference to this suggestion.
- (v) *Suggestion (8).*—In an article published in the Villagers' Guide and Calendar for 1941, attention has been specially drawn to the dangers of soil erosion and suggestions have been made as to the preventive measures to be adopted. The Government have also ordered in G. O. Ms. No. 2191, Development, dated 14th September 1940, that very active efforts should be made by the Agricultural department with the co-operation of the Revenue department to bring home to the ryots the loss which the latter are sustaining by soil erosion and to induce them to put far more labour than they have been accustomed to do in the past into embankments and revetments and, where it is practicable, in terracing in order to minimize erosion. To bring home the dangers of soil erosion to the rural population, the Director of Agriculture is requested to broadcast occasionally a talk on the subject and the measures to be adopted to prevent it.