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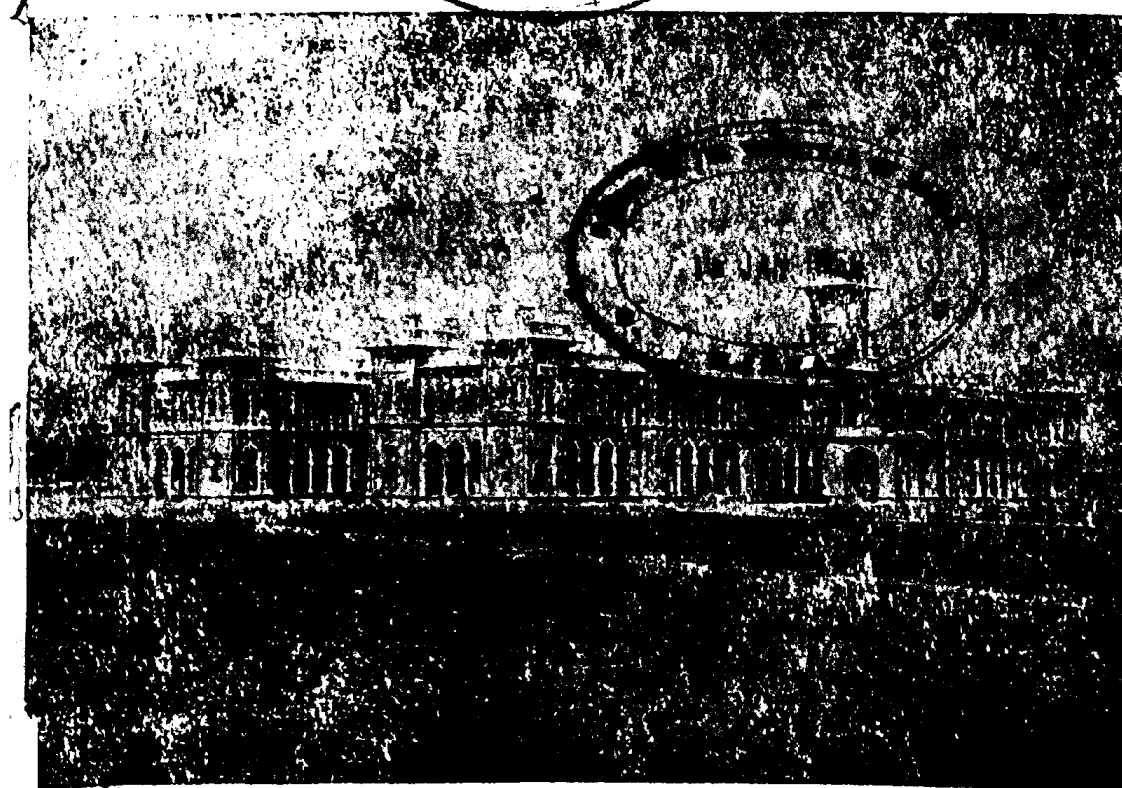
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TABLE I

Treatments	1948—1949				1950—1951				1951—1952				Grand Total	Average
	I	II	III	Total	I	II	III	Total	I	II	III	Total		
1. Farm Compost @ 50 lb. N + 50 lb. N (AG) ..	26.89	22.27	4.86	54.02	27.14	26.98	24.91	79.03	30.16	35.24	26.55	91.95	225.00	25.00
2. " " + 100 lb. N (AG) ..	14.66	25.19	17.82	57.67	29.15	31.85	25.60	86.60	32.38	34.40	33.71	100.49	244.76	27.19
3. " " + 150 lb. N (AG) ..	30.78	27.05	31.59	89.42	28.67	29.20	29.68	87.55	36.25	23.96	30.90	91.11	268.07	29.78
4. " " + 200 lb. N (AG) ..	26.00	23.89	20.25	70.14	34.50	31.48	27.77	93.75	30.95	36.89	37.68	105.52	269.41	29.93
5. " " + 50 lb. N (AC) ..	25.11	3.64	21.46	50.21	27.35	32.06	32.59	92.00	24.33	25.65	31.06	81.04	223.25	24.80
6. " " + 100 lb. N (AC) ..	29.48	25.27	24.70	79.45	31.22	30.85	27.61	89.68	33.55	28.99	28.30	90.84	259.97	28.88
7. " " + 150 lb. N (AC) ..	23.89	19.60	17.82	61.31	32.22	33.81	32.81	98.84	35.30	32.44	29.36	97.10	257.25	28.58
8. " " + 200 lb. N (AC) ..	25.11	25.11	24.30	74.52	33.34	33.39	30.32	97.05	22.47	22.84	26.87	72.18	243.75	27.08
9. F. Y. M. @ 50 lb. N + 50 lb. N (AG) ..	16.85	17.98	15.47	50.30	26.82	30.95	27.51	85.28	27.93	30.32	34.08	92.33	227.91	25.32
10. " " + 100 lb. N (AG) ..	26.73	20.57	29.97	77.27	30.05	34.13	29.52	93.70	35.40	33.60	33.02	102.02	272.99	30.33
11. " " + 150 lb. N (AG) ..	27.38	17.41	24.87	69.66	27.82	33.97	29.79	91.58	35.83	25.44	29.89	91.16	252.40	28.04
12. " " + 200 lb. N (AG) ..	20.17	22.27	21.87	64.31	31.48	29.29	33.34	94.11	22.84	31.06	22.68	76.58	235.00	26.11
13. " " + 50 lb. N (AC) ..	21.55	7.05	3.00	31.60	25.97	27.29	36.09	89.35	19.79	22.47	27.19	69.45	190.40	21.16
14. " " + 100 lb. N (AC) ..	23.65	3.00	23.89	50.54	28.51	30.32	31.22	90.05	27.40	34.87	30.74	93.01	233.60	25.95
15. " " + 150 lb. N (AC) ..	29.56	24.46	26.08	80.10	34.77	26.50	35.88	97.15	27.72	28.88	26.98	83.58	260.83	28.98
16. " " + 200 lb. N (AC) ..	31.59	20.65	27.54	79.78	25.86	34.18	30.16	90.20	19.82	34.29	34.56	88.67	258.65	28.74

AG = Mixture of ammonium sulphate and groundnut cake.

AC = Mixture of ammonium sulphate and castor cake.

ANALYSIS OF VARIANCE

Due to		D. F.	S. S.	M. S. S.	Ratio
Blocks	.. ..	6	30.17	5.03	..
Seasons	.. ..	2	2,243.99	1,121.99	46.00 **
Levels	.. ..	3	499.85	166.62	6.83 **
Mixtures	.. ..	1	31.96	31.96	1.30
Basal dressings	.. ..	1	24.74	24.74	1.01
Int. Levels × mixtures	.. ..	3	27.37	9.12	0.37
" " × basal dressings	.. ..	3	14.90	4.96	0.20
" Mixtures × basal dressings	.. ..	1	3.30	3.30	0.13
" Level × mixtures × basal dressings	.. ..	3	192.88	64.29	2.63
" Levels × Seasons	.. ..	6	344.73	57.45	2.35 *
Error	.. ..	114	2,780.72	24.39	..

** Significant at 1% level.

* Significant at 5% level.

(÷) The sum of squares of interactions with seasons have been pooled with the error variance, except that with the levels which was found to be significant.

Standard error for seasons = 0.71 tons.

C. D. = 2.05 tons.

" " nitrogen levels = 0.82 tons.

C. D. = 2.37 tons.

Standard error for mixtures or basal dressings = 0.58

C. D. = Not significant.

Standard error for inter-action — levels of N × seasons = 1.42

C. D. = 4.11 tons.

Interactions: The differential responses for various treatment combinations were not statistically significant except the interaction between the levels of nitrogen and the seasons, as will be observed from the figures given in table 3.

TABLE 3
Cane tonnage per acre

Levels of N.	Seasons.	1948-49.	1950-51.	1951-52.	Average.
50		15.51	28.80	27.90	24.07
100		22.07	30.00	32.20	28.09
150		25.04	31.26	30.24	28.84
200		24.06	31.26	28.58	27.96
Average		21.67	30.33	29.73	

Standard error for interaction:
between levels of N and seasons 1.42 C. D. 4.11

It will be evident from the above figures that the levels of nitrogen responded differently in each season and each level gave significantly lower yields in 1948-49 than in 1950-51 or 1951-52.

Response curves and optimal doses: The response curve helps a great deal to select the suitable levels of treatments in agronomical trials. The characteristic of a response curve is that it shows an upwards trend with an increase in the fertiliser dosage but the rate of increase declines for the higher doses.

In this paper the effect of graded doses of nitrogen on the cane tonnage has been shown by means of polynomial curves of the form $Y = a + bx + cx^2$ fitted to the observed mean values for three seasons, for both the mixtures Am. sulphate + groundnut cake (abbreviated as AG) and Am. sulphate + castor cake (abbreviated as AG) and Am. sulphate + castor cake (abbreviated as AC) and Am. sulphate + castor cake (abbreviated as AC) and have been represented in Fig. 1.

The curve for mixture 'AG' shows that the response due to 100 lb. N per acre was the highest but it declined with the subsequent dose of 150 lb. N. A further fall in the curve was noted with the application of 200 lb. N indicating thereby that the maximum yields were reached at 150 lb. N and no further gains would be achieved by exceeding this limit under Malwa soil and climatic conditions.

The second curve drawn for mixture 'AC' showed that although the yields with this mixture are lower than that of mixture 'AG' it responded better so that at the highest level of 200 lb. N per acre, the yield was the same for both the mixtures i.e. the lower doses of mixture 'AG' proved more effective than the same doses of mixture 'AC', but the highest dose of the latter has a lesser depressing effect than the same dose of the former.

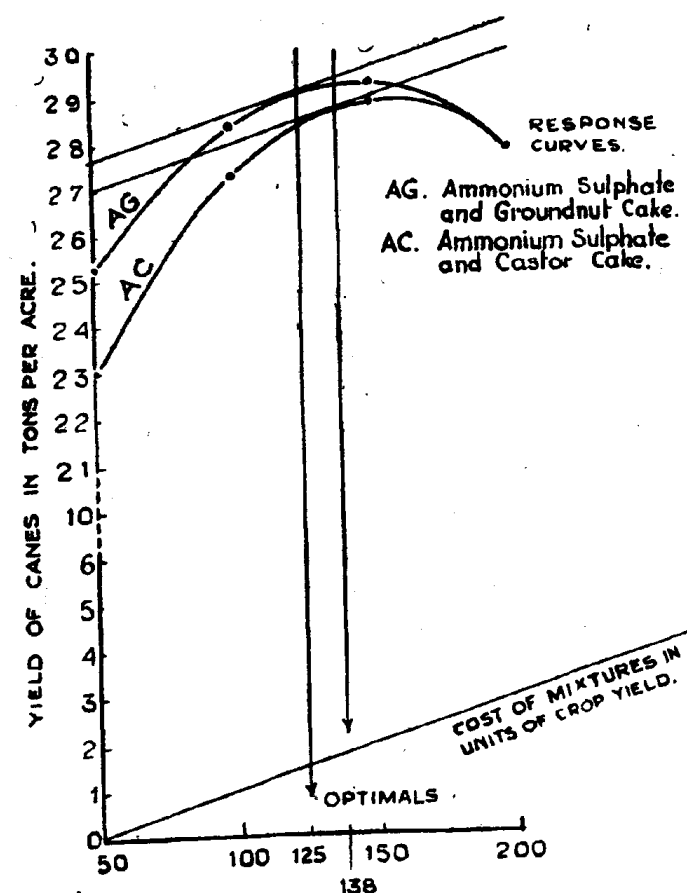


FIG. 1. RESPONSE CURVES SHOWING THE COST OF THE MIXTURES AND THE TANGENTS DETERMINING THE OPTIMAL DRESSINGS.

Normally the most desirable dose of the manure or the fertiliser is that which gives the maximum net profit to the grower and since the relative prices of the manures and the crop produce are apt to fluctuate from season to season, the most remunerative dose will also vary accordingly. Hence in order to make this dose somewhat stable, Finney (1953) suggested that if the cost of the

manure or the fertiliser is expressed in terms of the weight of the crop produce of equal value, the cost of any dressing may be represented by a straight line and the maximum profit will be obtained for the optimal dressing which can be determined by drawing a perpendicular to the horizontal axis from the point where a line parallel to the cost line is tangent to the curve, as has been shown in Fig. 1. Such optimal doses for the two mixtures Am. sulphate + groundnut cake and Am. sulphate + castor cake were found to be 125 lb. N and 138 lb. N per acre respectively. These optimals synchronised with the actual calculated values as will be seen from the Tables 4 and 5.

TABLE 4
Economics with the mixture, Ammonium sulphate and groundnut cake

Levels of N	Expected cane tonnage acre	Extra tonnage over control	Value of extra produce		Cost of manure mixture*		Profits (+) Loss (-)	
			Rs.	A. P.	Rs.	A. P.	Rs.	A. P.
Control	50	25.3	..	..	..	..	..	..
	100	28.4	3.1	155 0 0	47 14 7	107 1 5 (+)		
	(125)	29.1	3.8	190 0 0	71 13 10	118 2 2 (+)		
	150	29.3	4.0	200 0 0	95 13 2	104 2 10 (+)		
	200	27.9	2.6	130 0 0	143 11 9	13 11 9 (-)		

TABLE 5
Economics with the mixture, Ammonium sulphate and castor cake

Control	50	23.0	..	..	..	..	..	..
	100	27.3	4.3	215 0 0	47 14 7	167 1 5 (+)		
	(138)	28.8	5.8	290 0 0	84 12 5	205 3 7 (+)		
	150	28.9	5.9	295 0 0	95 13 2	199 2 10 (+)		
	200	27.9	4.9	245 0 0	143 11 9	101 4 3 (+)		

* Cost of additional manuring over the lowest dose of 50 lb. N per acre.
() Optimals found from the response curves in Fig. 1.

Prices (average of three seasons):

Ammonium sulphate (20% N)	..	Rs. 11-7-0 per maund (82 lb.)
Groundnut cake (7% N)	..	.. 7-0-0 per maund (..)
Castor cake (5% N)	..	.. 5-0-0 per maund (..)
Selling price of cane	..	.. 50-0-0 per ton.

Discussion: Amongst several agronomic practices that contribute to improving crop yields, manuring is the one major factor in sugarcane production. The evidence on the subject proves beyond doubt that for getting better yields of sugarcane the use of both organic and inorganic manures is indispensable. In the present investigation the effect of seasonal

variation was found to be significant, due mainly to lodging and the damage caused by rats during 1948-'49.

The two bulky manures, F. Y. M. and Farm Compost, or the two mixtures, Ammonium sulphate + groundnut cake and Ammonium sulphate + castor cake, did not show any significant variation in their responses. Similar results have been reported by Joshi (1953) from the experiments conducted at Tharsa and Adhartal farms in Madhya Pradesh with different kinds of manures and oil cakes. The same conclusion has been drawn from the results obtained at Gorakhpur and Kalai in U. P.

With regard to the effect of levels of nitrogen, it was noted that the yield increased with an increase in the dosage of nitrogen upto 150 lb. N per acre, but the differences were significant only over control (50 lb. N per acre). A further increase to 200 lb. N per acre, though it gave a significantly higher tonnage over control, slightly depressed the yields as compared to the dose of 150 lb. N. This fact has also been noted at Shahjahanpur in U. P. and in Madras where higher doses above 200 lb. N per acre affected the cane tonnage as well as sucrose content.

The utility of any dose of manure or fertiliser depends upon the financial returns after allowing for its cost. There are three possible ways to find out the most economical dose of any manure. In the first the cost of manure is deducted from the value of the extra produce, based on the actual market prices. The optimal dose thus determined will vary from season to season. The second is based on the formula $\frac{q}{p}$ suggested by Sukhatme (1941) where q is the cost per lb. of nitrogen and p the price per lb. of the produce. Here too, the ratio will change from season to season. The third and most useful method has been suggested by Finney (1953) in which the cost of the manure, if expressed in terms of the weight of the crop produce of equal value, the variation in the optimal doses from season to season would be minimised and the optimum dose would be more or less stable.

Summary: In a manurial trial on sugarcane Co. 419, farm-yard manure and farm compost were applied as basal dressings at 50 lb. N per acre and the mixtures of Ammonium sulphate + groundnut cake and Ammonium sulphate + castor cake were applied in graded doses of nitrogen varying from 50 to 200 lb. per acre as top dressings in two instalments. For the expected yield values polynomial curve was fitted for each mixture and the optimal dose was found out by

drawing perpendicular to the base line from a point on each curve where the tangent parallel to the cost line touches it. No non-zero level was included and the profits were calculated over the minimum dose of 50 lbs. N usually used by the cultivators. The results did not indicate any marked differences in the cane tonnage with the application of either farmyard manure or farm compost.

The two manure mixtures, Ammonium sulphate + groundnut cake and Ammonium sulphate + castor cake did not show any significant variation in their responses.

The application of higher doses of 100, 150 and 200 lb. N increased the yield significantly over control (50 lb. N), but the maximum was obtained by the application of 150 lb. N per acre.

Wherever the economics of manuring is to be studied the method mentioned by Finney seems to be of great utility for stabilising the optimals. In this trial the optimals by this method for Ammonium sulphate + groundnut cake and Ammonium sulphate + castor cake were found to be 125 lbs. and 138 lb. N per acre respectively.

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Striking Features of Australian Sugar Economy (Cane Prices Linked to Recovery)

As readers are aware, the Government of India has deputed a five-man Indian sugar delegation to Australia and Indonesia on a fact-finding mission. This step is said to be a preliminary to several concrete steps which the Government may decide to take soon for placing the sugar industry on a more solid and stable footing. The Government has done well to choose Australia and Indonesia for a study, for the sugar industry in these countries has achieved such remarkable progress that first-hand knowledge of the methods adopted by these countries for this achievement will be of immense benefit to India. Indonesia, for instance, has long been noted for high technological advances in sugar manufacture. The sugar industry in Australia has successfully tackled many problems, especially these relating to stabilisation of sugar output, marketing of sugar and cane, distribution of the sugar price between mills and farmers, and utilisation of byproducts. In as much as these are the very problems which have confronted the Indian sugar industry for a long time, it will be worthwhile analysing, in these pages the striking features of the Australian sugar economy.

Australia produces about a million tons of sugar every year, of which half is consumed within the country and the balance is exported. The *per capita* consumption of sugar is about 130 lb. which is nearly 90 lbs. more as compared with India. Queensland is the major seat of the sugar industry and accounts for 96 per cent of the total sugar output in Australia.

A striking feature of the Australian sugar industry's development is the system of Government erecting the mills and then gradually passing them on to the control of cane growers. There are at present 32 sugar mills in Queensland and three mills in New South Wales. The daily cane-crushing capacity of each of these mills ranges between 2,000 tons and 2,500 tons. Half of the sugar mills in Queensland are operated as growers' co-operative units, the remainder being owned by public or proprietary companies. All the mills purchase their cane from independent growers. Only in very few cases do the mill owners grow a substantial quantity of cane.

Sugarcane Farms: The sugarcane farms in Australia conform to the typical Australian pattern of one-man ownership and

operation. Generally, a farm comprises 70 acres of land, of which 60 acres are cultivated. The 60 acres normally comprise 15 acres of plant cane, 30 acres of first and second ratoons, and 15 acres of fallow land under preparation for planting. Each farm is a self-contained unit, with family residence, farm buildings, farm implements and cane cutters' barracks. Owing to high labour wages, mechanisation of farm operations, with the exception of harvesting, has been developed very extensively on farms in Queensland. The per-acre field of sugarcane in Australia averages 25 tons, which compares very favourably with the all-India average of 13 tons. The quality of cane grown is also very superior, the average recovery percentage being as much as 14.33—highest in the world—as against less than 10 in India. To a large extent, this pre-eminence, it is said, has been achieved through the system of quality payment which will be discussed later—and the development of varieties rich in sugar. To quote one report: "The grower endeavours to produce the best cane and the miller aims to extract the highest possible preparation of sugar contained in stalks".

The sugar industry in Australia is governed by the agreement signed by the Commonwealth Government and the Queensland Government. Under the agreement, the former has to protect the sugar industry through restriction on imports of sugar from abroad. On its part, the Queensland Government has undertaken to acquire all sugar produced from cane grown in Queensland and New South Wales, to make sugar and sugar products available throughout Australia at certain specified prices, and to control production of cane sugar. It has also accepted the responsibility for losses arising from export of surplus sugar. Further, it helps the Fruit Industry Sugar Concessions Committee by providing funds required for assisting the manufactured fruits industry.

Before the commencement of each sugar season (May-June), the Queensland Government issues a proclamation regarding payment of advances by the Sugar Board to the sugar mills when the latter deliver to the former their raw sugar production. The proclamation prescribes (a) tentative crop percentages of home consumption and surplus sugar based on estimates of output and demand within the country, (b) interim prices for both categories, with provision for additional payments during the season, and (c) a minimum standard of quality for sugar that would be accepted by the Government at the declared price. At the end of the season (close of January), the position is reviewed and, if circumstances

warrant, an additional price is fixed at the end of May, when the Board is in a position to determine the precise percentages of the crop required for home consumption and surplus sugar, as well as the actual prices payable for the two divisions of the output.

The Sugar Board consists of two representatives of the Queensland Government including the Chairman, and millers' representative and a growers' representative. The Board functions for the Queensland Government in the acquisition of the State output and the purchase of New South Wales production and for the disposal of the sugar so required. For financing the acquisition of raw sugar, refining and marketing it within the country, the Board has appointed the Colonial Sugar Refining Company as its chief agent. The Company, besides owning seven raw sugar mills, operates five refineries and has big interests outside the sugar industry. The marketing of the export quota of raw sugar is handled directly by the Board. When all the sugar has been disposed of in the Australian and overseas markets, the Board decides the final price to be paid to the raw sugar mills.

Fixation of Cane Prices: A unique feature of the sugar policy followed in Australia is that the price of sugarcane is linked to the price of sugar realised by the mills. The price is paid to the growers on the basis of "commercial" cane sugar" contained in the cane supplied by him. In other words, the proceeds of sugar are divided between the mills and the cane growers, the individual growers receiving payment according to the sugar content in cane supplied by him. The payment is done under the authority of the Regulation of Sugarcane Prices Act 1915. The provisions of the Act are administered by a special organisation.

Under the aforesaid Act, local Cane Price Boards have been established for each mill. It is this Board which fixes the price or prices to be paid by the mill for cane during the ensuing season and determines other matters relating to supply of cane such as period of delivery, weighment, handling, payment of price etc. While fixing the price or prices, the local Board takes into account (1) quantity of sugarcane to be crushed in the mill (2) estimated sugar content of cane (3) cost of production of cane in the area assigned to the mill and cost of production of sugar in the mill (4) crushing capacity and efficiency of the mills (it has been provided in the Act that the price of sugarcane will not be lowered on account of mills being inefficiently worked or managed or not

possessing machinery of the best kind), (5) labour conditions under which cane is grown, harvested and delivered to the mill, (6) price of raw sugar realised by the mill and (7) any other local conditions. The award determines only an interim minimum price which does not exceed 60 per cent and in special cases 85 per cent of the estimated value of sugarcane. It will be interesting to note in this connection that sugarcane with less than 7 per cent recovery can be refused by the mill. As already indicated the price paid for sugarcane varies according to the recovery percentage and the price of raw sugar. The following table indicates the fixation of cane price by a local board during the 1954 sugar season:

Recovery per cent.	Price of cane per ton when raw sugar is £35 per ton.			Increase or decrease per £ 1 above or below £ 35 per ton.	
	£.	s.	d.	s.	d.
7	1	2	2·8	0	6·48
8	1	8	6·4	0	1·84
9	1	14	10·0	0	10·80
10	2	1	1·6	1	0·96
11	2	7	5·2	1	3·12
12	2	13	8·8	1	5·28
13	3	0	0·4	1	7·44
14	3	6	4·0	1	9·60
15	3	12	7·6	1	11·76
16	3	18	11·2	2	1·92
17	4	5	2·8	2	4·08
18	4	11	6·4	2	6·24

The local boards are also authorised to determine the area which every grower can cultivate with sugar-cane in any particular year. This is related to the "mill peaks" assigned to individual mills by the Central Board. The "farm peaks" may be fixed in terms of tonnage of cane to be harvested, or tonnage of sugar to be manufactured therefrom, or the area under cane to be harvested. The farm peak system has been instituted to effect some measure of crop control and stabilisation so as to avoid overproduction. Appeals against the decisions of the local boards lie with the Central Sugarcane Prices Board.

The general methods of sampling and analysis to be followed for determining the sugar-content in cane supplied to mills by

individual growers are laid down in the Regulation of Sugarcane Prices Act. Samples of cane from trucks and juice from the front roller of the first mill are taken for every 30 tons of cane crushed. The juice is analysed for its brix and polarisation and cane for its fibre content.

Cane Tester: In order to ensure that the grower is dealt with squarely by the mills, a Cane Tester is appointed at each mill by the Queensland Government. The Tester has to pass an examination prescribed by the Cane Testers Examination board. His salary is paid out of the Sugarcane Prices Fund. His duties are to see that the sugarcane is correctly weighed, that the cane and the juice are sampled and analysed correctly in accordance with the prescribed regulations, and that the determination of sugar content is made in accordance with the regulations and payment is made therefor in accordance with the award. He can order fresh sampling and analysis if he is satisfied that they have not been correctly performed by the factory staff. He can also make the determination himself and his results are final. He can use the laboratory apparatus and material of the mill as are necessary for the purpose. He also prepares weekly and annual manufacturing reports and furnishes them to the local and central boards. The cane growers are also free to appoint a person or persons to observe and check the weighing of sugarcane supplied by the growers to the mills. The expenditure incurred on the administration of the provisions of the Act is met from the Sugarcane Prices Fund. This is built by the mills depositing at the rate of one penny on every ton of sugarcane received by them. Half of the amount is borne by the growers and the other half by the mills.

The final value of raw sugar—both home consumption and export—govern the total sugar money available. The Sugar Board pays this amount to the mills which, in turn, pay to the cane growers according to quantity scales prescribed in the awards of local boards. The balance is the mills' share of the sugar sales. Over a number of years, the proportions received by the two sections have varied very little; the generally accepted division is approximately 30 per cent to mills and 70 per cent to growers.

It will be evident from the foregoing account that the sugar industry in Australia is subject to several controls. These controls are administered not by a bureaucratic machinery, as is the case in India, but by a democratic body. This, the Central Sugarcane

Prices Board, consists of a Judge of the Supreme Court, who is the Chairman, one elected representative each of cane growers and millowners, a qualified sugar technologist, and a person experienced in accountancy and audit. The Chairman of the Board has all the powers, jurisdiction and authority of a Judge of the Supreme Court. It is this Board which assigns the cane areas to mills from which they draw their cane supplies and hears appeals against awards of local boards. It also determines the quantity of sugar manufactured by each mill in a particular year. This is done with due regard to the total tonnage estimated by the Sugar Board for Australian consumption and export, capacity of the assigned areas for growing cane, relative efficiencies of mills and growers to a reasonable extent, and employment of labour as economically as possible under fair and reasonable conditions. Further, the Board advises the Queensland Government on all matters relating to production and marketing of cane and payment of its price.

Research Notes

A species of *Pythium* parasitic on Rice in South India

During the month of February 1947, a case of wilting and rotting of paddy plants was reported from Athur in Salem district. Examination of the fields showed rice plants wilting in large patches here and there, the top leaves wilting first and then the lower leaves. Plants in advanced stages of wilting showed typical symptoms of water-soaking at the collar region and rotting of the root system. The causal organism was isolated into pure culture and found to be a species of *Pythium*. Inoculations were done with the culture of this fungus on healthy seedlings without much success, then and so further investigation was given up for the time being.

In the month of April 1948 similar symptoms were noticed in a number of experimental plants of Co. 13 variety in the Government Agricultural Chemist's green house. Many plants in the pots were found to be wilting, starting with the first leaf and ultimately the whole plant wilting and rotting. Again in 1953-'54 a number of paddy seedlings of Co. 13 and Co. 25 were found wilting in patches in the wetlands of the Central Farm, Coimbatore. During the same year a number of wilted specimens were received from the Trichinopoly district for examination. A species of *Pythium* isolated from the wilting plants. The description of the fungus is as follows.

Sporangia spherical to oval, terminal or inter-calary 14.0μ to 26.0μ ; average 19.4μ in diameter; germinating through germ tubes (conidia) or by producing zoospores, which are many in number. Hyphae branched, non-septate, septate in old cultures, hyaline 2.67μ to 5.3μ ; average 4.01μ in thickness. Oogonia smooth, spherical, measuring from 18.0μ to 26.0μ ; average 21.12μ with one to many antheridia. Oospores smooth, fairly thick-walled, aplerotic, measuring from 18.0μ to 28.0μ in diameter.

The above description of the fungus agrees with Middleton's and Mathew's description of *Pythium debaryanum*. *P. debaryanum* has been reported to be parasitic on rice in Hawaii; Carpenter (1919) and Philippine islands; Ramos (1926). Other species of *Pythium* that have been reported to be parasitic on rice are *P. monospermum* in Japan; Ito and Tokunaga (1933), *P. dissotocum* (syn. *P. oryzae* Ito and Tokunaga) in Japan: Ito and Tokunaga

(1933) and Darker (1940), *P. Gracile* in Japan: Ito and Tokunaga (1933), *P. graminicolum* in Hawaii, Parris (1940): *P. rostratum* in U. S. A.: Middleton, *P. nagaii* in Japan: Ito and Tokunaga, Darker (1940) and in U. S. A.: Edson and Wood (1937) and *P. echinocarpum* in Japan: Ito and Tokunaga, Darker (1940). The fungus isolated by the authors would appear, however to belong to the *Debaryanum* group.

The fungus does not form oospores in agar media or grated carrot agar. Produces sporangia freely when suspended in sterile water or flowing water. Oospores are formed sparingly when grown in sterilized bits of rice roots.

Inoculation experiments: Rice seedlings of Co. 13 variety (same as used by the Government Agricultural Chemist in his experiments) were grown in Buchner tubes containing 40 grams of sand moistened with 10.c.c. of Knop's solution and in 25.c.c. of Knop's solution alone. Before raising seedlings the tubes (with the sand and culture solution) were sterilised and half the number of tubes in each set namely sand and Knop's solution were inoculated with the pure culture of the fungus. Then the necks of the tubes were plugged and sown with sterilized seeds. The seedlings started showing signs of wilting even after 15 days and after 20 days many of the seedlings were dead in the inoculated tubes as shown in the table below. These were showing hyphae in the collar region and oospores and hyphae inside the root tissue. The same *Pythium* was re-isolated from these rotting collar region.

Treatments	Number of plants	Number of plants dead	Number of plants survived	% of infection
Sand inoculation	9	4	5	44.4
Knop's solution	15	14	1	99.3
Control (in sand)	10	nil	10	nil
Control (in Knop's solution)	9	nil	9	nil

Remedial measures: Drenching the soil with 2% Bordeaux mixture was found to have very effectively checked any further casualties of plants in the Government Agricultural Chemist's plots.

Summary: A species of *Pythium* parasitic on paddy plants was isolated and identified to be belonging to the *P. debaryanum* group. Inoculation of the pure culture of this fungus on rice

seedlings was positive and the fungus was reisolated from the plants. Drenching the soil with 1% Bordeaux mixture is able to control the disease in pots.

The authors are indebted to Sri. C. S. Krishnaawamy Ayyar, Retired Government Mycologist under whose guidance the work was done, for his valuable suggestions and encouragement in the work.

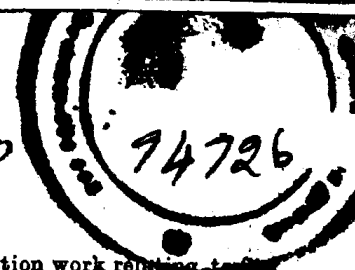
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Gleanings



Yield trial in cotton: In the programme of selection work relating to the Island Cotton in West Coast, for improving yield and ginning percentage and securing a type with optimum fibre length and fineness, to replace Egyptian types at present imported into the country, a main yield trial was conducted with new varieties Andrews, Westberry and with two selections from Montserrat. Analysis of yield and quality characters of the varieties showed that Andrews gave 40 per cent higher yield of lint over the control Montserrat due to high ginning per cent of 34 and fibre properties also. It possessed the optimum length, fineness and maturity with 1.23' mean fibre length, 1.26 x 10-6 gm. per cm. fibre weight, and maturity of 72 per cent. In micro-spinning tests, it was adjudged capable of spinning 80's, thus fulfilling the standards required to replace the imported Egyptians.

Nutritive Value of *Prosopis Juliflora* Pods: The pods of *Prosopis Juliflora* possess a high nutritive value, namely, 70, similar to that of any other concentrate food. They are rich in carbonaceous matter and have fair amounts of digestible nutrients like protein and fibre. The nutritive ratio too, is not very wide and hence its high usefulness to cattle as a balanced food. The calcium/phosphorus ratio also is not ill-balanced, thus increasing its food value. The pods do not show the presence of any cyanogenetic glucoside.

Nutrients.	Per cent on dry matter basis.	Digestibility coefficient.	Per cent digestible nutrient.	Total digestible nutrients TDN.
Dry matter per cent	84.57	..	..	..
Crude portion	10.06	65	6.86	..
Ether extractives	4.26	48	2.45	..
Crude fibre	30.77	81	24.92	70.51
N. F. E.	50.33	66	33.22	..
Total Ash	4.59	..	..	..
Ca.	0.33	..	..	..
P.	0.23	..	..	..

When the pods are given in the dry or semi-dry condition preferably in a crushed state, cattle, sheep and goats relish them well without any adverse effect.

Insect pests of cotton: Cotton is subject to the attack of two or three kinds of scale insects and mealy bugs, which are found sometimes doing considerable damage to the crop. The form, structure and habits of these scale insects and mealy bugs attacking cotton and the control measures adopted for them are briefly mentioned below.

Scale Insects: Scale insects are bugs which are stationary and fixed to the plant surface. They are covered over by a scale-like protective cover secreted by the insect itself. In this position the insects fix their sucking tube into the plant tissue and feed on the plant sap. Among scale insects the following are found on cotton in South India.

The Black Scale (*Saissetia Nigra*, N): This is a well-known black scale found in many plants and shrubs. The adult insect has a hard scaly covering and is of deep reddish-brown or darkish colour and is oval or roundish in shape. This scale covers every portion of the plant and sucks up the plant sap. Each female scale lays hundreds of pinkish eggs which hatch as minute, active larvae and crawl about the infested plant and later on settle on the shoots and stems and suck up the sap. This scale sometimes becomes very bad on cotton and under such conditions the plant gets weakened and stunted in growth.

The Neem Mealy Scale (*Pulvinaria Maxima*, G): This is another scale insect which, though not so common as the black scale, has been noted occasionally attacking isolated plants in cotton areas. The adult insect is leathery and oval and when about to breed, the female insect deposits a long whitish egg sac covered with mealy or white waxy matter. The presence of this scale can be made out by the presence of these white egg-sacs. The damage done is similar to that caused by the black scale.

The Yellow Scale (*Gerococcus Hibisci*, G): This scale is occasionally found on cotton in Tirunelveli, North Arcot and Coimbatore. The mature insects are

protected by a fairly hard scale of golden yellow colour and hundreds of these cover the infested plants in patches and suck up the sap. The damage done is similar to that caused by other scales.

Mealy Bugs: These insects belong to the same group as scales and have more or less the same habits and life history. They are characterized by their bodies being covered over by white cottony or mealy secretion. Though most of the adult mealy bugs are also stationary in habits like scales, some of them are able to move slowly. These bugs generally cover up the tender shoots and stems of the plants and check the vigorous growth by sucking the sap. Among mealy bugs the following two are noted on cotton.

***Pseudococcus Virgatus*, C:** This is a common mealy bug found on many plants. The adult is a soft, white, small creature of about $\frac{1}{4}$ inch with numerous white filaments on the sides and two conspicuous tail-like threads at the tail end. Very often this mealy bug completely covers the leaves and shoots of the cotton plant which when looked from a distance appear as though white-washed with lime. When appearing in large numbers, these bugs cause stunted growth and weakening of the crop.

***Pseudococcus Corymbatus*, G:** This is similar to *P. Virgatus*, having the same general characters and habits, but in detailed structure the adult differs and it can be distinguished from *P. Virgatus* by the absence of white filaments on the body and the tail-like threads at the tail end. Damage done to plants is similar to *P. Virgatus*. Isolated plants often suffer from the attacks of this mealy bug which often covers the shoots in white mealy masses.

Remedial measures for Scales and Mealy Bugs: The control measures against the scale and mealy bugs are on the same lines. All badly infested plants should be thoroughly pruned and all the prunings burnt. Those that are partially attacked may be sprayed with a contact poison like fish oil soap at 1 lb. in 6 gallons or crude oil emulsion at 1 lb. in 6 gallons. Experiments conducted at the Agricultural College and Research Institute, Coimbatore, on these mealy bugs and scales have shown that Folidol or Ekatox 20 sprays at 1 oz. in 6 $\frac{1}{2}$ gallons are highly effective on both. The spraying should be done thoroughly so as to completely cover the shoots, stems and leaves of the plant. As these insecticides are very poisonous, great care should be taken in handling them. Preferably, the treatment may be done under departmental supervision. They can be safely used on cotton unlike vegetables or other edible crops. One or two rounds or sprayings at fortnightly intervals will completely control the insects. The cost of treatment works out to Rs. 6 per acre per treatment. Another advantage of spraying Folidol and Ekatox 20 is that these insecticides are effective on other cotton pests also like aphides, mites, jassids, boll-worms, etc.

World Record Rice Yield at Yenda: A 60 acre-rice crop at Yenda, on the Murrumbidgee irrigation area, has yielded four tons per acre—a world record for machine-harvested rice.

The Yenda crop was part of the recent 90,000 tons rice harvest in the Murrumbidgee irrigation area and the Wakool area. Average yields obtained established district records in both areas—at least 2.5 tons per acre in the M. I. A. and 2.2 tons per acre at Wakool.

Previous record for the M. I. A. was 2.35 tons per acre in 1951. Mr. D. E. Wallin, District Agronomist of the Department of Agriculture at Griffith said recently that the high yields could be attributed to a number of factors, including the operation of the pure seed scheme centred at Leeton and administered by the Department of Agriculture in conjunction with the Rice Marketing Board. More than 90 per cent of growers in the M. I. A. had used *Caloro* seed supplied under this scheme.

Another most important factor was the now widespread practice of using subterranean clover in a pasture phase in the rice rotation. This increased soil fertility to such an extent that application of sulphate of ammonia was no longer necessary to ensure good rice crops.

Weather had been ideal for maximum yields, and many farms had been redesigned on a true contour system which permitted better control of irrigation during rice growing. (The Agri. Gaz. N. S. W. July 1955, p. 344). [T. R. N.]

Weather Review — For the month of September, 1955

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January	Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January
North	Madras (Meenam-bakkam)	4.3	- 0.4	30.8	South	Madurai	5.2	+ 0.5	20.0
	Tirur-kuppam*	6.3	+ 0.2	31.9		Pamban	1.1	Nil	15.0
	Vellore	8.3	+ 1.4	27.7		Koilkatti*	2.2	+ 0.8	12.6
	Gudiyatham*	7.2	+ 3.9	24.7		Palayam-cottai	0.8	- 0.4	10.3
						Amba-samudram*	3.1	+ 2.0	18.8
East Coast	Palur*	2.2	- 2.8	35.9	West Coast	Trivandrum	17.5	+ 13.0	58.5
	Tindivanam*	3.3	- 1.5	28.2		Fort Cochin	17.8	+ 10.1	116.9
	Cuddalore	1.1	- 4.1	34.9		Pattambi*	13.8	+ 7.4	80.3
	Naga-pattinam	3.2	- 0.1	25.8		Kozhikode	25.2	+ 18.6	127.8
	Aduturai*	2.2	- 1.1	26.6		Taliparamba*	16.8	+ 6.5	122.5
Central	Pattukottai*	3.5	+ 0.6	19.8		Wynaad*	9.5	+ 2.8	64.0
	Salem	5.2	- 0.9	27.3		Nileshwar*	20.4	+ 7.1	163.7
	Coimbatore (A. M. O.)*	2.2	+ 0.8	13.0		Pilicode*	20.3	+ 9.2	136.5
	Coimbatore	2.1	+ 0.5	15.3		Mangalore	20.2	+ 10.8	137.1
	Tiruchirappalli	10.5	+ 6.5	26.5		Kankanady*	21.4	+ 9.6	137.6
					Hills	Kodaikanal	14.9	+ 7.6	53.2
						Coonoor*	8.2	+ 5.1	29.3
						Ootacamund*	7.8	+ 3.7	49.1
						Nanjanaad*	8.6	+ 2.5	49.8

Note.— * Meteorological Stations of the Madras Agric. Dept.

A low pressure area was lying over Rajasthan and adjoining Madya Bharat on 1—9—1955, but this became less marked on the next day. A depression was forming over the head Bay of Bengal on 2—9—1955. This intensified into a cyclonic storm of small extent overnight, crossed the coast near Balasore on the morning of 3—9—1955 and moved west-northwest wards over central India as a depression, which weakened into a diffused low pressure area over Rajasthan on 7—9—1955. In the meanwhile, unsettled conditions were observed in the West Central and adjoining north-west Bay of Bengal on 6—9—1955, which concentrated to a shallow depression on the next day, centred about 150 miles east of Calingapatnam, and moved inland over south Orissa as a low upto north-east Madhya Pradesh, where it got filled up on 13—9—1955. An easterly wave moved into the south-east Arabian Sea across the extreme south peninsula on 13—9—1955. A depression formed over east Uttar Pradesh near Kanpur on 14—9—1955, moved eastwards and broke up over the Nepal-Himalayas on 16—9—1955. A trough of low pressure lay over the south Peninsula on 16—9—1955. Two days hence, another low pressure trough lay off the West Coast, causing strengthening of the monsoon in the Maldives-Comorin area. Unsettled conditions persisted for two days in the south-east Arabian Sea and these were accentuated by an easterly wave entering into the south-east Bay of Bengal on 20—9—1955. A well-marked low pressure area lay over east central Arabian Sea with its central region about 250 miles west of Mangalore on 21—9—1955. On the same day a trough of low pressure lay over the west central and adjoining north-west Bay of Bengal, which concentrated into a depression the same evening and crossed the Orissa coast. The depression passed through central and north India before breaking up over the Punjab, Kumaon hills on 26—9—1955. The low pressure area over the east central Arabian Sea weakened to a trough on 23—9—1955 and persisted there up the end of the month, causing strengthening of the monsoon along the West Coast, where widespread and locally heavy rains occurred. During this period, a trough of low pressure formed in the south Bay of Bengal on 25—9—1955. Yet another trough of low pressure extended from east Hyderabad to the west central Bay of Bengal on 27—9—1955 and 28—9—1955. Due to the movement

of an easterly wave, markedly unsettled conditions were observed in the east central Bay of Bengal on 29-9-1955. A cyclonic storm rapidly developed in the north Bay of Bengal on 30-9-1955, and centred about 100 miles east-south-east of Puri.

Along the West Coast widespread rainfall occurred during the first ten days and locally heavy rainfall during the last five days of the month. Thundershowers were fairly well distributed over Tamilnad.

The note-worthy rainfalls and the zonal rainfall in inches are furnished below:—

Noteworthy Rainfalls			Zonal Rainfall			
Date	Place	Rain-fall in inches	Name of Zone	Rainfall for the month	Departure from normal	Remarks
12/9/55	Vellore	3.3	North	6.3	+ 1.3	Above normal
13/9/55	Nanjanad	3.2	East Coast	2.6	— 1.5	Below normal
26/9/55	Trivandrum	4.6				
27/9/55	Kozhikode	7.1	Central	5.0	+ 1.7	Above normal
do.	Alleppey		South	2.5	+ 0.6	Just above normal
29/9/55	Fort Cochin	3.7				
do.	Pilicode	4.0	West Coast	18.3	+ 9.5	Above normal
do.	Nileshwar	3.8				
do.	Pattambi	3.3	Hills	9.9	+ 4.7	Above normal

Agricultural Meteorology Section,
Lawley Road P. O.,
Coimbatore, 12-10-1955.

C. B. M. & M. V. J.

Departmental Notifications

Gazetted Service—Postings and Transfers

Name and present post	Posted as
Mohd Obeidullah Shah, Dy. Director of Agriculture, Coimbatore,	State Marketing Officer, Madras.
Mariakulandai, Dr. A., Gazetted Asst. Lecturer in Chemistry, Coimbatore,	Government Agricultural Chemist, Coimbatore.
Satagopan V., State Marketing Officer, Madras,	Headquarters Dy. Director of Agriculture Inspection and General, Madras.
Varadachari K. Dy. Director of Agri. Vellore,	Dy. Director of Agriculture, Coimbatore.
Varadarajan, S., Asst., in Chemistry, Coimbatore,	Agri. Bacteriologist, Coimbatore.

Upper Subordinates

Name and present post	Posted as
Alagappan, R. M., Paddy Asst., Coimbatore,	A. D., Villupuram.
Annaswami, N., A. D., Varagoor,	P. P. A., Mycology, Pattukottai.
Balasubramaniam, C. R., Cotton Certification Inspector, Coimbatore,	Rajapalayam, to work in Lint . Certification.
Dhandapani, A., Spl. A. D., Sugarcane, Gudiyattam,	Extension Officer, Krishnagiri.
Dinesh Rao, H., A. D., Palamedu,	A. D., Ramapuram.
Govinda Iyer, T. A., Asst., in Chemistry,	Statistical Asst., Coimbatore.
Johnson Thiruthuraj, A. D., Karaiyur,	A. D., Thirumayam.
Kannan, S., A. D., Andhiyur,	F. M., Central Farm, Coimbatore.
Kuppuswami, V. N., Puduchatram	Instructor in Agri., Grama Sevak Training Centre, Bhavanisagar.
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Moenakshisundaram, D., Asst., Plant Physiology, Coimbatore.	Paddy Asst., Pattambi.
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Name and present post	Posted as
Pranatharthiharan, S. N., A. D., Hosur,	F. M., Livestock Farm, Orthanad.
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Ramachandram Pillai,	P. P. A., Pattukottai.
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Srirangaswami, S., A. D., Kodumudi,	Soil Conservation Asst., Satyamangalam.
Srinivasan, K. V., A. D., Tirukalukundram,	A. D., Jayankondan.
Subramaniam, T. N., A. D., Madukarai,	A. D., Andhiyur.
Subramaniam, P. T., Fruit Research Asst., Plant Physiology,	Pepper Asst., Taliparamba.
Shoukat Ali, K. A., Agri. Instructor, Koilpatty,	P. A., to D. A. O., Salem.
Sethuraman, M. S., P. A., to D. A. O., Salem,	A. D., Hosur.
Sanjeevi, P. S., F. M., Kulitalai,	A. D., Milathur, Tanjore District.
Samu Iyer, P. V., Cane Asst., Palur,	A. D., Shembanarkoil.
Subramaniam, A., Millet Asst., Ariyalur,	Millet Asst., Coimbatore.
Thirumaleshwara Bhat, Myco. Asst., Vittal,	Extension Officer in Agri., Manjeshwar.
Tyagarajan, N. M., Asst., in Chemistry,	Asst. in Plant Physiology, Coimbatore.
Venkataswami, B., Extension Officer, Krishnagiri,	A. D., Cuddalore.
Vaidyanathan, R., A. D., Madurai,	Extension Officer, Perambalur.
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Vinodini Vasudevan, Asst., in Millets,	Fruit Res. Asst., Plant Physiology, Coimbatore.
Vittal Hegde, F. M., Kulitalai,	Cane Asst., Palur.



Opening of the Regulated Market at Kuttippuram
by The Hon'ble Sri M. Bhaktavatsalam, Minister for Agriculture, Madras



The Minister cutting the ribbon to declare the Market Yard open



MALABAR MARKET COMMITTEE

*Opening of the First Regulated Market at Kuttippuram
by the Hon'ble Sri M. Bhaktavatsalam,
Minister for Agriculture, Madras*

The First Regulated Market Yard of the Malabar Market Committee was opened by Sri M. Bhaktavatsalam, Minister for Agriculture, Government of Madras on 8th July 1955. A large gathering of growers and traders was present. Sri A. V. Govinda Menon presided.

In his speech welcoming the audience and the Minister, Sri P. B. Kurup, Chairman, Malabar Market Committee, said:

I have great pleasure to extend to you Sir, and all others who have kindly responded to our invitation and graced this occasion of the opening of the first Regulated Market in this District.

We are particularly grateful to you Sir, for having accepted our invitation to inaugurate this market in the midst of your various pressing engagements and multifarious activities.

We are also thankful to Mr. A. V. Govinda Menon who gladly accepted our invitation to preside over this function. Mr. A. V. Govinda Menon is familiar to you all through his various public activities and it would be superfluous on my part if I attempt to introduce him to you on this occasion. It is quite gratifying that the committee is having the willing co-operation of able and public-spirited men like Mr. Govinda Menon.

I would now like to place before you a brief outline of the activities of the Committee in its endeavour to realise the aims and objectives for which it was constituted.

The Madras Commercial Crops Markets Act enacted as early as 1933 for the better regulation of buying and selling of commercial crops, and the establishment of markets for them was made applicable to Malabar only in 1949. In a Gazette notification dated 5th May 1950, Malabar District was declared a notified area under the Act, and coconuts, copra and arecanuts were declared as notified commercial crops. This was followed by the nomination of 12 members to the Market Committee from among the important growers, traders, and a Government official as ex-officio member, with a Secretary as the executive officer of the Committee and the Committee started functioning from 28-10-1950.

A notice was published by the Committee Secretary requesting the traders, commission agents brokers and weighmen to take out licences and abide by the provisions of the Act. Despite the fact that this legislation was enacted for the benefit of the growers and traders of commercial crops, the Committee did not get the welcome it deserved from the prospective beneficiaries.

With the publication of the notice by the Secretary, there was considerable opposition from the traders, and attempts were openly made to violate the provisions of the act and rules, and paralyse the working of the Committee. Representations were made by the trade interests to Government through memoranda and otherwise, protesting against the establishment of the Committee. Efforts were also made even to misinterpret the Act to the growers.

But after discussions held between the trade interests and Government authorities and the sincere and earnest efforts of the Committee through persuasion and vigorous propaganda, the misunderstanding of the implications of the Act, and the general misconceptions about the Committee and its objectives subsided to some extent and traders began to come forward to take out licences and abide by the act and its provisions. Although the opposition decreased to some extent it did not end. The authority of the Government to enact such a legislation was challenged at the Madras High Court under the fundamental rights guaranteed in the Constitution of India. Similar writ petitions from other districts where committees functioned were also on the files of the High Court.

A special bench of the High Court after hearing both sides passed judgment dismissing the petitions and upheld the act and rules declaring void only a section of the Act which gave the District Collector unlimited discretion to grant or refuse licenses under section 5. They partly declared void Rule 37 in so far as it prevented persons who are licensed but are not registered with the Committee, in carrying on trade in commercial crops. In their judgment, their lordships remarked that in a predominantly agricultural and backward country like India the need for such marketing legislation was all the more essential.

With this judgment of the High Court opposition almost faded out and the Committee was able to proceed in right earnest with its constructive activities.

One of the important functions of the Market Committee is to open regulated markets at important producing areas and existing assembling centres. Unfortunately, despite concerted efforts the Committee has not, been able to open markets at any of the important centres particularly in Kozhikode, Badagara and Ponnani already sanctioned by the Government due to paucity of suitable sites where trading is actually carried on at present. The Government had originally sanctioned the opening of a market for arecanut at Chalissari but since a District Board shandy is functioning there, the original sanction was cancelled and the matter has been shelved for the present. With the continued efforts to open markets at Kozhikode and Badagara the Committee has now switched on its efforts to open as many regulated markets in the important interior centres where there will be no difficulty to find suitable places within the shortest possible period. In this connection the Committee has also formulated a Five-year plan in the course of which period it is proposed to open 22 regulated markets spread throughout the District.

It was only recently that the sanction has been accorded for the opening of regulated market for arecanuts at Kuttippuram and for coconuts and arecanuts at Thalakkadathur.

Kuttippuram, it is considered, is an ideal centre for a regulated market for arecanut. Situated as it is in the heart of the important arecanut growing area in South Malabar, the town which is a railhead has also sprung into prominence after the bridging of the Bharatha-puzha (river) and the consequent easy accessibility from all parts of the district by road. A large number of arecanut curers in this district are also distributed within about 10 miles around the place. It is therefore a matter of gratification for the committee that it has been able to open a regulated market here and it is hoped that in course of time, this would develop to its full stature to serve the needs of the growers, curers and traders in arecanut in this area who have been groaning under various disadvantages in the past.

It is also hoped that within a short period the Committee would be able to open markets at Thalakkadathur and other centres and thus serve the needs of the district at large.

The Malabar Market Committee, when it was first constituted was a nominated one, and the present Committee which began functioning from 3rd March 1953 is the first elected Committee. The Committee has twelve members of which five are from growers, four from traders who are elected two members nominated by the Government and one ex-officio

member who is the District Agricultural Officer of this District. It is a noteworthy fact that one of our members is a lady, and that she happens to be the first lady to be a member of any market committee in this State.

This Committee is only four years old, but during the short period of its working it has been able to bring about an appreciable improvement in regulating the purchase sale of and coconuts, copra and arecanuts in this district.

Merchants, commission agent, brokers and weighmen have been licensed. The old practice of buyers taking various "Mamool deductions" in cash and kind from the sellers viz., sales tax (from the grower) charity, *Tukka*, cartage, *notuvattom*, *vattapasias*, *dallali paisa*, sorting charge, weighing charge, etc., in cash, and *Thandamuri*, *Kuttumuri*, *Varal* and *Thookatakka* (arecanut) etc., in kind, have been generally eliminated.

Commission charges, brokerage, weighing charges, and other incidental market charges have been clearly defined to the advantage of both the purchaser and the producers. Excessive and unwarranted charges are prohibited and market practices have been regulated. Units of weight have been standardised and weights and scales in use are checked with test weights for correctness. Issue of bills is also insisted upon.

Provision have also been made in the bylaws for settlement of disputes, for the prompt payment of the value of the produce by the buyer, and for collection of statistics of stocks and prices through periodical returns.

The financial position of the Committee is satisfactory at present. It is a matter of gratification that after meeting the usual items of expenditure, it has been able to save in all during the past four years more than Rs. 2 lakhs and invest them in National Plan Loan, Madras State Loan and other interest-bearing securities. The Committee may require about Rs. 50 lakhs or more for completing its five-year programme of opening 22 regulated markets in different centres of the district and providing all amenities and for which allotments from Central Arecanut and Coconut Committees are expected. The Committee will also have to meet an equal portion of the allotment, which under the present circumstances will be beyond the means of the Committee. We request the State Government to come to the aid of the Committee in meeting this absolutely necessary expenditure.

The traders are in general abiding by the Act and rules, but unfortunately there were a few instances of persistent evasions and violations of the provisions and the Committee had to resort to the unpleasant task of prosecuting them. However, when such prosecuted parties come forward to take out licences and abide by the Act, the

complaints against them were withdrawn on levying a nominal sum by way of compounding fee.

I may take it that I have now placed before you a brief outline of the activities of the Committee so far.

As the elected Chairman of the Committee from its very inception in 1950, I consider it a great privilege to have had the opportunity to serve the growers and traders of this district. As Chairman of the Committee and personally, I have endeavoured to do my honest best to achieve the aims of objectives of the Committee. I should also mention here that Sri A. G. Kunhikrishnan Nair as Vice-Chairman of the Committee, has also rendered valuable services to the Committee. Despite strong differences of opinion among members it has always been possible to come to unanimous and amicable decisions and they as my colleagues, have always extended to me their unstinted co-operation in the discharge of my duties as Chairman of the Committee.

I will be failing in my duty if I do not speak about the efficient service rendered to the Committee by the Secretary, Sri Sivasankaran Menon. An honest and selfless officer himself, his varied experience in the Agricultural Department and his thorough knowledge of all agricultural aspects of this District has been of great assistance in taking the Committee ahead in its work. The fact that the staff of the Committee has also been very devoted to their work has also to be appreciated.

It is also gratifying to note that successive Directors of Agriculture, State Marketing Officers, and District Collectors have given valuable guidance and help to the Committee.

Finally, I have one request to make to the growers and traders of this District. However laudable the objectives of any legislation be, the willing co-operation of the public at large and particularly from its beneficiaries is necessary for the successful realisation of its objectives. I therefore request you all, and particularly the growers of commercial crops, to extend their wholehearted support and co-operation to the Committee to bring its efforts to fruition.

I once again welcome you, Sir Mr. President and all present here, and now request the Hon'ble Minister to inaugurate the Market.

Inaugurating the First Market Yard at Kuttippuram, Sri M. Bhaktavatsalam, Minister for Agriculture, Madras, said:

It gives me great pleasure to be in your midst to-day, to perform the opening ceremony of the first regulated market of the district to be established under the Marketing Legislation of this State. I am thankful to Sri P. B. Kurup for having given me an opportunity to be in your midst to-day and for addressing you all on the role of regulated markets.

A regulated market is a place for regulating the trade and other transactions in agricultural commodities. The producers, the traders and the consumers obtain the highest common measure of the benefits of such regulation. The actual methods are devised by the people themselves in a democratic way. For this purpose, a Market Committee composed of the representatives of both the growers and the traders is established. Statutory power is vested in such Committees to enforce the regulations. This in turn carries with it certain duties and responsibilities aiming at service to the people and the country.

The need for better marketing of agricultural produce has been felt acutely for a long time. Some of the advanced countries like the U. S. A. and U. K. have introduced their own marketing methods. Similar regulations are all the more necessary in an economically backward country like India and this fact has been stressed time and again by the various Committees set up by the Government of India and more particularly by the Royal Commission on Agriculture in 1928. This long-felt need has been fulfilled by the Madras Government passing the Madras Commercial Crops Markets Act, as early as 1933. It is in the fitness of things that the Planning Commission which has undertaken the huge task of improving the standard of living of the people has laid emphasis on the organised marketing of agricultural produce. Though ultimately the marketing legislation has to be enforced in respect of almost all the agricultural commodities for which there are wholesale markets, it is now applied only in respect of the more important commercial crops of cotton, tobacco, groundnut, coconuts, arecanuts and gingelly. It is the aim of the Government to bring other commodities also gradually within the fold of regulated markets, and I hope that the people themselves will come forward with proposals in this regard.

It is admitted on all hands that the ryots as a class are economically backward and do not get their legitimate return. There is a tendency to squeeze from a weaker element a very much larger share of profit than what is due for the services rendered. Malpractices in weighing are not also uncommon. The growers are tempted with some advances and other kinds of assistance and are ultimately made to part with a good slice of the price of the commodities due to them. To remove these disadvantages, it is essential to regulate the trade in agricultural commodities. Regulation in marketing practices aims at having a hold over the persons who handle the produce in the course of its transmission from the producer to the producer to the consumer through a system of licences and to put down corrupt practices indulged in by unfair members in the trade. Illegal exactions are completely eliminated. At the same time the facilities provided outside the regulated markets will be complementary to those offered within such markets. A few persons holding an unbridled monopoly in trade with a desire to exact payments

or squeeze profits by unfair methods could alone object to this regulation as detrimental to the interests of the larger sections of the community. I am happy to observe that such opposition is yielding to a recognition of the benefits of regulated markets. There are still some misconceptions about the marketing legislation and they have to be removed by constant propaganda. There is no denying that reforms like regulation of trade in agricultural produce is essential and any opposition to such a measure cannot but be the worst type of social evil in a welfare State. My appeal to all of you is to help the Government and the Market Committees in fulfilling their duty by the people.

Regulated markets are working successfully in South Arcot district. These markets have become so popular that even growers from the neighbouring districts resort to these markets as the prices they are able to get there are higher than those in the unregulated markets nearer their homes. You are now starting one such market at Kuttippuram for the benefit of both the growers and the traders. This is but the forerunner of many more such markets in this district as elsewhere in this State. Arecanut, which will be the principal crop that will be regulated in this market is an important commercial crop in India and plays a very vital role in the economy of Malabar. Considering this factor, Malabar occupies a very enviable position in the production and trade of this commodity. It is now the proud privilege of the arecagrowers of Ponnani to have the first regulated market of the district in their place.

Let me hope that the people of Malabar will realise the benefits of regulated marketing and appreciate their role in the welfare of the ryots. With such a pious wish and with the blessings of Guruvayurappan, I have pleasure in declaring this market open.

Regulated Markets in Madras *

by

HON'BLE SRI M. BHAKTAVATSALAM
Minister for Agriculture, Madras

I am very happy to be in your midst to-day and preside over the Conference of the Chairmen of the Market Committees in this State. This is the first Conference which you have arranged after the separation of the Andhra State. This is also the first conference of the Chairmen of Market Committees which, I, as the Agriculture Minister of this State am called upon to preside over; the previous conferences in 1952 and 1953 having been held when my friend Dr. Nagan Gowda was in charge

* Presidential address of the Minister for Agriculture, delivered at the Conference of the Chairmen of Market Committees at Villupuram on 7-8-1955.

of Agriculture portfolio. I may state at once that Conferences like the one you have arranged now are essential as they serve as an occasion not only for exchange of views to review the progress so far achieved and and to prepare a plan for the future but also to discuss in a general way our difficulties and common problems confronting the Market Committees and devise means to get over them. It also affords an opportunity to spotlight to the public, the advantages accruing from the scheme of regulated markets.

Let me now deal in brief with the origin and development of of regulated markets in this country and particularly in this State. Some decades ago, it was noticed that the markets for commercial crops were in a disorganised state and that the cultivator laboured under many disabilities. The manipulation of the scales, weights and measures, unauthorised deductions from the price of the produce for religious and charitable purposes, the taking away of large-scale samples out of the cultivators' produce without any payment and the presence of brokers who were not always fair in their dealings with the growers, were some of difficulties which the illiterate farmer could neither understand nor overcome. It was in these circumstances that the Royal Commission recommended as early as 1928 the establishment of regulated markets for commercial crops under State Legislation. Hyderabad was the first to implement the recommendation of the Royal Commission and the first regulated market in this country was established at Nanded. Madras was not slow to move in this direction, as we also passed the Marketing Legislation in 1933. Similar legislation has since been passed in the States of Madhya Pradesh, Bombay, Mysore, Madhya Bharat, Pepsu and the Punjab.

The Commercial Crops Markets Act of this State was first applied to Tirupur in respect of cotton and the South Arcot District in respect of regulation of trade in one or more of the commercial crops of cotton, groundnut, gingelly, tobacco, coconut and arecanut. Fair and reasonable prices to the grower is as important as production itself and the absence of economical and efficient marketing facilities does not afford the farmer his legitimate return for all his labour. The marketing legislation ensures these facilities to the producer and guarantees a minimum price for his produce.

I shall now deal with the benefits of these regulated markets set up under the Marketing Legislation. This legislation provides for the appointment of market committees fully representative of the growers and traders. Market charges are clearly defined and unauthorised deductions are prohibited. The methods of sale, weighment, allowances, storage etc. are regularised. The traders, brokers, weighmen and other market functionaries are licensed. Correct weighment is assured by the

adoption of standard weights and measures. By-laws are framed for the regulation of business and conditions of trading in the market yards established by the Market Committees. The auctions conducted by the regulated markets have proved conducive to healthy conditions in which the grower is able to realise the just price for his produce and the trader his duty and responsibility towards the producer. The Market Committees publish the daily rates of the commercial crops they handle for the benefit of the growers and the trade.

Let me tell you that the scheme of regulated markets is slowly but steadily being extended in this State. But things have of late not been smooth with these regulated markets. The Government and the market committees had to face stiff opposition from the trade in certain parts of this State to the enforcement of the provisions of the Marketing Legislation. About two or three years back writ petitions were filed before the High Court by the members of the trade challenging the validity of the Marketing legislation of this State on the ground that it sought to impose restrictions on trade which were opposed to the provisions of the Constitution. The Marketing Act was upheld by the Madras High Court as a valid piece of legislation. But appeals to the Supreme Court are sought to be filed against the Madras High Court's Judgment. I shall leave the matter at this. I might state that the Government will always be prepared to consider any suggestions for the removal of defects in the Act or the rules and any hardships created by them.

Apart from the difficulties created by the attitude of a certain section of the trade, it is regrettable that in spite of the vast developments and progress made since Independence the ryots are still not completely free from some of the pitfalls inherent in their dealing directly with the trade in places where regulated markets have yet to be established. Marketing activities were dormant during the days of commodity controls as the marketing problems were not so pronounced in view of the scarcity of commodities on one hand and inflation on the other. There is now a surplus of almost all agricultural produce coupled with a steep fall in prices. Agricultural Marketing on scientific lines should be considered as necessary and useful in any rural economy. The solution now lies in an expansion of the regulated markets in order to guarantee a reasonable price to the grower. This is a difficult problem and has to be solved in the interests of the economic well-being of the ryots.

But even after more than two decades since the marketing legislation of this State has been passed, there is still a total misconception in the minds of some people about the objects of regulated markets. I wish to make it clear that the objects of the regulation envisaged under the Marketing Act is not to interfere with the trade or to control the price or tax the producer. It is not obligatory on the merchants to

buy in any particular place. Further, petty merchants who buy in small quantities are exempted from taking out licences under the Act and the grower need not pay any levy. It is unnecessary for me to explain the benefits of regulated markets in detail here. But I can assure you that the grower and the trader will derive a lot of advantages through these regulated markets. The need for better marketing of agricultural produce has been felt in advanced countries like the U. S. A. and England. "Marketing" is the last link of production affording the farmer an opportunity to realise the fruits of his labour. Marketing is the crux of the whole food and agriculture problem. I need hardly add that progress in this direction is all the more necessary in a country like India where most of the ryots are educationally and economically backward.

It is my hope that a network of regulated markets in all producing centres in this State would be established and that the day will not be far off when the objects of the regulated markets will be fully understood by the people.

The need for extending the benefits of regulated markets to all the important areas and crops has been stressed in the First Five-Year Plan. The number of regulated markets in the entire Indian Union has increased by 129 during the first Five-Year Plan period. To-day we have 412 regulated markets in the whole country spread over the States of Bombay, Madhya Pradesh, Madras, Mysore, Andhra, Punjab, Hyderabad, Madhya Bharat and Pepsu. These markets have become so popular that it is no wonder that the Spices Enquiry Committee set up by the Indian Council of Agricultural Research has suggested the establishment of regulated markets in respect of spices like pepper, cardamom, ginger, cashewnuts etc.

Regulation under the M. C. C. M. Act is only one aspect of marketing. The other aspect, viz., market news service, grading and standardisation, marketing surveys etc., are also equally necessary for orderly marketing of agricultural produce. The Government of India have under the Second Five-Year Plan recommended a few schemes being taken up under the Agricultural Marketing. There is also a proposal under the Second Five-Year Plan for the construction of warehouses. As warehousing facilities are very important for Market Committees the question whether the Government of India should render financial assistance to regulated markets in the shape of loans for construction of godowns, would naturally arise and I hope that any assistance which the Market Committees may require will have the backing of this Government. But the final decision in the matter rests with the Government of India. The objectives of organised marketing will be fulfilled only if the schemes for regulation under the Marketing Act and the schemes under the Second Five-Year Plan are implemented

simultaneously. I need hardly add that if the agriculturists and traders are to prosper, the development of regulated markets should precede development in other sectors.

I therefore appeal for the co-operation of the people in achieving the objectives of the Marketing legislation of this State and the implementation of the schemes under agricultural marketing that have to be taken under the Second Five-Year Plan. I also hope that the legal difficulties would before long clear themselves and the Government will be in a position to go ahead with their programme of development of regulated markets and agricultural marketing.

Gentlemen, I am afraid, I have spoken at some length but it has been necessary as I feel that the objects of regulated markets should be explained more fully and more clearly, so that the people themselves will take the initiative and come forward with proposals for the enforcement of the provisions of the marketing legislation. The existing channels of propaganda and publicity should be utilised to the utmost and new methods found out for educating each and every ryot on the benefits of regulated markets. The task is not so easy. But I do hope that constant propaganda would give the best results. I do not wish to take any more of your valuable time. I am happy that all of you are taking the keenest interest in the problems facing you and I find that your agenda contains many subjects of importance, such as doing away with the present system of elections to market committees, co-operation between market committees and Co-operative marketing Societies, extension of the benefits of regulated markets to all districts and to all important agricultural committees and so on. I have no hesitation in saying that you will consider all these problems deeply and in detail before coming to conclusions. I can assure you that the resolutions which you may pass in the conference will receive the most earnest and sympathetic consideration at the hands of the Government. I now request you to proceed with the deliberations and come to some useful and practical conclusions to enable the Government to implement the scheme of regulated markets fully.

Gentlemen, I wish your deliberations all success and I thank you once again for having given me this opportunity of meeting you.

Crop and Trade Reports

Mesta—First and Preliminary report 1955-'56—Madras State: The area sown with *mesta* in the Madras State upto 25th June 1955 is estimated at 860 acres. Compared with the area of 760 acres estimated for the corresponding period of last year, this is an increase of 14.7 per cent. An increase in area is estimated in the districts of Coimbatore, Tiruchirapalli and Tanjore. The area estimated was the same as that of the last year in North Arcot and Madurai districts. The area under *mesta* is little or negligible in Tirunelveli district. The yield per acre is expected to be normal in the districts of Coimbatore, Tiruchirapalli and Tanjore and slightly below the normal in the districts of North Arcot and Madurai.

The seasonal factor for the State as a whole works out to 99 per cent of the normal as against 98 per cent of the normal estimated for the corresponding period of last year. On this basis, the total yield works out to 1,810 bales of 400 lb. of dried fibre as against 1,380 bales of 400 lb. estimated for the previous year, representing an increase of 16.7 per cent.

Cotton—First forecast report—1955-'56—Madras State: The area sown with cotton in the Madras State upto 25th July 1955 is estimated at 74,500 acres. Compared with the area of 71,000 acres estimated for the corresponding period of previous year and an average area of 57,800 acres calculated for the previous five years ending with 1954-'55, this is an increase of 4.9 per cent and 28.9 per cent respectively. The area estimated is the same as that of last year in the districts of Malabar and South Kanara. A decrease in area is estimated in the district of Chingleput and an increase in the other districts of the State except the Nilgiris where the area under the crop is negligible.

The estimated area by varieties in the current year together with the corresponding figures for the previous year is given below:

Variety				Area in '00' acres	
				1955-'56	1954-'55
Madras American—Cambodia	..	..	..	203	238
Madras American—Cambodia—Uganda	..	..	..	150	93
Total				353	331
Karungannies	..	..	..	245	229
Tirunelvelies	..	..	..	81	138
Uppam	..	..	..	66	9
Nadam and Bourbon	..	..	..	..	3
Total				392	379
Grand Total				745	710

The average wholesale price of lint per maund of 82 2/7 lb. or 3,200 tolas on 6-8-1955 was Rs. 94-7-0 for Coimbatore Cambodia, Rs. 78-12-0 for Coimbatore Karunganni. Compared with the prices which prevailed on 7-8-1954, these prices reveal an increase of 2.0 percent in the case of Coimbatore Cambodia and a decrease of 4.0 percent in the case of Coimbatore Karunganni.

Ginger—first forecast report—1955-56—Madras State. The area under ginger crop upto 25th August 1955 in the districts of Madurai, Malabar, South Kanara and the Nilgiris is estimated at 13,030 acres. Compared with the area of

12,770 acres estimated for the corresponding period of the previous year, it shows an increase of 2.0 percent. An increase in area is estimated in the districts of Malabar, South Kanara and the Nilgiris and decrease in the district of Madurai. The condition of the crop is satisfactory and the yield per acre is expected to be normal in Malabar and South Kanara districts.

The wholesale price of dry ginger per standard maund of 82 2/7 lb. or 3,200 tolas on 3-9-1955 was Rs 147 at Kozhikode. Compared with the price for the corresponding period of last year i.e., 4-9-1954 it shows an increase of 66.7 percent.

Pepper—First forecast report—1955-'56—Madras State: The area under pepper upto 25th August 1955 in the districts of Malabar, South Kanara and the Nilgiris is estimated at 1,20,000 acres (1,02,360 acres in Malabar district, 17,490 acres in South Kanara district and 150 acres in the Nilgiris district) as against 1,16,610 acres (99,220 acres in Malabar district, 17,490 acres in South Kanara district and 150 acres in the Nilgiris district) as against 1,16,610 acres (99,220 acres in Malabar district, 17,240 acres in South Kanara district and 150 acres in the Nilgiris district) estimated for the corresponding period of the last year. The condition of the crop is reported to be normal in Malabar and South Kanara districts.

The wholesale price of pepper per maund of 82 2/7 lb. or 3,200 tolas on 3-9-1955 was Rs. 120-7-0 for Nadan and Vatakkan variety, Rs. 126-6-0 for Nadan and Vatakkan variety, Rs. 126-6-0 for Wynaad variety at Kozhikode, Rs. 122-11-0 at Cochin, Rs. 124-11-0 at Tellicherry and Rs. 121-4-0 at Mangalore. Compared with prices in the corresponding period of the previous year i.e. those which prevailed on 4-9-1954 these prices show a fall of 7.0 per cent for Nadan and Vatakkan variety, 6.5 per cent for Wynaad variety in Kozhikode, 22.3 per cent in Cochin, 12.3 per cent in Tellicherry and 24.6 per cent in Mangalore.



THE MADRAS AGRICULTURAL JOURNAL

Hints to Contributors

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All articles for publication should be addressed to the Editor, Madras Agricultural Journal, Lawley Road P. O., Coimbatore.

In view of the high cost of printing, contributions should be as concise as possible and should conform to the best usage in the leading Journals published in India and abroad.

Manuscripts should be typed with double spacing on one side of the paper only and with wide margin. They should not ordinarily exceed 5,000 words or 12 pages of printed matter including tables and illustrations in the Journal. Manuscripts should be carefully revised; numerical data and calculation checked. Main headings in the text should be typed in capitals with paragraph indentations and followed by a period and two hyphens. Sub-heads should be lower case and be underlined to indicate italics. Latin nomenclature and local terms etc., should be in italics. Original papers must conclude with a summary of not more than 300 words, drawing attention to the main facts and conclusions.

Tables: The number of tables should be restricted to those absolutely necessary, as numerous tables detract from the readability of the article. Each table should be numbered consecutively from 1 up and must have a heading stating its contents clearly and concisely. The tables are to be typed on separate sheets with their positions marked in the text.

Illustrations: Wherever possible illustrations should be made with pen and Indian ink for reproduction as line blocks. The name of the author, title of the article and figure number should be written on the back of each figure in blacklead pencil. Each figure should have a legend typed on a separate sheet.

Photographs: Photographs and wash drawings are more expensive as half-tone blocks are necessary. The cost of blocks is chargeable to the author of the article. Photographs submitted as illustrations should be unmounted, glossy prints of good quality, with strong contrasts, trimmed so as to include only the essential features to be illustrated. They should preferably be of the same size as desired in the printed paper. Photographs should always be packed flat, never rolled or folded.

Line drawings: Line drawings, and charts should be prepared in twice the scale desired in the printed form. All letterings, figure numbers and explanatory notes in graphs should be light face and large enough to be 1/16" high in the finished illustrations.

Graphs: Graphs should be drawn in Indian ink on co-ordinate paper ruled with blue lines. Any portion which is desired to appear in the reproduction should be drawn over with Indian ink.

References: References and reviews of literature should relate only to closely pertinent papers. The list of references should come at the end of the article, after the summary and should be arranged in alphabetical order of authors' names followed by the year of publication in brackets, and then the title of the paper, name of periodical volume number in bold face type and then the page number, e. g. Darlington C. D., (1944) Heredity, development and infection. *Nature*, 154; 164-9. Abbreviations for names of journals are to be in the approved form as given in the World List of Periodicals.

The responsibility for statements, whether of fact or opinion, rests entirely with the author of the article and not with the Editorial Board of the Madras Agricultural Journal.

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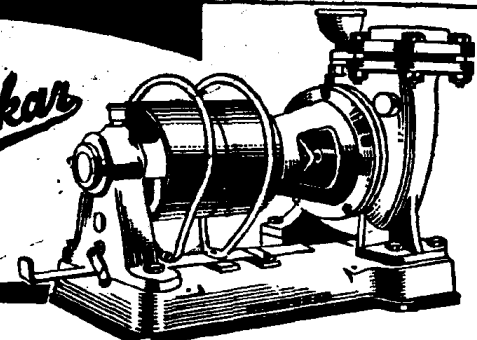
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The Madras Agricultural Journal

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The Madras Agricultural Journal

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Editorial

348

Scientific Jargon: Our readers can no doubt recall some of the oldtime favourites as subjects for school-boy debates, such as "Town Life or Country Life, which is better; Commerce or Agriculture, The Pen or the Sword, which is mightier". To these may be added the subject of "Scientific Jargon—whether it exists; if it does, whether it is necessary or not".

The term scientific jargon is at first sight somewhat paradoxical—because the dictionary meaning of jargon is "unintelligible words, gibberish" and gibberish can hardly ever be deemed to be scientific. All the same it is a fact that a certain type of specialised set of terms and expressions gets developed in certain specialised fields of knowledge. For instance in technical journals like Electronics or Chemical Engineering it is arguable that scientific jargon is appropriate so long as it is accepted in that particular field. It may even be desirable, when its use saves paper, time and energy in comprehending the facts communicated. In general however, it is rather difficult to explain what exactly is meant by "Scientific Jargon". In fact, there is no single diagnostic touchstone for it as such, because the acceptance or otherwise of any kind of jargon is determined mostly by usage, in which case it serves as a convenient vehicle for communication between experts. Without such a convenient medium for interchange of facts and knowledge, specialists might find communication as awkward and time-consuming as doing multiplication with Roman numerals. On the other hand compression should not be carried to the point of obscurity. The following examples will serve to show how overcrowding of technical terms obscures the meaning. "The pulverised fuel is gravity-fed to a point where it meets the forced draught through a twelve-armed spider rotating rapidly to break up lumps of coal that may have formed due to coal

particles adhering together. (Kapp, 1948)". Here are two examples from an agricultural report:— "The experiment was laid out in split-plot design in two sets, one with cumbu, cholan, ragi and groundnut in two seasons, the first crop season from September to December and the second crop season from December to March and the other with cotton in one continuous season from September to March." "Fisher's Z test was satisfied for kinds of legumes but it was not satisfied for phosphate treatments and interaction". One more example from the same book by Dr. Kapp typifies the "official jargon" rendering of of Mark Antony's famous speech. "In this case I have undertaken my journey here for the sole purpose of interring the deceased. From this point of view I do not propose putting anything on record is so far as praise of Caesar is concerned."

In agriculture, just as in all other sciences it is essential to put across facts and ideas in the most effective manner possible and to do this well, it needs a conscious effort and a certain amount of training to achieve an effective presentation of agriculturally technical information. It is obvious that in these days, almost every reader comes across far more written matter than he ever has time to read and hence the competition for his attention is very keen indeed. The scientists who neglect the basic principles of effective presentation, under a mistaken impression that such things are too trivial for their precious time and exalted attention, should recognise that the time of the reader too, is equally valuable to be wasted in digging out meanings from sentences buried in obscure technical jargon.

There is of course such a thing as scientific jargon which is by no means superfluous, but is very often useful and even necessary, but it should be kept well within bounds and used with discretion, so as to be intelligible to those who are not fully familiar with the subject matter. This is particularly necessary in the field of agricultural science, because at the receiving end the persons are invariably those who do not know much about specialised sciences, while at the transmitting end, each aspect is part of a specialised science in itself.

A New Angle on Trichy Phosphatic Nodules

by

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Introduction: Attempts have been made since 1892, both in this Institute and elsewhere, to convert the rich phosphatic material available as nodules in the Tiruchirapalli district of the Madras State into a readily available phosphatic fertilizer. The high content of lime (calcium carbonate) present in the raw material mitigated against its conversion into superphosphate by the usual sulphuric acid treatment. Consequently, the material, inspite of its high total P_2O_5 content (25 to 30%), remained unexploited for use as a fertilizer.

With the advancement of chemistry and technology, newer methods have been developed in recent years to convert rock phosphates into readily available phosphatic fertilizers without the use of sulphuric acid. The outcome of such developments have led in other countries to the production of phosphatic fertilizers by the following process:

(a) defluorinated phosphatic rock produced both by calcination and fusion (b) fertilizers produced by calcination of phosphatic rock with alkali salts (c) "phosphate rock-magnesium silicate glass" fertilizer produced by fusion with magnesia and silica and (d) fertilizers obtained by treatment of phosphate rock with nitric acid (Jacob, 1953).

Of the above products, the "Phosphate-rock-magnesium silicate glass" is prepared by fusing phosphate rock with olivine or serpentine rocks, which are inexpensive natural sources of magnesium and silica. This product has the following advantages over the other products:

- i. No defluorination furnace or rotary kiln with its attendant refractory problems and fuel consumption is required;
- ii. Olivine and serpentine rocks are readily available and cheap;
- iii. Besides phosphorus, magnesium which is also a plant food, is present in this fertilizer and

- iv. The product is similar to the silico-phosphate which does not undergo reversion in acid soils as is the case with superphosphate (Crowther and Lea, 1946; Mariakulandai, Venkatachalam and Rajagopal Iyengar, 1955)

Hence it was felt that the technique used in the preparation of "phosphate-rock-magnesium silicate glass" might serve the purpose of rendering the phosphorus in the Trichy phosphatic nodules available to plants.

Object: Accordingly, the process was studied under the following heads to arrive at the best technique and ingredient for rendering the P_2O_5 in the Trichy nodules available to plants:

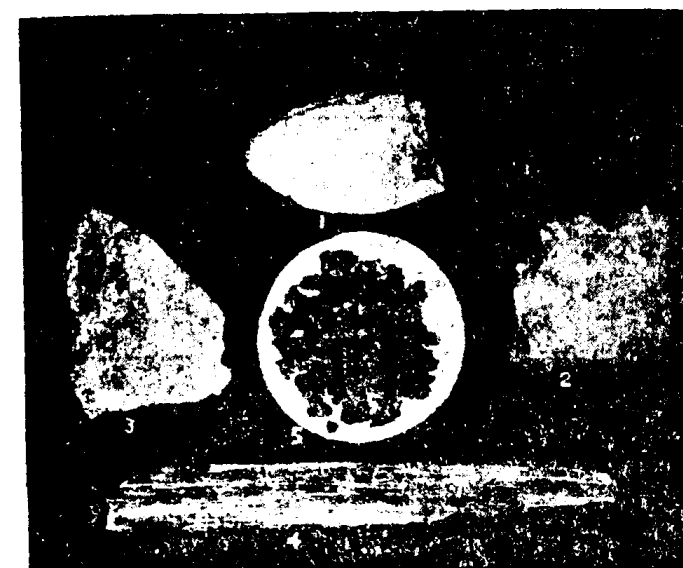
- (1) To study the effect of pure compounds of magnesium and silica in the fusion mixture.
- (2) To study the possibility of using naturally occurring olivine and serpentine rocks of Salem, as cheap sources of magnesia and silica.
- (3) To study the use of sulphates in improving the availability.
- (4) To note the effect of quenching the fused mass in cold water.

A preliminary report of this work was published by the authors in Current Science (Mariakulandai *et al* 1955.)

Materials and Methods: Trichy phosphatic nodules giving a total P_2O_5 content of 28% were powdered to pass through a 50 mesh sieve and used. This material was mixed with a number of other chemicals like silicate, sulphates and carbonates of sodium, magnesium or calcium and also with materials like olivine and serpentine rocks obtained as by-products in the magnesite quarries of Salem, Madras State and bagasse ash obtained as waste in sugar factories. Bagasse ash used in this study was from the sugar factory at Pugalur in Trichy District. Plate 1 shows the raw materials used in this study with the fused product obtained from them.

About 100 grams of mixtures of the above materials were mixed in different proportions in a mortar using a little quantity of water and formed into small pellets of the size of a playing marble. These pellets were first air-dried and then dried in an oven at $150^\circ C$. The dried pellets had to be fused next. The fusion is usually done at a temperature of $1550^\circ C$ in a three-phase

electric arc furnace in other countries (Moulton, 1949). As this facility was not available locally, oxy-acetylene flame was used (excepting for mixture No. 34 which was fused using graphite arc) for fusing the pellets prepared as above, one by one on a firebrick. The hot fused mass was then immediately quenched in cold water. All the mixtures presented in Tables 1 to 3 were quenched immediately after fusion.



1. Trichy nodule 2. Bagasse ash
3. Olivine 4. Serpentine
5. Fused Product

The fused product thus obtained was powdered to pass through a 90 mesh sieve and analysed for "total P_2O_5 " and "available P_2O_5 ". "Total P_2O_5 " was estimated volumetrically after precipitation as ammonium-phospho-molybdate, after extraction with 1:1 HCl to which a few ccs of HNO_3 was added while "available P_2O_5 ", which represents the form in which phosphorus is available to plants was estimated in the 2% citric acid extract of the material.

Raw materials used in the mixture, like olivine, serpentine and bagasse-ash, were analysed for their MgO and SiO_2 contents (Tables 5 & 6).

The results of analysis of the mixtures tried out are presented in Tables 1 to 4. From the data obtained, the following points emerge as answers to the problem under study.

(i) Presence of a silicate along with magnesia is better than either of them alone in the fusion mixture, in rendering the phosphate available in Trichy nodules (Table 1).

TABLE 1.
Showing the effect of fusing Trichy phosphate with pure compounds of magnesium and silica

S. No.	Mixture No.	Composition of mixture	Total $P_2O_5\%$	Avail-able $P_2O_5\%$	% rendered soluble in 2% citric acid
1.	4	10:3 T. P: $MgCO_3$	29.33	2.83	9.65
2.	7	10:6 T. P: $MgSO_4$	29.57	4.83	16.33
3.	12	10:6 T. P: Na_2SiO_3	19.15	7.70	40.22
4.	5	10:3:3 T. P: $Na_2SiO_3:MgCO_3$	23.56	9.13	38.76
5.	6	10:3:3 T. P: $Na_2SiO_3:MgSO_4$	23.42	12.75	54.44

T. P:— Stands for Trichy phosphate

(ii) The naturally occurring olivine and serpentine rocks of Salem could be used as a source of silica and magnesia in the fusion mixture for rendering the P_2O_5 in the Trichy nodules available to plants. The bagasse-ash supplying mainly silica to the mixture was better than either of the two raw materials mentioned above when the latter are used alone in the mixture, without addition of other materials such as sodium sulphate (Table 2). In the presence of sodium sulphate, olivine and bagasse-ash mixtures are equal, while serpentine mixture is the best. (Table 3).

TABLE 2.
Showing the effect of fusion with raw materials containing magnesia and silica

S. No.	Mixture No.	Composition of mixture	Total $P_2O_5\%$	Avail-able $P_2O_5\%$	% rendered soluble
1.	16	10:6 T. P: Olivine	19.68	5.66	28.76
2.	17	10:3 „ „	23.00	5.10	22.18
3.	18	10:3 „ Serpentine	24.68	6.55	26.55
4.	19	10:6 „ „	19.74	5.73	29.02
5.	20	10:3 „ Bagasse ash	19.80	9.74	49.19

(iii) Of the sulphates tried along with olivine and serpentine in the mixture, sodium sulphate was found to be the best, and sodium sulphate was necessary to get a 95% availability (Table 3).

TABLE 3.
Showing the effect of sulphates in improving the availability of phosphate in Trichy phosphate

S. No.	Mixture No.	Composition of mixture	Total $P_2O_5\%$	Avail-able $P_2O_5\%$	% rendered soluble
1.	16	10:3 T. P: Olivine	23.00	5.10	22.18
2.	22	10:3:3 „ Olivine: $CaSO_4$	22.15	5.60	25.28
3.	26	10:3:3 „ „ : $MgSO_4$	22.35	10.15	45.19
4.	27	10:3:3 „ „ : Na_2SO_4	19.70	14.10	71.57
5.	18	10:3 „ Serpentine	24.68	5.10	22.18
6.	23	10:3:3 „ „ : $CaSO_4$	22.15	5.60	25.28
7.	34*	10:3:3 „ „ : Na_2SO_4	21.65	20.65	95.33
8.	20	10:3 T. P: Bagasse ash	19.80	9.74	49.19
9.	39	10:3:3 „ „ : Na_2SO_4	19.03	13.60	71.47

* Fusion done using the graphite arc at the Electrochemical Research Institute, Karaikudi.

(iv) As already observed by other workers, (Jacob 1953), fused product has to be quenched as it granulates the material for easier grinding and also prevents the reversion of the P_2O_5 to the unavailable form (Table 4).

TABLE 4.
Showing the effect of quenching the fused mass on the availability of phosphorus in Trichy phosphate

S. No.	Mixture No.	Composition of mixture	Total $P_2O_5\%$	Avail-able $P_2O_5\%$	% rendered soluble
1.	2	10:3:3 T. P: $MgCO_3:Na_2SiO_3$ (Not quenched)	22.78	6.13	26.92
2.	5	10:3:3 T. P: „ Quenched	23.56	9.13	38.76

Discussion and Conclusions: Rendering phosphate rock available to plants through fusion has been tried by a number of workers. Waggaman and Esterwood (1927) have reviewed the conditions under which phosphate rock could be rendered citrate-soluble through calcination. The temperature range is a very important factor and is considered to be narrow for each type of salt and proportions tried (Guernsey and Yee, 1924). In the United States of America, mixtures of rock phosphate and olivine or serpentine are fused at

1550°C in a triple arc furnace and is estimated that with 850 kw. hr. of electricity and 15 to 20 pounds of graphite for the arc furnace, a ton of the product could be prepared on a commercial scale. In the present study, the objective was to render the phosphate in the Trichy nodules, citrate-soluble, so that the phosphorus in the nodules will be available to the plants. As a three-phase electric arc furnace was not available at this laboratory, the fusion was done with oxy-acetylene flame, the temperature of which was round about 1500°C in all cases reported in this study, barring mixture No. 34 which was fused in graphite arc at the Karaikudi Electrochemical Research Institute at about 1500°C. The main objective of the experiment was directed towards finding out the best ingredients to be used, keeping the temperature factor as nearly constant as possible.

The use of silica and alkali salts such as KCl or K_2SO_4 has been found to be beneficial by Day (1895), in cases of phosphate rocks containing calcium carbonate. Wolter (1903) found alkaline earths and silicates to be good for the purpose, while Walthall and Bridger (1943) showed that fusion of phosphate rock with magnesia and silica gave a product with a high availability of phosphate. With Makatea phosphate of Japan, Ando and Kataoka (1952) report best results when mixed with Na_2SO_4 , carbon and SiO_2 .

This study has clearly brought out that of the pure chemicals tried in the mixture, magnesia or silica individually did not bestow as much benefit as would be obtained by a judicious mixture of both. Under the conditions of this experiment the best combination to render the phosphorus in Trichy nodules available to plants was 10 : 3 : 3 of Trichy nodules with $MgSO_4$ and sodium silicate respectively. But in any commercial venture of exploiting the process, the addition of pure chemicals would not be economical and in the search for such natural products to go into the mixture, a reference to literature indicated that Boylan (1953) found "langebeinite" containing K_2SO_4 and $MgSO_4$ to give 96% availability. Walthall and Bridger (1943) used olivine rock in the mixture with good results, Nagai *et al* (1951) in Japan found fusion of rock phosphate with serpentine and potassium liparite in the ratio of 60 : 35 : 5, good. Huang (1953) has used both olivine and serpentine successfully in the fusion mixture. In the present study, olivine and serpentine rock samples obtained from Salem were used. These rock samples contained MgO and SiO_2 in good amounts (Table 5). But, it was found that the rocks by themselves could not give a

high availability of P_2O_5 without addition of sodium sulphate in the mixture (Table 3).

TABLE 5.
Showing the analysis of the olivine and serpentine rocks used in the study

	Olivine rock	Serpentine rock
$SiO_2\%$	36.20	42.50
MgO%	47.61	42.72

Bagasse ash thrown out as a waste product from sugar factories and consisting mainly of silica (Table 6) with 2% P_2O_5 and a little lime was also useful in rendering the phosphorus in Trichy nodules available to the extent of 50%, when used alone with the Trichy nodules and to about 70% when used with sodium sulphate.

TABLE 6.
Showing the analysis of Bagasse ash used in the study

1. Insolubles (mainly silica)	..	94.19
2. Iron and alumina	..	2.31
3. Lime	..	1.91
4. Magnesia	..	trace
5. Potash	..	"
6. Soda	..	"
7. Sulphate	..	Nil
8. Phosphoric acid	..	2.23

Whatever be the mixture, quenching of the molten mass immediately in cold water gave a higher solubility and this is in keeping with the observation made by Jacob (1953).

From the above, it is evident therefore, that fusion at about 1500°C of the Trichy phosphatic nodules with the proper mixture followed by quenching in cold water would be a solution to the age-old problem of rendering the P_2O_5 in the Trichy nodules available to plants.

With the availability of cheap fuel and power at the lignite mines at Neiveli and the growing fertilizer consciousness in the country, the need for exploiting the natural phosphate resources has been keenly felt of late. The conversion of the phosphorus in the Trichy nodules to a useful form of fertiliser such as ammonium phosphate etc., is being studied. In this connection, it is felt

by the authors that the conversion of the nodules to the silico-phosphate form is likely to be cheaper than the conversion to ammonium phosphate. The latter involves multiple processing of the nodules viz., conversion of the phosphate in the nodules to elemental phosphorus, oxidation of the phosphorus so obtained to the oxide through thermal processing, hydration of the oxide to produce phosphoric acid and then again treating the acid with ammonia to be obtained through lignite, whereas the conversion to silico-phosphate involves only one step, of fusing the phosphate mixture at about 1500°C. Moreover, silico-phosphate is found to be the remedy for the problem of phosphate fixation in laterite soils of the Nilgiris and hence will be highly useful to the potato growers of the Nilgiris.

Summary: Work done as early as 1925 by Sivan *et al* had indicated that approximately 8 million tons phosphatic nodules containing nearly 25.6% of total P_2O_5 occur in Utatur village of Ariyalur Taluk in Trichy District. The phosphate in the nodules is in a form unavailable to plants due to its very low citrate solubility. The conversion to the commonly known useful form of fertilizer such as superphosphate was found to be uneconomical due to its high content of calcium carbonate.

Of the various techniques now available, the conversion to "phosphate rock-magnesium silicate glass" was adjudged as the best suited to avoid the use of acids for processing the material into an easily available plant food. The main objective of the study was towards finding out the most suitable mixture with magnesia and silica to obtain a highly citric-soluble fertilizer from the Trichy phosphatic nodule. To start with, pure salts of magnesia and silica were tried and it was found that 10:3:3 Trichy phosphate, magnesium sulphate and sodium silicate was the best. The next step was to attempt to substitute the pure salts with cheaply available raw material. Olivine and serpentine (from Salem) were used as sources of magnesia and silica. Though it has been reported by other workers that fusion of phosphate rock with olivine or serpentine gives the maximum solubility, yet in the case of Trichy phosphatic nodules it is seen that olivine or serpentine alone was not sufficient and that sodium sulphate is also necessary to bring about the maximum citric acid solubility. Quenching of the hot fusion product was also necessary to get the maximum solubility. Bagasse ash, a waste product from furnaces of sugar factories, which consists mainly of silica was also tried as a cheap source of silica and was

found to give a citric solubility of 50% only by itself and 71% availability when Na_2SO_4 was added to the mixture. 95% availability of the P_2O_5 was achieved in the case of mixture No. 34 consisting of 10:3:3 of Trichy Phosphatic nodules with serpentine and sodium sulphate fused in the graphite arc furnace.

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Manuring of Sugarcane in Malwa

by

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Introduction: Madhya Bharat is situated in the centre of the Indian Union extending over an area of 47,000 square miles. The central part of this State is called Malwa Plateau situated at a height of 1,200 to 1,800 ft. above sea level. It consists of black cotton soils varying in depths from 1 to 6 feet and receives an annual rainfall of about 30 inches. On account of its high moisture-retaining capacity, the main crops of wheat, cotton, groundnut and jowar (sorghum) etc., are grown under rainfed conditions while sugarcane and other garden crops are cultivated on irrigated lands. The total area under sugarcane is about 55 thousand acres representing about 14% of the irrigated area of the State. The yields of indigenous cane varieties were only 10 to 12 tons per acre, but as a result of evolution of improved hybrid canes developed at the Central Sugarcane Research Institute at Coimbatore, the yields have increased by about 200 to 400%, but still it is not equal to the other sugarcane-growing areas of the country such as U. P., Bihar and Madras etc.

The yields of the improved varieties can further be raised by the application of nitrogenous manures both organics and inorganics. Sethi in U. P., India, (1937) reported that there is a general consensus of experimental results to show that part of nitrogen should be given in the organic form particularly as castor or groundnut cake, which proved superior to bulky manures. Rege in Bombay, (1941) stated that since the application of ammonium sulphate alone deteriorates the quality of the juice, mixture of inorganic manures with organics like oilcakes was best for sugarcane. Carey and Robinson (1953) in British Guiana found that with dressings of 2, 4, 6 and 8 cwt. per acre of ammonium sulphate, the percentage of sucrose fell on an average by 0.01, 0.10, 0.23 and 0.51 respectively.

Since no such work on sugarcane was done in this part of the country, an experiment was started at the Institute of Plant Industry, Indore, in 1948-49. The bulky manures, farmyard manure and compost, were applied as basal doses while mixtures of ammonium sulphate, groundnut cake and ammonium sulphate and castor cake were applied as top dressings.

Experimental layout and results: The treatments consisted of F. Y. M. (0.5% N) and Farm Compost (1.0% N) applied as basal dressing at 50 lb. N per acre, and two mixtures of ammonium sulphate plus groundnut cake and ammonium sulphate plus castor cake applied as top dressing to supply 50, 100, 150 and 200 lb. N per acre, in two instalments, once at the time of planting and the other at earthing-up after about four months. The mixtures were made in such a way that half the quantity of nitrogen was from ammonium sulphate and the remaining half from groundnut or castor cakes. The variety of sugarcane used was Co. 419 which has been recommended as the most suitable for this tract. The treatments were in three replications in a simple randomised block design in each season.

For combined analysis, the plotwise yields have been converted in tons per acre and these are given in Table 1.

As a result of the statistical analysis, it was found that the differences in the cane yield obtained in different seasons were highly significant. The yields obtained during 1948-49 were significantly lower than those of 1950-51 or 1951-52.

There were no significant differences in the cane tonnage due to the two bulky manures applied before sowing or to the two manure mixtures being applied as top dressings.

With regard to the effect of various doses of nitrogen, it was found that the higher levels of 100, 150 and 200 lb. nitrogen per acre increased the yield significantly over control (50 lb. N per acre). However, there were no appreciable differences in their mean yields. The application of 200 lb. N gave a lower yield than 150 lb. N per acre, although it is not statistically significant, as will be seen from Table 2 given below.

TABLE 2.
Cane tonnage per acre

Levels of N.	Mixtures.	Ammonium sulphate groundnut cake.	Ammonium sulphate Castor cake.	Average.
50		25.16	22.98	
100		28.78	27.41	24.07
150		28.91	28.78	28.09
200		28.02	27.91	28.84
Average		27.71	26.77	27.96
Standard error for levels:		0.82	C. D. 2.37	
Standard error for mixture:		0.68	Differences not significant.	