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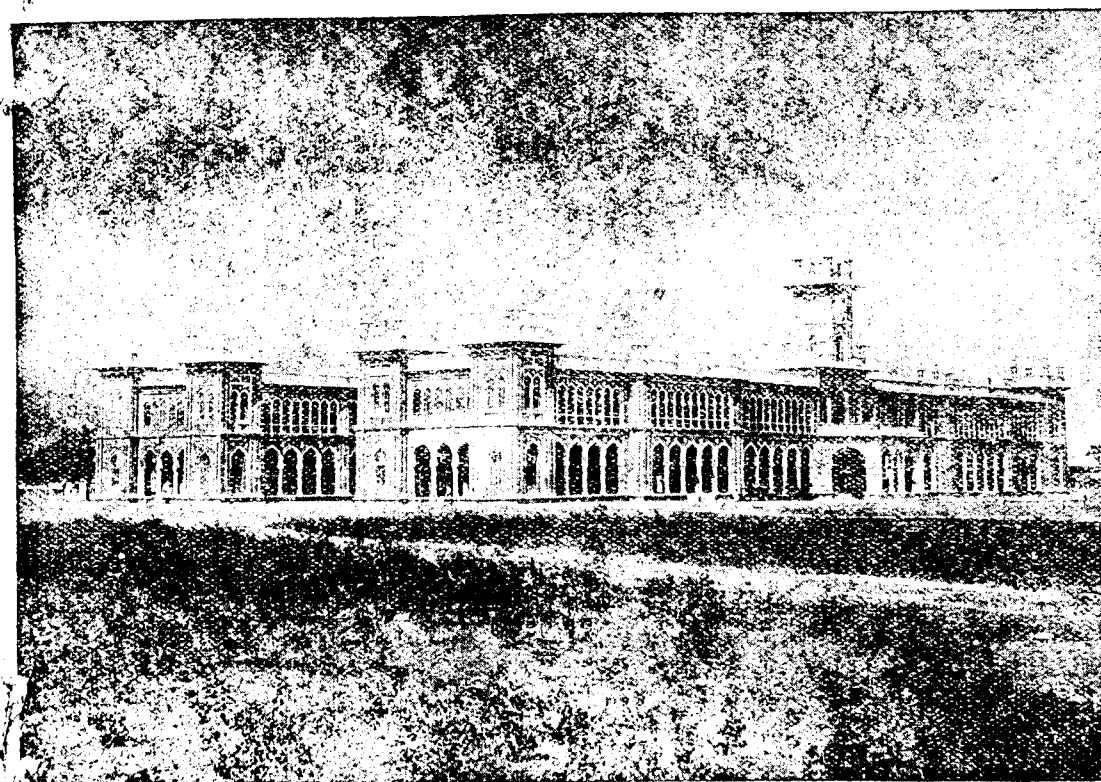
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November 1957

No. 11



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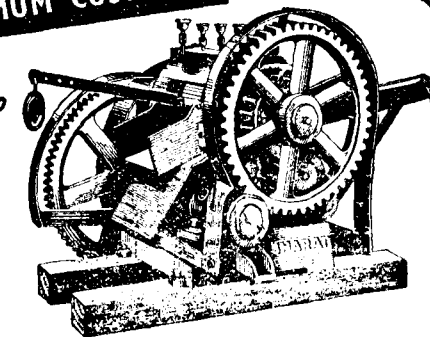
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Announcement

INDIAN COUNCIL OF AGRICULTURAL RESEARCH THE RAFI AHMED KIDWAI MEMORIAL PRIZES FOR AGRICULTURAL RESEARCH.

The Indian Council of Agricultural Research has with a view to creating an incentive for research workers and to recognising outstanding research work done by them in the fields of agriculture, animal husbandry and allied subjects, decided to institute 11 prizes of the value of Rs. 5,000 each. These prizes will be known as The Rafi Ahmed Kidwai Memorial Prizes for Agricultural Research and one prize will be awarded annually for outstanding research work done in India in each of the following subjects:

- | | |
|---|---|
| 1. Agronomy | 7. Animal breeding |
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| 3. Agricultural Chemistry | 9. Animal Diseases |
| 4. Agricultural Botany | 10. Dairying and |
| 5. Agricultural Zoology (including Fisheries) | 11. Agrl. and Animal Husbandry Economics and Statistics. |
| 6. Horticulture | |

2. These prizes will be in the form of gold medals or cash or both and the first prize in each subject will be awarded for outstanding research work done in the country either individually or jointly during the calendar year 1957 i.e. 1st January to 31st December 1957 and thereafter for such research work carried out during each subsequent calendar year.

3. The award of each of the prizes shall be based on significant advances in human knowledge in a particular subject as revealed by books, monographs or papers published in the name of the candidate or any other unpublished account of the outstanding research work done or discoveries and inventions made by him. The selection of a candidate for the award of a prize will be made on the recommendations of a judging Committee consisting of eminent scientists appointed for the purpose by the Indian Council of Agricultural Research. The award of a prize may be made to more than one research worker and the prize money divided amongst them in such proportion and manner as may be decided by the Council.

4. All researcher workers, engaged in research work in India in the fields of agriculture, animal husbandry and allied sciences are eligible for competing for these prizes. Applications should be submitted in *quintuplicate* in the prescribed form which can be had free of cost from the Addl. Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi. Candidates working in Research Institutes etc. should submit their applications through the Head of the Institute/Department etc. Others may submit their applications direct.

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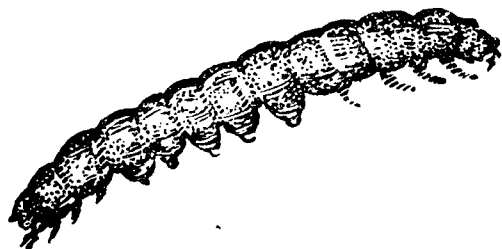



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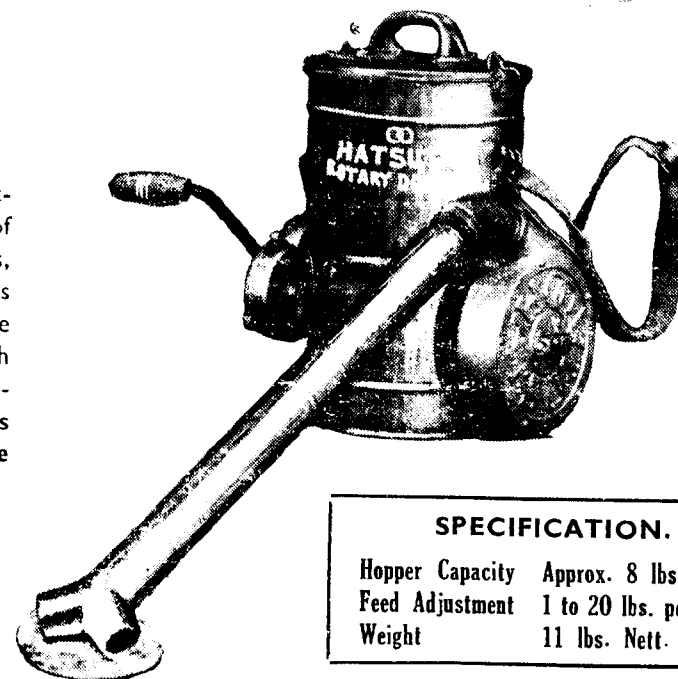
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The Madras Agricultural Journal

Vol. XLIV

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No. 11

CONTENTS

PAGE

Original Articles :

1. Manuring Crops ... 501
— by Dr. A. Mariakulandai

2. A Note on the Influence of Manuring on the
Incidence of the Fulgorid — *Nilaparvata lugens*
S. on Paddy ... 529
— by E. V. Abraham

Weather Review ... 533

Departmental Notifications ... 535

Marketing of Turmeric ... 539
by — K. Sriraman

Manuring Crops

by

Dr. A. MARIAKULANDAI
Agricultural Research Institute, Coimbatore
(Contd. from August 1957 issue)
[Abstract of the Curzon Lectures]

Potatoes: Experimental work on potato cultivation has been confined to the Agricultural Research Station, Nanjanad which was established in 1917 in the Nilgiris District of the Madras State.

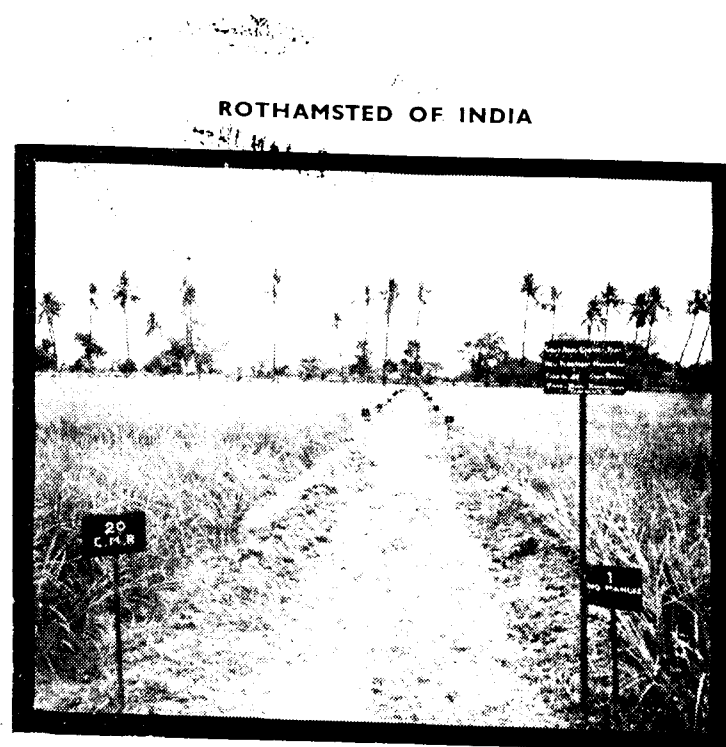
Manurial experiments 1920 — 1930: (a) Organic manures compared with sodium nitrate:— Fish guano at 1120 lb. and cattle manure at 560 lb. per acre were compared with sodium nitrate at 1 cwt. over a period of three years. In two years the former was better while in one year the latter yielded more.

(b) Cattle manure with and without lime or sodium nitrate:— The experiment was done for 5 years and the results indicated a maximum increase of 280% for 10 tons of cattle manure, with the treatment (2 cwt. of sodium nitrate plus 5 tons of cattle manure) coming next. There was no effect due to lime at 4 cwt. per acre.

(c) Fish guano with and without lime or sodium nitrate:—
(i) This experiment was also done for 5 years and revealed a similar trend to the above, fish guano at 10 cwts. with 5 tons of cattle manure recording the highest yield (increase of 400%) while the combination of sodium nitrate at 1 cwt. with fish guano at 10 cwt. came next and there was no effect due to lime. (ii) Increasing doses of 1 cwt. to 4 cwt. of sodium nitrate over a basal dressing of (1) 10 cwt. of fish guano; (2) 5 tons of cattle manure and (3) a complete manure of super 15 cwt., potash (as KCl) 2 cwt. and lime 10 cwt. were compared for 3 years.

The results for the first year alone indicated increased yields with increased doses of sodium nitrate over a basal of fish guano, while for the remaining year no effects due to increased doses of sodium nitrate were felt.

(d) *Effect of lime:* The prior experiments wherein lime had been tried in combination with others had proved futile in registering any increase in yield. A separate experiment with lime alone at $\frac{1}{4}$ ton and $\frac{1}{2}$ ton was compared against no manure for 3 years. The increases of 9.8 and 21.0% respectively were not significant over that of the control.



The Permanent Manurial Plots laid out half a century ago at the Agricultural Research Institute, Coimbatore has earned the reputation of being known as the "Rothamsted of India". In these plots long term manurial trials are being conducted by the Government Agricultural Chemist, Coimbatore.

(e) *Complete manure with increasing doses of sodium nitrate:* Complete manures consisting of 3 tons of cattle manure, 15 cwt. of fish guano, 5 cwt. of super and 2 cwt. of KCl were compared with single (1 cwt.) and double doses of sodium nitrate for 3 years. The response to sodium nitrate was not felt and maximum yield was registered for the complete manure only.

(f) *Complete artificials compared against different mixtures:* The idea of having a balanced fertiliser mixture was slowly receiving attention in these years and in a series of experiments conducted separately for 3 years the following 3 treatments were compared:—

- (1) Fish guano 10 cwt. plus super 5 cwts. plus KCl 2 cwt.
- (2) Groundnut cake 250 lb. plus sodium nitrate 240 lb. plus steamed bone meal 200 lb. plus super 200 lb. plus potassium sulphate 120 lb.
- (3) Super., potassium nitrate and ammonium sulphate each at 2 cwts.

Treatment (1) gave the maximum yield but the differences were not significant.

(g) *Niciphos (versus) Ammonium phosphate:* Niciphos which is a mixture of ammonium phosphate and ammonium sulphate was compared with ammonium phosphate with and without the farm mixture (K_2SO_4 —200 lb., fish guano substitute—10 cwt., super 5 cwt.) over a basal dressing of cattle manure. The farm mixture group gave the higher yields with 468 maunds per acre for the niciphos and 365 maunds/acre for the ammonium phosphate treatment.

(h) *Fish guano substitute experiments:* To find out the best level of fish guano to be used in the farm mixture, 5, 10, and 15 cwts. of fish guano were tried in the farm mixture. It was found that the yield increased with increase of fish guano and that 15 cwt. dose gave the maximum yield.

Manurial Experiments 1930—1955: The beginning of this period marked the evolution of the “Nanjanad Farm mixture.” Instead of fish guano which was till then used in the old farm mixture, groundnut cake, steamed bone meal and ammonium sulphate came to be included in addition to the concentrated super and potassium sulphate. The experiments that are reviewed in the following paras therefore mainly relate to the series of trials to find out the most efficient and economic combination in the above mixture and also to see whether any alterations in the forms of N, P and K ingredients could be made with advantage.

(1) *Optimum quantity of super and sulphate of potash in the Nanjanad Farm mixture:* Over a basal dressing of 5 tons of cattle manure and a mixture of 500 lb. of groundnut cake, 200 lb. ammonium sulphate and 350 lb. of steamed bone meal, treatments with varying combined dosages of super and sulphate of potash, viz. 3 and 2, 1 and 2, 5 and 2, 3 and 1, and 3 and 3 cwt. of each respectively were tried for one year. Best yields were obtained for 3 cwt. dosage of conc. super and 2 cwt. of K_2SO_4 . No significant increases due to levels of K_2O were observed.

(2) *Muriate and sulphate of potash* were compared in combination with the usual ingredients of the new farm mixture at 0, 1 and 2 cwt. levels. The results indicated slightly favourable yields with potassium sulphate at 2 cwt. level.

(3) *Organic nitrogen versus Inorganic nitrogen in the farm mixture:* The nitrogenous constituents of the farm mixture were tested in either organic or inorganic forms like groundnut cake, ammonium sulphate and sodium nitrate each alone or in combination of organic and inorganic forms, keeping the total nitrogen level constant. The results indicated that better yields could be obtained for combinations of organic and inorganic forms of N than for the inorganic forms alone.

(4) *Cattle manure — Potash experiments:* The N, P and K values contained in cattle manure were tested by substituting with artificials in combination with the usual farm mixture. Treatments with no potash and increasing levels of potash were also included for comparison. The results clearly showed the value of potash and the efficiency of cattle manure.

(5) *Effect of farm mixture containing steamed bone meal and conc. super as against either of these alone, keeping N and K constant at both full and half doses:* The results were favourable for single doses for all the crops seasons excepting the second crop for one year when no advantage over half dose was observed. The use of insoluble steamed bone meal alone gave the worst yield when compared to the farm mixture by the usual combination and super phosphate alone. The phosphates of the farm mixture behave alike when the insoluble portion (i. e. steamed bone meal) is replaced by concentrated super phosphate.

(6) *Manurial Experiments to test the effects of artificials:* N, P and K applied individually and in combination with additions of lime, cattle manure as well as a mixture of both (main and second crop for 4 years) (Main treatments—No manure, N, N + K, P, N + P, N + P + K).

Results gave the following indications :

(1) The response to N is not felt when applied alone on both the crops, but in combination with P and K the yield is considerably increased, the maximum being with N plus P and N plus P plus K.

(2) P alone is significantly better than N applied individually.

(3) N plus P plus K in combination with cattle manure or lime have acted more beneficially than the artificials alone.

(4) No difference is observed between lime and cattle manure plots in the main crop but superiority of cattle manure is felt to a slight extent in the case of the second crop.

(5) Maximum yields of both crops were obtained in plots receiving full doses of cattle manure, lime and artificial.

7. *Relative merits of potato fertilisers of M/s. Parry & Co., and Shaw Wallace Co., as against Nanjanad Mixture with and without cattle manure on equal N basis:* (Main and second crops)

(1) The average yields for 3 years indicate that the Farm mixture with and without Cattle manure has been found to be superior to other mixtures for both the crops.

(2) The relative merits of the mixtures from Shaw Wallace and Parry companies cannot be definitely assessed from this experiment.

8. *Optimum proportion of organic to inorganic N contained in the Nanjanad Farm Mixture and comparison of the Farm mixture with Niciphos mixture:* Main and second crops.

(1) Significant results are obtained in one out of three seasons only with both the crops.

(2) The superiority or otherwise of Niciphos or organic and inorganic nitrogenous manures in any proportion cannot be definitely established owing to the variable nature of the results obtained in the different seasons.

9. *Relative merits of complete inorganic fertilizer mixtures against Nanjanad Farm mixture in different doses* (Second crop only).

(1) Full dose of complete inorganics is not significantly superior to the corresponding dose of Nanjanad farm mixture.

(2) 2/3 dose is significantly poor to the full dose in the case of inorganic mixture only.

(3) Additional 1 cwt. of sulphate of potash has no desirable effect in both the mixtures.

(4) Extra dose of 5 tons of cattle manure applied in the furrows has not appreciably increased the yields.

10. *Effects of quality and quantity of different kinds of phosphates, viz., conc. super, dicalcic phosphate, steamed bone meal and a mixture of conc. super and steamed bone meal in single and double doses with and without lime against the farm mixture:* Main and second crops.

(1) Steamed bone meal is definitely inferior to more soluble forms of phosphate.

(2) The general mean yields of all the 3 years for the limed and unlimed series, show that lime has no beneficial effect on the phosphates.

(3) Both in the limed and unlimed series the full doses of phosphates have proved better than the corresponding half doses.

(4) The farm mixture with Mono and Tri-calcic phosphates is as good as similar quantities of phosphates applied as conc. super or dicalcic precipitated phosphates.

11. *Relative merits of easily available concentrated manures and Nanjanad Farm Mixture in full and 2/3 doses with cattle manure applied in furrows or broadcast:* (Main and second crop).

(1) Full doses of all the manures give better yields than 2/3 doses.

(2) Application of cattle manure in furrows is better than broadcasting.

(3) There is no difference between farm mixture and the easily available concentrated manures.

12. *Relative merits of different oil cakes when substituted for groundnut cake in the Farm mixture on equal N basis:* (11 crop only). All cakes except Neem cake are equal to groundnut cake.

13. *Effect of broadcasting Cattle Manure versus applying in furrows:* (11 crop only). Application in furrows is better than broadcasting (vide item 11 above).

14. *Effect of replacing chemical nitrogen in the Farm mixture by groundnut cake:* Ammonium sulphate in the farm mixture could be fully replaced by groundnut cake without any adverse effect while the replacement of organic nitrogen completely by ammonium sulphate depressed the yield.

15. *Placement of fertilizer mixture or phosphates of Nanjanad mixture at seed level and at 3" below seed in the furrows:* For the five years of study viz., from 1946 — 1951 significantly higher yields for placement of the Farm mixture (3" deeper below seed in the furrows) could be obtained for 2 years only. The increase in yield was however not impressive. In most cases the differences due to treatments were not significant.

16 (1) *Liming Trials:* Lime at 5 levels 0, 5, 10, 15 and 20 cwt. was tried for 5 years (1946 - '50) but no significant increase due to the same was observed.

(2) *Liming experiment:* With higher doses, viz. 0, 1, 2 and 4 tons in the form of slaked lime by different methods of application viz. broadcast before planting, band placement in furrows 4 weeks before planting, and application to previous green manure crop of lupin (4 weeks before sowing of groundnut) to be followed by potato was conducted for 2 years. The differences in yields among the various treatments were, however, not significant.

17. *Effect of varying levels of nitrogen and different sizes of seed tubers:* In a one year study (1948 - '49) the effect of application of nitrogen of the Farm mixture at 60, 80 and 100 lb. N levels on the three different sizes of seed tuber viz. $\frac{1}{2}$ oz., 1 oz. and 2 oz. was studied. The results indicated that increases in yield with increases in levels of N and size of tuber could be obtained.

18. *Complex manurial trials for exploring the possibility of reducing the manurial composition and dosage in Nanjanad farm mixture without impairing efficiency in yield and loss in soil fertility:* In the above experiment, which was conducted for 3 years from 1949 - '50, the Potash content of the Nanjanad mixture was kept the same viz. at 100 lb. K_2O . While 2 levels of N (80 lb. and 40 lb.) 4 levels of P_2O_5 (0, 40, 120 and 200 lb.) were tried without and with lime (at 2 tons per acre). The results indicated the following conclusions.

- (1) The higher the dose of N, the greater is the yield.
- (2) The yield increases with increase of dosage of P_2O_5 .

- (3) Lime by itself or in conjunction with N or P_2O_5 does not influence the yield to any great extent.
- (4) The fertility status of the soil is not impaired after a crop of potato is taken.
- (5) Nanjanad Farm mixture with 80 lb. N, 200 P_2O_5 and 100 lb. K_2O seems to contain the minimum of ingredients necessary for good yields of potato and no further reduction in either nitrogen or P_2O_5 seems possible without detriment to yield.

19. *Replacing nitrogen constituents of the Farm Mixture completely by chemical manures like sodium nitrate, urea and ammonium sulphate and comparing the same against Farm Mixture with and without lime and green leaf (at 1500 lb. and 5000 lb. respectively):* The three years of experimentation gave the following conclusions.

- (1) There were no significant differences between the different basal dressings in two out of three years. In the other year 5000 lb. green leaf either alone or in combination with 1500 lb. lime was better than control and lime alone.
- (2) With regard to nitrogen carriers, in two out of three years Nanjanad Farm Mixture gave significantly better yields.

In general, the supply of N either as $NaNO_3$ or urea was not found useful. Maximum yields were obtained when N was supplied as groundnut cake and ammonium sulphate.

Summary and Conclusion: A review of the various manurial experiments on potato conducted at the Agricultural Research Station, Nanjanad during the past 35 years has been presented here. The earlier experiments have clearly indicated the value of organic manures like cattle manure and fish guano for giving good yield of potato. Sodium nitrate was not found useful either alone or in combination with cattle manure or fish guano when compared to the organic manures alone. There was no effect for lime application, although the soils of the tract are lateritic in nature. The need for potash salts and high doses of phosphates was clearly indicated and the first mixture which was formulated and proved successful at this farm consisted of fish guano 15 cwts., super phosphate 5 cwts. and Muriate of potash 2 cwts. for one acre. A series of trials started later on to find out cheaper substitutes for fish guano resulted in the

discovery of the manure mixture which came to be popularly known as Nanjanad Farm Mixture. This mixture for one acre is made of 500 lb. of groundnut cake, 350 lb. of steamed bone meal, 3 cwt. of conc. super, 200 lb. of ammonium sulphate and 2 cwt. of sulphate of potash, to supply 80 lb. of Nitrogen, 200 lb. P_2O_5 and 100 lb. of K_2O per acre. Consistently high yields have been obtained by application of the mixture to the soils of the tract and many experiments conducted to find out better substitutes for this mixture have not so far been successful. As a result of the various experiments conducted up till now the following conclusions have been arrived at: (1) organic forms of N (excepting neem cake) are superior and complete use of chemical nitrogenous manures like ammonium sulphate, urea or sodium nitrate are not beneficial; (2) Insoluble forms of phosphates applied alone are not useful. Steamed bonemeal and super as used in the Farm mixture will however give the best results and can be replaced only by soluble (or available) forms of phosphates; (3) Basal dressing of cattle manure is desirable, while that of lime is not necessary; (4) The use of green manure either alone or in combination with lime has not given significantly higher yields; (5) The Nanjanad Farm mixture is the most economic and useful mixture for giving maximum yield of potato in the Nilgiris district.

Final Discussion and Conclusion: A rapid review of the experiments done in the State on some important crops like paddy, cotton, sugarcane and potato has been presented in this paper. Results obtained in the experiments conducted under the Technical Co-operation Mission programme and the Indian Council of Agricultural Research have also been incorporated.

From this review it should be clear that the problem of correct scientific manuring is not simple. Even for a single crop like paddy the responses to fertilisers vary according to the region, soil and the season. The recent Agronomic Trials and the Free Fertiliser Demonstration Trials (1953-1956) were laid with a view to cover all soil-climatic zones under cultivator's conditions. From these experiments it should be evident that what we need is a localised schedule of manuring for each tract and not one prescription for the entire State. Even within contiguous areas soil reaction may vary due to previous manuring and agronomic history of the land. With the introduction of the Free Soil Testing Service all over India under the auspices of the Indo-American Operational agreement, we now have the tool to fix the manurial schedule for each individual field of land based on its requirement as assessed by soil analysis.

However, the numerous manurial experiments and data presented in this paper are not without benefit. Though they cannot be used for an overall prescription for manuring yet some optimum levels and forms of manuring can be indicated as given in the appendices. These experiments have also given us a clear picture that nitrogen universally does give a response, while P_2O_5 is good for light soils of all types and best in sandy and gravelly soils. In regard to K_2O though there are conflicting results about its response, it cannot be denied that plants do require potash. But as additions of plant residues in the form of trash, green manure, farm waste or ash is invariably the farm cultural practice in practically all holdings, the requirement, of potash is mainly met from this source and no response to added potassic manures is therefore seen in most of the trials with paddy.

Thus at the present moment we are having a mass of data on the forms and levels of fertilisers to be applied to major crops. With a little more research and with the new tool of "Isotopes" in this atomic age, we will be able to trace the fate of added fertilisers in plant nutrition much in the same way as nutrients have been followed up in animal metabolism and in the course of a few years we will have a much clearer picture of the requirements of crops and the mode of supplying them.

Acknowledgments: I wish to thank the authorities of the Madras University for giving me this opportunity to deliver these lectures under the Maharaja of Travancore Lord Curzon Endowment. To Dr. K. C. Naik, M. Sc., Ph. D. (Bristol), Principal, Agricultural College and Research Institute, who found the time amidst his multifarious duties to very kindly preside over these lectures, I offer my sincere thanks.

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APPENDIX I

Manurial Trials on Paddy

Table 1. (Crop - Paddy)

Nitrogenous inorganic manures

Forms tried:

- | | | |
|---|---|---------------------------------------|
| A | { | 1. Ammonium sulphate |
| | | 2. Ammonium nitrate |
| | | 3. Sodium nitrate |
| | | 4. Calcium cyanamide (in early years) |
| B | { | 5. Urea |
| | | 6. Ammonium chloride |
| | | 7. Ammonium sulphate nitrate |

A — On Government Farms

B — On Ryots' Lands under Fertiliser Demonstration and Agronomic trials.

Table 2. (Crop - Paddy)

Some Nitrogenous manures compared

Locality	Name of Fertiliser	Results						
Palur :	Ammonium sulphate and Ammonium nitrate	Differences not significant						
Tirurkuppam :	do	Ammonium sulphate @ 60 lb. N Ammonium nitrate @ 45 lb. N were on a par						
Aduthurai :	do	Results not significant						
Aduthurai :	Ammonium sulphate and Sodium nitrate	Ammonium sulphate yielded 13% more than sodium nitrate						
Aduthurai : Agronomic (Trials by I. A. R. I. under G. A. C.)	Ammonium chloride Ammonium sulphate	Increase per lb. N. due to ammonium chloride over ammonium sulphate @ the following N. level <table style="margin: 0 auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">20 lb.</td> <td style="text-align: center;">40 lb.</td> <td style="text-align: center;">60 lb.</td> </tr> <tr> <td style="text-align: center; border-top: 1px solid black;">9.6 lb.</td> <td style="text-align: center; border-top: 1px solid black;">2.6 lb.</td> <td style="text-align: center; border-top: 1px solid black;">1.7 lb.</td> </tr> </table>	20 lb.	40 lb.	60 lb.	9.6 lb.	2.6 lb.	1.7 lb.
20 lb.	40 lb.	60 lb.						
9.6 lb.	2.6 lb.	1.7 lb.						
do	Ammonium sulphate Ammonium nitrate	Increase per lb. N. due to ammonium sulphate over ammonium sulphate nitrate at N. level <table style="margin: 0 auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">20 lb.</td> <td style="text-align: center;">40 lb.</td> <td style="text-align: center;">60 lb.</td> </tr> <tr> <td style="text-align: center; border-top: 1px solid black;">1.2 lb.</td> <td style="text-align: center; border-top: 1px solid black;">2.18 lb.</td> <td style="text-align: center; border-top: 1px solid black;">1.7 lb.</td> </tr> </table>	20 lb.	40 lb.	60 lb.	1.2 lb.	2.18 lb.	1.7 lb.
20 lb.	40 lb.	60 lb.						
1.2 lb.	2.18 lb.	1.7 lb.						
Coimbatore :	Groundnut cake Castor cake Neem cake	All cakes are nearly equal. Neem cake appeared better in seasons of drought.						

Table 3. (Crop - Paddy)

Comparison of Green Manure, Farm Yard Manure and Compost

Locality	Manures compared	Dosage	Results
Pattambi :	Compost and farm yard manure	60 lb. N.	No difference
Anakapalli : Samalkot :	Night soil compost and cattle manure	60 lb. N.	do
Maruteru :	do	do	Cattle manure gave higher yield in the second crop
Aduthurai :	Compost and farm yard manure	30 lb. N.	No difference
do	do and green manure	60 lb. N.	Green manure gave higher yield
Central Farm Coimbatore :	Night soil and farm waste compost and farm yard manure		Night soil compost slightly better than farm yard manure
Tirurkuppam :	do		Farm yard manure slightly better than farm yard manure
Maruteru :	Farm waste compost and farm yard manure		do

Table 4. (Crop - Paddy)

Relative Merits of Different Green Manure Crops (Based on yield)

Name of green manure	Dosage	Locality	Results
Daincha Pillipesara Sunnhemp Cowpea	Entire green manures grown on the plots ploughed in	Central farm (Coimbatore)	Crop yields were in the order - Daincha, Pillipesara Sunnhemp & Cowpea
Mango Leaves Vengai Hyptis suaveolens	4000 lb.	Pattambi	Differences not consistent
Gliricidia Pungam Calotropis Adathoda Pillipesara Daincha Sunnhemp Kolinji	do	Aduthurai	No significant difference

Table 5. (Crop - Paddy)

Optimum Dosage of Nitrogenous Manures

Locality	Basal dressing	Groundnut cake	Ammonium sulphate
Pattukottai	5000 lb. Leaf	20 lb. N.	20 lb. N.
Aduthurai	2000 lb. „	40 lb. N.	20 lb. N.
Ambasamudram	...	48 lb. N.	...
Tanjore District (Stewart's Expt.)	5000 lb. „	...	30 lb. N.
Whole State	5000 lb. „	...	30 lb. N.

Green Manure Crops - Dosage Found Optimum

Locality	Dosage
Aduthurai	4000 lb. and 6000 lb.
Coimbatore	4000 lb.
Pattukottai	5000 lb.
Pattambi	6000 lb.

Table 6. (Crop - Paddy)

Combinations of Nitrogenous Manure (Organic and Inorganic)

Locality	Manurial combination	Dose of N	Results
Aduthurai	Cattle manure, green manure groundnut cake, ammonium sulphate, singly groundnut cake + green manure, ammonium sulphate + green manure.	40 lb.	Green manure plus ammonium sulphate best
	Green leaf (4000 lb.) + groundnut cake (100-400 lb.)		200 lb. of G. N. cake + 4000 lb. leaf + 100 lb. ammonium sulphate gave maximum yield
	do do + Ammonium sulphate	(50 & 100 lb.)	
Pattambi	Groundnut cake, leaf, ammonium sulphate in different proportions	0, $\frac{1}{2}$, $\frac{2}{3}$, & 1 of 400 lb. G. N. cake, 4000 lb. green leaf, 150 lb. ammonium sulphate	Results not consistent
do	Green leaf + ammonium sulphate	4500 lb. (45 75 lb.) lb. N.	Green leaf + ammonium sulphate gave maximum yield
	Green leaf + groundnut cake	2500 lb. 75 lb. (30 lb. N)	
Coimbatore	Green leaf + ammonium sulphate	2000 lb. 100 to 400 lb.	Green leaf + ammonium sulphate @ 400 lb. gave the max. yield.

Table 7. (Crop—Paddy)

Response per unit of Nitrogen (pounds of grain per lb. of N.)

Manure	Locality	Soil type	Response per lb. of N. @ 30 lb. N.
Ammonium sulphate	Chinglepat	Coastal alluvium	20.1 lb.
	South Arcot	Red Loam	7.5 "
	Tanjore	Cauvery alluvium	12.4 "
	Coimbatore	Mixed Black & Red soil	15.4 "
	Average for the whole State		13.7 "
Urea	do.		14.5 "
			(Fertiliser demonstration Trial).
Basal dressing of 3000-4000 lb. leaf + Ammonium sulphate to supply 20 lb. N.	Aduthurai	Cauveri alluvium	6.5 lb.
40 lb. N.		do.	4.8 "
30 lb. N. as ammonium sulphate over 5000 lb. leaf	Tanjore Dist.	do.	7.4 "
(Stewart's Manurial Experiment)			

Table 8. (Crop—Paddy)

Phosphatic manures—Forms tried.

A. Inorganic :—

1. Super phosphate - Single and concentrated
2. Niciphos
3. Ammophos
4. Flour Phosphate
5. Fused Phosphate
6. Raw and processed Trichy Phosphate
7. Ultra Phosphate
8. Hyper Phosphate

B. Organic :—

1. Bone meal - Raw and steamed
2. Calcined Bone meal
3. Milled guano
4. Fish guano

Table 9. (Crop—Paddy)

Comparisons of different forms of Phosphatic manures.

Locality	Forms of phosphate	Dose	Results
Aduthurai	Raw bone meal versus Steamed bone meal	50 lb.	No difference
Palur	Bone meal versus Calcined bone meal	84 & 168 " 56 & 112 "	Difference not significant
Aduthurai	Calcined Bone meal Raw Bone meal Steamed Bone meal	20 " P ₂ O ₅	do.
Paddy Breeding Station Coimbatore	Bone meal, Bone char Superphosphate	33 " P ₂ O ₅	Super was the best Bone Char not superior to bone meal
Bachireddipalayam	do.	30 lb. P ₂ O ₅	Not significant
Mangalore (T.C.M. Simple Manurial Experiment on ryots' Field)	Triple super versus Bone meal	20 & 40 lb. P ₂ O ₅	Bone meal better at 40 lb. level; Super better at 20 lb.

Table 10. (Crop—Paddy)

Optimum Dosage of Phosphatic manures (inorganic Phosphates)

Name of manure	Nitrogenous manure or basal dressing	Dose of P ₂ O ₅ tried	Locality	Optimum dose
Super	Green leaf	0, 30, 60, lb.	Paddy Breeding Station, Coimbatore	30 or 60 lb. over basal dressing gave maximum yield
do.	Ammonium sulphate	0 & 30 lb.	Samalkot	Increase due to P ₂ O ₅ less than 30% of net increase
Niciphos	30 lb. N.	0 & 30 lb.	do. Pattambi Aduthurai	Results not encouraging
Ammophos	42 lb. N.	30 lb.	do.	do.
Flour phosphate	Groundnut cake	16, 32, 48 lb.	Maruteru	No response to P ₂ O ₅
Niciphos	Green leaf + Amm. sulphate Total 36 lb. N.	0 & 16 lb.	do.	Good response

Table 11 (Crop - Paddy)
Optimum Dosage of Organic Phosphatic Manures.

Manure	Dosage Tried	Early experiments	
		Locality	Results
Bone meal	136 & 200 lb.	Maruteru	Not consistent
do	40 lb. (P_2O_5)	Aduthurai	No response
Milled guano	16, 32 lb. (P_2O_5)	Maruteru	No response

Table 12 (Crop - Paddy)

Increase per pound of P_2O_5 .

Locality	Basal dressing	P_2O_5 level	Increase in grain yield per lb. of P_2O_5
(Stewart's Experiment)			
Tanjore District	Basal dressing of 5000 lb. leaf & 30 N. as ammonium sulphate	30 lb.	7.9 lb.
(Agronomic Experiment)			
Aduthurai	N. levels 20 lb. 40 lb. 60 lb. } Green manure at 3000 to 4000 lb. }	40 lb.	11.66 13.2 10.1
do	Green manure at 3000 to 4000 lb.	20 lb. 40 lb.	7.2 3.7

Table 13 (Crop - Paddy)

Dosage of Potassic Manures Tried

1. K_2O — 0 to 60 lb. as KCl and K_2SO_4
2. Ash — 400 and 4000 lb.

Usefulness of Potassic Manures Tried

Name of manure	Basal dressing	Other fertilisers used	Dose of K_2O	Locality	Results
Muriate of potash	G. N. cake 48 lb. N.	Super 25 & 50 lb. P_2O_5	20 & 40 lb.	Amba-samudram	No benefit
Potassium sulphate	6000 lb. leaf	G. N. cake 0-120 lb. N. Super 0-60 lb.	0-60 lb.	Maruteru Buchireddi-palayam Tirur-kuppam Coimbatore Pattukottai Pattambi	do K depressed the yield K did not increase the yield

Name of manure	Basal dressing	Other fertilisers used	Dose of K_2O	Locality	Results
Wood ash	400 lb.	G. N. cake 200 lb. Super 100 lb.		Tirur-kuppam	Not significant
do	4000 lb.	Green leaf 4000 lb. Groundnut cake 400 lb.		Pattambi	Ash by itself gave fair response. In combination with cake or leaf gave maximum yield.

Table 14 (Crop - Paddy)
Maximum Potentiality Trials on Paddy

Locality	Dosage Tried			Conclusions
	N. lb.	P_2O_5 lb.	K_2O lb.	
Maruteru	0,30,60 90,120	0,30 60	0,60	(60 & 90 lb. N. on a par) (30 lb. P_2O_5 optimum)
Buchireddi-palayam	do	do	do	60 lb. N. in combination with P_2O_5 & K_2O increased the yield.
Tirurkuppam		do	do	90 lb. N. appeared optimum. K_2O depressed yield.
Palur	30,112 225 500	10,22.5 45,100	20,41 82,100	A combination of 30 lb. N, 10 lb. P_2O_5 and 20 lb. K_2O appeared optimum.
Aduthurai	30,112 225,500	10,22.5 45,100	20,41 82,100	Increase in N. lowered the yield.
Pattukottai	do	do	do	Results not significant.
Aduthurai	0,30,60 90,120	0,30 60	0,60	Only N. contributed to yield. Maximum yield obtained in a combination of 120 lb. N. and 30 lb. P_2O_5 over a basal dressing of 6000 lb. leaf.
Pattukottai	do	do	do	Maximum yield with 60 lb. N. K_2O did not increase yield 30 lb. P_2O_5 gave slight increase.
Paddy Breeding Station, Coimbatore	do	do	do	Maximum yield noted in 120 lb. N. K_2O and P_2O_5 did not enhance the yield.
Pattambi	do	do	do	90 and 120 N. on a par. K_2O and P_2O_5 did not contribute to yield. Only in absence of leaf K increased yield.

Table 15 (Crop-Paddy)
Japanese Method of Cultivation

	Japanese method	Modified Madras method	Results
Manuring of Nursery	40 cart-loads Farm yard manure; 2000 lb. wood ash; 2000 lb. Farm compost per acre. Ammonium sulphate and Super in the ratio 1:1 applied at 2 lb. per lb. of seed. A second dose 10 days after sowing.	10,000 lb. Green manure per acre.	Did not influence yield in general.
Manuring of Trans-planted Field	20 cart-loads Farm yard manure, 30 lb. N as ammonium sulphate, 30 lb. P_2O_5 as super before planting. A second dose of half the ammonium sulphate and super at 15 days after planting and a similar dose 30 days after planting (Total 60 lb. N. and 60 lb. P_2O_5).	5,000 lb. Green manure + 30 lb. N. (ammonium sulphate) + 30 lb. P_2O_5 (super)	Japanese method gave an average increase of 352 lb. of grain. (12%)

APPENDIX 2 (Crop-Paddy)

I. C. A. R. Fertilisers Demonstration Trials in India 1954 — '55

Object:

1. To demonstrate the effectiveness of some of the important fertilisers.
2. To popularise some of the new fertilisers like UREA.

Programme of the Demonstration.

1. Location—Cultivators' fields throughout the State.
2. Types of experiments—3 (in simple 3 plot design).
 - Type A. Treatments:— (i) Control (cultivators' practice)
(ii) Nitrogen
(iii) N + P
 - Type B. Treatments:— (i) Control
(ii) Recommended doses of NP mixed Fertiliser (12:6) at 30 lb. N,
(iii) $1\frac{1}{2}$ times the dose as in (ii)
 - Type C. Treatments:— (i) Control
(ii) N as Ammonium sulphate
(iii) N as Urea (at the same dose as in (ii))

Manuring Crops

Forms of Nitrogen.

- (1) Ammonium sulphate
- (2) Urea

Forms of Phosphorus.

- (1) Ordinary Super-phosphate or
- (2) Triple super-phosphate

Dose (Madras State).

Nitrogen (N) 30 lbs. per acre

Phosphoric acid (P_2O_5) 30 lbs. per acre

Number of Demonstrations Conducted in India & Madras (1954-55).

Region	Crops	No. of demonstrations	Remarks
India	{ Paddy Ragi Cotton Maize Bajra	4224	
Madras State	{ Paddy Ragi	1345 104	9 Districts Tirunelveli District.

Results.

A. Response to Nitrogen.

1. Good response in all districts.
2. Average response for the State } 13.8 lb. of Paddy per acre
5 maunds per acre for 30 lb. N. } per lb. of Nitrogen.
3. Variation in response amongst districts is small.
4. Lowest response in South Arcot District (2.75 maunds per acre for 30 lbs. N.)
5. Highest in Chingleput District (7.34 maunds per acre).

B. Response to Phosphorus.

1. Response to P. smaller than for N.
2. Average for the State for 30 lb. } 7.2 lbs. per lb. of P_2O_5
 P_2O_5 (over 30 lbs. N.) } per acre.
3. Variations amongst districts larger.
4. Responses poor in Chingleput, Tanjore, Madurai and Malabar.

C. Difference in Response due to Forms of Nitrogen (i. e.) Ammonium sulphate & Urea.

No difference in all districts, except in South Arcot where Ammonium sulphate is significantly superior to Urea.

APPENDIX 3 (Crop—Paddy)

T. C. M. Simple Manurial Experiments on Cultivators' Fields 1953—1956.

Crop—Paddy.

Soil Types.	Centres.	
(a) Alluvial (undifferentiated)	1. Agartala	(Tripura)
	2. Darrang	(Assam)
(b) Coastal alluvium	3. Mangalore	(Karnataka)
	4. Samalkota	(Andhra)
(c) Red Loam	5. Raneshwar	(Bihar)
	6. Kalhandi	(Orissa)
(d) Laterite	7. Kunnathnad	(Kerala)
(e) Red and yellow soil	8. Raipur	(M. P.)
(f) Medium black soils of trap and gneiss	9. Bodhan	(Hyderabad)
(g) Gray and brown soils of Indo-Gangetic basin impregnated with salts	10. Nilokheri	(Punjab)
	11. Pusa	(Bihar)

Fertilisers Tried.

- Nitrogenous Fertilisers :
 - Ammonium sulphate.
 - Urea.
- Phosphatic Fertilisers :
 - Triple super or ordinary super.
 - Bone Meal.
- Potassic Fertilisers :

Sulphate of Potash.

Levels of Fertilisers.

0, 20 and 40 lb. per acres.

RESULTS :

Responses to N, P and N+P (Average for all soil types for 1953-55)

Treatment		No. of experiments	Increased yield of paddy per acre lbs.
N lb.	P ₂ O ₅		
(1) 20—	0	797	249
(2) 40—	0	477	426
(3) 0—	20	503	179
(4) 0—	40	345	298
(5) 20—	20	972	531

CONCLUSIONS (Average for all soils in India) :

Response to Nitrogen alone—12 lb. of Paddy per lb. of Nitrogen.
 Response to Phosphate alone—9 lb. of Paddy per lb. of P₂O₅
 Response to N+P—26.5 lb. per lb. of N and 1 lb. of P₂O₅

FOR MANGALORE :

Response to N—5.5 lb. of paddy per lb. N.
 „ P—8.0 do. per lb. P₂O₅
 „ N+P—12.5 do. per lb. N and lb. P₂O₅

Levels & Types of Nitrogen.

Ammonium Sulphate & Urea Compared at 20 & 40 lbs. levels over a basal of 0 and 20 lb. of P₂O₅.

Results 1954-55 (Response in maund/acre)

Centre	Yield without N	Response to Ammonium sulphate		Difference in Response of Ammonium sulphate-Urea	
		20 lb. N	40 lb. N	20 lb. N	40 lb. N
Average over all soil types	23.73	3.15	4.24	0.68	0.54
Mangalore	24.18	1.86	2.69	0.38	—0.17

Conclusion.

(1) Increasing N level from 20 to 40 lb. per acre gave an average increase of 1.09 maund per acre.

(2) In general no difference between ammonium sulphate and urea noticed, the two fertilisers indicate equal response at both levels.
 (1 maund=82 2/7 lb.)

Levels & Types of Phosphates.

Fertilisers: Triple super, and bone meal.

Levels: 0, 20 and 40 lb. P₂O₅ per acre over a basal of 20 lb. N.

Results: Response in Maund/acre.

Centre	Yield without P	Response to Super		Diff. in response super-bone meal	
		20 lb./acre	40 lb./acre	20 lb. P	40 lb. P
Average for all soils	23.94	1.66	2.60	—0.25	0.48
Mangalore	27.07	2.25	3.96	0.61	—0.12

Conclusion: 1. There is an increase in response with increased P₂O₅ level at almost all centres, the average increase being about 1 maund per acre.

(2) In the Red loam soil the response to super was significantly higher at 40 lb. levels, while for medium black and laterite, bone-meal indicated higher response.

Response to Potash.

Fertiliser: Sulphate of Potash.

Doses: 0, 20 and 40 lb. K_2O in conjunction with 20 lb. each of N and P_2O_5 .

Results: 1954-55 Response in maund/acre.

Centre	Yield without Potash	Response to 20 lb. K.	Response to 40 lb. K.
Average for all soils	25.81	1.05	2.20
Mangalore	27.91	-0.49	0.26

Conclusions.

- (1) In general the application of 20 lb. K_2O increased the yield by 1 maund and the additional dose of the same by 1.15 maunds.
- (2) For Mangalore, there is no response to K.

APPENDIX 4. (Crop—Paddy)

Complex Experiment—T. C. M. Scheme - 1953—'56.

Location of Experiments conducted in India (15 Acre block at each centre)

Centres:	Soil types;
1. Aduthurai (Madras)	Coastal alluvium
2. Karjat (Bombay)	Medium black soil of Trap and gneissic origin
3. Bhagurai (M. B.)	Red gravelly
4. Shimoga (Mysore)	Laterite
5. Ponnampet (Coorg)	
6. Sahaspur (Orissa)	Deltaic and saline
7. Burdwan (W. Bengal)	
8. Canning (W. Bengal)	
9. Maruteru (Andhara)	Red loam
10. Chalvai (Hyderabad)	Mixed Red and black soils
11. Satna (Vindya Pradesh)	

FERTILISERS TRIED:

1. N. Fertilisers:

- Ammonium sulphate
- Ammonium nitrate
- Urea
- Ammonium sulphate-nitrate
- Ammonium chloride

2. P. Fertilisers:

- Triple Super or ordinary super
- Bone meal
- Ammonium phosphate
- Rock phosphate

3. Potassic Fertilisers:

Sulphate of Potash

4. Bulky organic manures:

Farmyard manure or compost

5. Lime (for Acid Soils):

Levels of Fertilisers:

0, 20, 40, lb. of N, P_2O_5 or K_2O per acre in all cases except in special cases at 60 and 80 lb. doses.

Bulky Manures:

0, 5, and 10 cartloads for unirrigated and 0, 10, and 20 for irrigated crops

Lime; 0, 1 and 2 tons

TYPES OF EXPERIMENTS:

1. Levels and types of N and P
3 levels N $\times$ 3 types N $\times$ 3 types + 3 extra combinations
2. Time of application
3. Fertiliser placement
4. Liming of paddy soils
5. Residual value of phosphates
6. Water supply—3 frequencies $\times$ 3 levels N $\times$ 3 levels P
7. Variety $\times$ Fertiliser
3 varieties (Local and 2 improved) $\times$ 3 levels N $\times$ 3 levels
8. Levels of N $\times$ P $\times$ Bulky manure
9. Efficiency of N. Fertilisers
3 levels of N—20, 40 and 60 $\times$ 3 types of N—Ammonium sulphate, Ammonium sulphate nitrate and ammonium chloride + 1 control
10. N.P.K. experiments
3 levels of N $\times$ 3 levels of P $\times$ 3 levels K.

RESULTS:—

A. Nitrogen:

1. Response to N generally good.
2. Average response to 20 lb. N—2.2 Maunds/acre
3. Additional response for increase of N from 20 to 40 lb./acre. } 2.0 maunds/acre
4. The above responses are much lower for Aduthurai centre (viz. 1.5 and 0.81 maunds respectively)
(1 maund = 82 2/7 lb.)

B. Types of Nitrogen:

1. No significant difference due to forms of N.
2. For Aduthurai centre, ammonium chloride was better than ammonium sulphate or ammonium sulphate-nitrate.

- C. Method of application of N.:
1. No significant difference due to single dose and split doses.
 2. At Aduthurai, ammonium sulphate showed best responses when applied at planting.
- D. Responses to Phosphorus:
1. Response generally lower than for N.
 2. Response to 20 lb. P_2O_5 = 1.67/maunds/acre
(For Aduthurai - 1.78 maunds/acre)
 3. For levels beyond 20 lb. very little additional response.
- E. Types of Phosphate:
1. No significant difference due to forms of P.
 2. In the highly acidic soils (Shimoga) bone meal was better than super or mixture of super and rock phosphate.
(Experiment not tried at Aduthurai)
- F. Methods of application of Phosphates:
- No significant difference in response due to methods of application like broadcast, drilling, dipping in slush, pellet application, etc.
(Experiment not tried at Aduthurai)
- G. Residual effect of Phosphate:
- Residual effect obtained at Shimoga and Maruteru.
- H. Potash:
1. Response obtained for soils in West Bengal only.
 2. Experiment not tried at Aduthurai.
- I. Lime:
1. Good response in acid soils only (Mysore and Coorg)
 2. Experiment not tried at Aduthurai.
- J. Farm yard manure:
1. Good response at Shimoga, Maruteru and Karjat.
 2. At Aduthurai (and also Warangal) no difference due to application of farmyard manure.

APPENDIX 5. (Crop — sugarcane)

Table I

Comparison of the effect of Organic and Inorganic Nitrogen alone and in combination — Palur.

Manure applied	Doses tried	Conclusion
Dosage of N lb. per acre.		
Organic nitrogen: groundnut cake	0, 75 and 150	Inorganic form recorded higher yields than organic nitrogen
Inorganic nitrogen: ammonium sulphate	0, 75 and 150	
In combination groundnut cake and ammonium sulphate 50:50	75 and 150	Inorganic and organic nitrogen in the ratio of 50:50 was good

Table II

Optimum Dose of Nitrogen for Palur Tract

Place — Palur
Year — 1943—'47
Variety — Co. 281 and Co. 349

Basal dressing	Treatments nitrogen applied as groundnut cake lb./acre.	Response	Conclusion
1. 10 tons of farm yard manure	0, 100, 150, 200 and 250	Increased yields recorded with higher N. doses N. at 250 dose depresses juice quality	1. No significant differences between basal and no basal dressing
2. No basal dressing	0, 100, 150, 200 and 250	do	2. Optimum dose of nitrogen is 250 lb. per acre

Table III

Combined Varietal and Manurial Trials

Year — 1939—'40

Place — Palur

Variety	Manure and doses applied lb./acre.	Conclusion
Co. 419	Nitrogen 0, 75, 150 P_2O_5 0, 35, 70 K_2O 0, 50, 100	1. Co. 419 is capable of thriving even with less doses of nitrogen
Co. 349	do do	2. P_2O_5 and K_2O whether alone or in combination have not influenced the yield or quality of cane
Co. 2878	do do	

Table IV. (Crop—Sugarcane)

Whether it is advantageous to apply the manure in one or two doses at intervals?

Year — 1928-'33.

Place — Palur

Variety — Fiji B

No. of doses	Manure applied lb./acre	Conclusion
One dose	75 N as groundnut cake and 25 N as ammonium sulphate	Application in 2 doses: I 40-45 days after planting; and II At the time of earthing up is advantageous.
Two doses	75 N as groundnut cake and 25 N as ammonium sulphate in two doses.	

Table V.
Optimum Dose of Nitrogen for Gudiyattam Tract.

Trials: Year — 1945-'48
Place — Gudiyattam
Variety — Co. 419

Basal dressing	Nitrogen applied as groundnut cake lb./acre	Response
10 tons of cattle manure per acre	0, 50, 100, 150, 200, and 250,	Yield miserably poor at 0. Good response to increased doses of nitrogen upto 200 lbs. 250 lb. delays maturity and depresses sucrose content.

APPENDIX 6

Crop-Cotton Table A

Response to Nitrogenous Manures (Expressed as increase over control, in lbs., of Cotton kapas per Unit lb. Nitrogen).

A. UNIRRIGATED COTTON:

	Lb. cotton kapas per unit lb. nitrogen
1. Inorganic Manures:	
State Experiments	3 to 6
Fertiliser Demonstration trials Outside State	0.6 to 1.2
2. Organic Manures:	
State Experiments	3 to 18
Outside State (Nandyal)	1.4

B. IRRIGATED COTTON:

1. Inorganic Manures:	
State Experiments (NPM)	2 to 3.5
Free Fertiliser Demonstrations outside State	2.2
2. Organic Manures:	
State Experiments (NPM)	9 to 39

Table B

Manurial Recommendations for Cotton in Madras State.

DRY LANDS:

- Areas with less than 30" rain:
Manuring with N. uneconomical.
- Areas with more than 30" rain:
40 lb. of N. as a suitable nitrogenous manure.

IRRIGATED LANDS:

- Tirunelveli Tract: Upto 80 lb. N. can be applied economically.
- Coimbatore Tract: Nitrogenous manuring to be practised in intensely cropped fields not receiving adequate cattle manure.

APPENDIX 7

Table I Crop - Potato

Experiments on Potatoes—Forms of Manures and Fertilisers
Tried with Doses.

- Cattle manure 0, 3, 5 and 10 tons.
- Fish guano 5, 10, and 15 cwt.
- Cakes—Doses upto 80 lb. N.
- Green leaves— 5,000 lb.

Fertilisers:

- N Fertiliser — 1. Sodium nitrate 0, 112, 224 lb.
2. Ammonium sulphate 0, 40, 80 lb.
3. Urea do
- P₂O₅ — 1. Super phosphate 0, 40, 120, 200 lb.
2. Bone meal do
- Potash salts — 1. Muriate of Potash — 0, 1, 2, 3 cwt.
2. Sulphate of Potash — do
3. Wood ash — 0, 1000, 2000 lb.
- Lime — — 0, 5, 10, 15 and 20 cwt.
2, 5 tons.

Table II

Responses to Manures (Artificial only)

1. N. alone (at 80 lb. N.)	176 lb. per acre.
2. P=alone (at 200 lb. P ₂ O ₅)	6280 lb. „
3. N+P at 80 lb. N. and 200 lb. P ₂ O ₅	10,150 lb. „
4. N+K at 80 lb. N.+100 lb. K ₂ O	1,275 lb. „
5. N+P+K 80 lb. N, 200 lb. P ₂ O ₅ & 100 lb. K ₂ O	11,700 lb. „

Table III

Yield of Potato for different Manures.

A. Organic Manures:

Average yield in lb./acre
for 5 years

- Cattle Manure alone at 10 tons 5746
- Fish guano alone at 1120 lb. 4812
- Cattle manure at 5 tons and fish guano at 1120 lb. 9928

B. Organic & Artificial:

1. Old Nanjanad Farm Mixture:

Fish guano	15 cwt.	}
Conc. Super	5 cwt.	
Muriate of Potash	2 cwt.	

Approximate yield lb.

16,000

2. New Nanjanad Farm Mixture:

Groundnut cake	500 lb.	}
Ammonium sulphate	200 lb.	
Conc. super	336 lb.	
Steamed bone meal	350 lb.	
Potassium sulphate	224 lb.	

do.

Table (IV)

Time and method of application.

1. Broadcast versus Furrow application of cattle manure

2. Nanjanad mixture at seed level in furrows

Versus

do do at 3" below seed level

Conclusion:

1. Furrow application of cattle manure is superior
2. Differences due to depth of placement with Nanjanad mixture not significant.

A Note on the Influence of Manuring on the Incidence of the Fulgorid — *Nilaparvata lugens* S on Paddy.

by

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Assistant in Entomology,

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Introduction: Intensive application of manures and fertilisers is one of the chief methods of increasing crop yields.

A close relationship between manuring and incidence of pests and diseases has been observed by research workers. The interesting observations made by the author on the influence of manuring on the incidence of the fulgorid — *Nilaparvata lugens* S on paddy are recorded in this note.

The work done on this aspect in India is rather limited. Andrews (1923) remarks that nitrogenous manures should be used with caution. Dealing with the incidence of *Helopeltis theivora* W on tea, he mentions of a distinct reduction in damage by the bug with the application of potash to the soil. McCollach and Salmon (1923) conclude that silica applied in the form of sodium silicate wards off the Hessian fly — *Mayetiola destructor* S on wheat. Less (1926) and Evans (1938) mention that the reproduction of aphids is positively correlated with nitrogen and protein contents of the plant. Martin (1940) holds the view that increased application of nitrogenous manures creates favourable conditions for diseases and that plots not manured with potash are the first to be attacked by insects. Balasubramaniam and Kesava Iyengar (1950) have recorded that the application of groundnut cake and cattle manure has given rise to an increase in incidence of the cotton jassid — *Empoasca devastans* D.

Materials and methods: During investigations on the pest at the Agricultural Research Station, Aduthurai, an overwhelming incidence was noted on some of the heavily manured fields in the farm. With a view to explore the relationship between manuring and incidence of the pest, observations were made in the 'Permanent Manurial Experimental' plots in the farm during 1954 and in the 'Varietal Response to Manuring Experimental' plots in 1955. Actual counts of pest population were taken in such of the plots in the Permanent Manurial Experimental area, where nitrogen, phosphate and potash each at 60 lb. per acre and lime at 1500 lb. per acre were applied, the variety of paddy being ADT. 3. In the

subsequent year, counts of insect population were confined to variety ADT. 20 in the plots treated with nitrogen and phosphate alone and in combination, since it was observed in the previous year that the incidence of the pest was more on ADT. 20 than on ADT. 3. For population counts, random sample of area of 2 sq. ft. per plot was examined at different stages of the crop. Four such samples were taken from each treatment.

Results: The counts of pest population recorded in the 'Permanent Manurial' plots are furnished in table I under appendix. Due to the rank growth of the plants, the crop lodged in the nitrogen treated plots early, i.e., before the grains had hardened, while in other treatments, viz., phosphate, potash, lime and no treatment, the lodging was only normal. The incidence of the pest, however, was not so severe as to affect the yield in the area. There was no perceptible difference in the incidence of the pest in the different plots till the lodging of the crop whereas after lodging there was a rise in the population in the nitrogen treated plots. The results of counts taken in the 'Varietal Response to Manuring' trial in 1955 are given in table II under appendix. The data show that there was no perceptible difference in incidence of fulgorids in the different plots till the crop lodged. The population flared up after lodging, as already experienced in the previous season, on account of the ideal conditions created thereby, the semi-decaying stage of the stem being an ideally suited sustenance for the insect. The population figures were highest in plots treated with a combination of 60 lb. nitrogen and phosphate at 30, 45 and 60 lb. per acre and in these plots the crop suffered badly. The crop in these plots lodged earlier than in other treatments, i.e., even at the milky stage. Plots treated with nitrogen alone harboured more fulgorids than plots treated with P_2O_5 alone. The pest proportions were not serious and there was no severe lodging in plots receiving 30 lb. nitrogen. The incidence of fulgorids in 'no treatment' plots and P_2O_5 treated plots was more or less similar. There was no early lodging in the P_2O_5 plots unlike in the nitrogen plots.

The yield figures were vitiated due to fulgorid damage and the crop getting caught in the rains at harvest time and subsequent germination of the grains. Hence a correlation of the yield with the insect factor was not possible.

Summary and conclusions: The incidence of the fulgorid—*Nilaparvata lugens* S was kept under observation during the 1954 and 1955 seasons in the Manurial Experimental plots of the farm

where different manures like nitrogen and P_2O_5 independently and in combination, as also lime and potash were applied. The results showed that the incidence of fulgorids increased rapidly after lodging and that the population was highest in plots treated with 60 lb. of nitrogen and 30, 45 and 60 lb. of P_2O_5 in combination on account of an early lodging of the crop. Plots treated with higher doses (45 and 60 lb. per acre) of nitrogen alone harboured spectacularly larger population of fulgorids than plots treated with P_2O_5 , lime, potash and plots receiving no treatment.

Acknowledgement: The author's thanks are due to Sri. M. Basheer, Govt. Entomologist, Coimbatore for the help rendered in writing up this note and to Sri. V. Srinivasan, Superintendent, Agricultural Research Station, Aduthurai for the keen interest shown and the facilities provided for conducting the investigations. Thanks are also due to Sri. K. P. Anantanarayanan, Retd. Govt. Entomologist, for guiding the observations.

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APPENDIX.

TABLE I

Incidence of fulgorids in plots treated with different manure.
Permanent Manure Experiment. Kuruvai season—1954.
 Variety — ADT. 3; sown on 26–6–1954;
 planted on 24, 25–7–1954.

Of different variants in the experiment, only 5 were taken for observation.

Treatments in which observations were made: 5

Size of plot: 45' x 7 1/2'.

Replication: 4. Layout: Split plot design.

Counts taken from a 2 feet square sample per plot.

Treatment	Population of fulgorids (total in 4 plots)		
	3 weeks since Planting (21-8-1954)	At the shot blade stage 10-9-1954	Just after lodging 9-10-1954
1. Nitrogen as ammonium sulphate (60 lb./acre)	17	115	355
2. Potash at 60 lb./acre	24	134	218
3. P ₂ O ₅ at 60 lb./acre	14	105	196
4. Lime at 1500 lb./acre	19	111	182
5. No treatment	21	119	182

The population of fulgorids was relatively more in the nitrogen treated plots after lodging.

TABLE II

Incidence of fulgorids in plots manured with different rates of nitrogen and phosphate, each alone and in combination (Varietal response trial area where ADT. 20 and ADT. 3 were included).

Kuruwai season 1955 Variety kept under observation ADT. 20; sown on 1-7-1955 and planted on 31-7-1955.

Treatment: 16.

Replications: 4.

Layout: Split plot design.

Size of plot: 10' x 20'. Counts taken from a 2 feet square sample per plot.

Population of fulgorids (total in 4 replications)

Treatment	Population of fulgorids (total in 4 replications)		
	3 weeks since planting 24-8-1955	At the shot blade stage 10-9-1955	Immediately after lodging 3-10-1955
1. 30 lb. N	13	21	168
2. 45 lb. N	11	28	259
3. 60 lb. N	17	16	245
4. 30 lb. P ₂ O ₅	6	22	102
5. 45 lb. P ₂ O ₅	18	18	120
6. 60 lb. P ₂ O ₅	13	19	149
7. 30 lb. N + 30 lb. P ₂ O ₅	14	25	226
8. 30 lb. N + 45 lb. P ₂ O ₅	14	26	254
9. 30 lb. N + 60 lb. P ₂ O ₅	11	25	222
10. 45 lb. N + 30 lb. P ₂ O ₅	10	26	288
11. 45 lb. N + 45 lb. P ₂ O ₅	16	29	232
12. 45 lb. N + 60 lb. P ₂ O ₅	17	24	264
13. 60 lb. N + 30 lb. P ₂ O ₅	21	37	426
14. 60 lb. N + 45 lb. P ₂ O ₅	11	35	402
15. 60 lb. N + 60 lb. P ₂ O ₅	15	26	393
16. Control	9	24	115

With the lodging of the crop, insect population increased.

The population of fulgorids was highest in plots treated with a combination of 60 lbs. N and P₂O₅ at 30, 45 and 60 lb./acre. In these plots the crop was noted to lodge early due to luxuriant growth.

Weather Review — For October, 1957

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1957
North	Madras (Meenambakkam)	7.4	- 4.6	27.3
	Tirurkuppam*	7.1	- 0.4	27.0
	Vellore	11.0	+ 4.2	29.1
	Gudiyatham*	5.1	- 1.0	29.0
East Coast	Palur*	11.3	+ 2.9	25.7
	Tindivanam*	8.0	+ 1.2	26.5
	Cuddalore	14.5	+ 3.0	29.4
	Nagapattinam	8.8	- 1.8	24.5
	Aduthurai*	7.5	+ 0.8	30.9
	Pattukottai*	7.0	+ 0.5	21.4
Central	Salem	5.4	- 1.0	20.7
	Coimbatore (A. M. O.)*	10.1	+ 4.4	18.7
	Coimbatore	6.6	+ 0.3	13.5
	Tiruchirapalli	10.1	+ 3.8	20.6
South	Madurai	7.9	+ 0.5	23.7
	Pamban	3.4	- 5.1	8.1
	Koilpatti*	7.8	+ 1.9	16.7
	Palayamecottai	8.2	+ 1.1	17.8
	Ambasamudram*	8.1	+ 5.1	14.2
	Nagarcoil*	7.4	+ 1.3	36.6
Hills	Kodaikanal	14.7	+ 1.5	43.2
	Coonoor*	23.0	+ 13.8	61.0
	Ootacamund*	10.1	+ 0.1	54.1
	Nanjnad*	14.0	+ 4.7	58.3

Note:— 1. * Meteorological Stations of the Madras Agricultural Department.

The trough of low pressure developed by the end of September 1957 in the east Arabian Sea of Malabar - Kanara coast brought about thundershowers at a number of places in interior Madras on 1-10-1957, and localised rains or thundershowers in Madras State on 2-10-1957. As a result of a shallow low pressure area formed over the north Bay of Bengal, rains of thundershowers were local on 3-10-1957 and scattered on 4-10-1957 and 5-10-1957. Localised thundershowers were received in Tamil Nad for three days from 6-10-1957. On 9-10-1957, the South West Monsoon had withdrawn from the country outside extreme South Peninsula, and on that day, localised rains or thundershowers occurred in Madras State. Weather was thundery along and off the Malabar and South Kanara coast on 10-10-1957, when rains or thundershowers were local in Madras State. As the thundery weather shifted westwards into the Laccadive area apparently on 11-10-1957, rains or thundershowers occurred at a few places in interior Madras, while dry weather prevailed elsewhere in the region. A trough of low pressure that was laying over the east central and adjoining west central Bay of Bengal on 12-10-1957, shifted to the south and adjoining central Bay on 14-10-57. For three days from 12-10-1957, weather was dry in Tamil Nad.

The North East monsoon had set in over the east coast of the Peninsula on 15-10-1957, when the trough of low pressure developed on the previous day, persisted over the South West and adjoining west central Bay of Bengal, while at the same

time, a feeble trough also was laying off the Malabar and South Kanara Coast. Under their influence, rains or thundershowers were local for two days from 15-10-1957. Due to the strengthening of North East monsoon along coastal Madras, widespread to fairly widespread rains or thundershowers occurred in Madras State for four days from 17-10-1957. The low pressure wave that was lying as a feeble trough over the south east Arabian sea off the Malabar coast with an associated cyclonic circulation extending upto 3 Kms. a. s. l on 19-10-1957, apparently concentrated into a depression on 22-10-1957. Under these circumstances, localised rains or thundershowers were received for two days from 21-10-1957. On 23-10-1957, a trough of low pressure apparently formed in the south west Bay of Bengal off Ceylon, the influence of which was felt as localised rains or thundershowers in interior Madras, while the weather was dry on 23-10-1957, and scattered rains in Tamil Nad on 24-10-1957. As the depression formed in the south east Arabian Sea deepened after the shift to the east central region, rains or thundershowers were fairly widespread in Madras State for three days from 25-10-1957, and local for four days from 28-10-1957.

There was marked fluctuation in the day temperatures, while the night temperatures were markedly below normal in Madras State during the month under report.

Rainfall: The noteworthy rainfalls and zonal rainfall for the month are furnished below:

Noteworthy Rainfalls for the month

No.	Date	Name of place	Rainfall in inches
1.	1-10-1957	Mathurai	3.10
2.	2-10-1957	Cuddalore	2.91
3.	do	Vellore	2.65
4.	18-10-1957	Nagapattinam	2.96
5.	19-10-1957	Coonoor	2.85
6.	21-10-1957	Coimbatore (A. M. O.)	3.70

Zonal Rainfall for the month (in inches)

Name of Zone	Rainfall for the month	Departure from normal	Remarks.
North	7.7	-0.5	Just. below normal
East Coast	9.5	+1.1	Just above normal
Central	8.1	+1.9	do
South	7.2	+0.8	do
Hills	14.7	+5.0	Above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore.
11-11-1957.

C. B. M., M. V. J., & M. S. D.

Departmental Notifications

Gazetted Officers — Postings and Transfers.

Name and Designation	Posted or Transferred
Sri S. G. Ayyadurai, Asst. Oilseeds Specialist, Coimbatore.	Appointed and to act temporarily as Crop Specialist — O. S. S. Coimbatore
„ T. S. Palanivelu, Asst. Agril. Engineer, (Tractor Workshop), Coimbatore.	Appointed Temporarily as Agri. Engineer, Madras.
„ V. N. Madhava Rao, Asst. Fruit Specialist, (on leave)	Recalled from leave and posted as Banana Res. Officer, Aduthurai.
„ R. Soundararajan, Asst. in Chemistry, Coimbatore.	Appointed to act as Field Manure Officer, Coimbatore.
„ Samuel John Moses, Gazatted Block Development Officer, Bhavanisagar.	Appointed to act as Field Manure Officer, Madurai.
„ G. Doraiswami, D. A. O., Nagarkoil	Appointed to act as Field Manure Officer, Tanjore.
„ A. Muhamad Ali, D. D., Madras.	Appointed temporarily as Joint Director of Agriculture (Inspection and General) Madras.
„ Leo Swamikannu, Addl., Lecturer in Civil Engineering	Trans. and posted as Lecturer in Civil Engineering A. C. R. I. Vice Sri N. Sankaranarayana Reddy.
Dr. M. Srinivasan, Lecturer in Agril. Economics — A. E. R. I.	On deputation to the Govt. of India as Senior Marketing Officer.
Sri S. Varaisai Muhamad, Asst., O. S. S., Pollachi.	Assistant Oil Seeds specialist, Coimbatore.
„ T. Srinivasalu, Asst. in O. S. S., C. B. E.	Asst. O. S. S. Pollachi Vice Sri S. Varaisai Muhamad.
„ P. N. Krishnaswami, Asst. Cotton Specialist, Tirupur.	On return from leave is reposted as A. C. S. Tirupur.
„ R. Sambadam on relief by Sri P. N. Krishnaswami, Tirupur.	Cotton Extension Officer, Madurai Vice Sri T. B. Krishnaswami Rao, reverted.
„ D. Shanmugasundaram, Asst. Marketing Officer, Madras.	Appointed to act temporarily as D. D., Madras.
„ K. Sriraman, A. M. O., Madurai.	Transferred and posted as A. M. O., Madras vice Sri D. Shanmugasundaram.
„ G. K. Chidambaram, Asst. Agl. Chemist, Coimbatore	Transferred and posted as Chief Inspector of Fertilisers — Madras.
„ C. R. Venkataraman, Asst. in Chemistry, Coimbatore.	Appointed to act as Asst. Agril. Chemist Vice Sri G. K. Chidambaram.

Appointment of Upper Subordinates in the Madras Agricultural Department.

Name and Designation	Transferred and Posted
Sri Varatharajan, B. Sc.	Appointed as Entomological Asst. Aduturai.
Kumari T. N. Mathuram, B. Sc., (Hons)	„ Cane Assistant, Gudintham.
Sri V. Thomas Alexander, B. Sc., (Ag.)	„ A. D., Uthukuli, Coimbatore, Vice Sri R. Nagappan.
„ Vasudeva Karanth,	„ Paddy Assistant, Tirurkuppam.
„ K. Gangadharan,	„ Mycology Assistant, Vice Sri. T. K. Kandaswami.
„ K. Sambasivam,	„ Mycology Assistant, Vice Sri. Adyanthia.
„ M. Gangadharan, B. Sc., (Ag.)	„ Spl. Agri-Demonstrator, Sugarcane Karur, Vice Sri T. V. Singaravelu.
„ A. Srinivasan, B. Sc.,	„ Entomology Assistant, Coimbatore.
„ J. M. M. MD. Abdulkadar, B. Sc., (Ag.), M. Sc.,	„ Fruit Assistant, Periakulam.
„ N. R. Sundararajan, B. Sc.	„ Chemistry Assistant, Coimbatore.
„ N. Venkataraman, B. Sc.	„ Chemistry Assistant, Ghee gardening scheme, Karur.
„ V. V. Raghavendran, B. Sc.,	„ Ghee gardening scheme, Coimbatore.
„ C. M. Janardhanam, B. Sc.	„ Chemistry Assistant, Ghee gardening scheme, Dharapuram.
„ N. Rajamony, B. Sc.	„ Chemistry Asst. Cuddalore, Vice Sri. T. R. Subramaniam applied for leave.
„ C. M. Ratnasingh.	„ Cane Asst. Vadapathimangalam.
„ C. Chidambaram Pillai, B. Sc., (Ag).	„ Spl. A. D. Cotton, Kadambur, Tirunelveli Dist., Vice Sri. A. Damodharan.
„ P. Vincent, B. Sc.	„ Paddy Assistant, Coimbatore.

Appointment of Fieldmen as Upper Subordinate.

„ S. Krishnamurthy, Fieldman, Mayuram.	Appointed as Farm, Manager, State Seed Farm, Mahadharapuram.
„ S. Yegyanarayan, A. R. S. Koilpatti.	„ Farm, Manager, Kayathur.
„ S. Kalyanasubramaniam,	„ „ Nazerethpet Chingleput District.
„ T. A. Lakshmanan, U. D. C., D. A. O's Office, Kumbakonam.	„ „ Sriramkattalai, Kumbakonam.
„ T. A. Subba Naidu, to Asst. Cotton Splt. Koilpatti.	„ „ Karaikuppam, Tirunelveli Dt.
„ G. Ramachandran, Fieldman, Rural Exten. Training Centre, Pattukottai.	„ „ Nemmelithippikudi Pattukottai.
„ K. Venkatavaradan, Fieldman, A. R. S. Tindivanam.	„ „ Vadakankudi, South Arcot.
„ T. N. Meenakshisundaram, A. R. S. Tirur,	„ „ Vaniyanagaram.

Transfers and Postings of Upper subordinates of Agricultural Department

Name and Designation	Transferred and posted to
Sri Y. B. Morachan on expiry of leave.	Posted as Soil conservation Assistant, Ootacamund.
„ S. Ramakrishnan, Extension Officer in Agriculture, Palladam.	Block Dev. Officer, Gobichettipalayam.
„ K. N. Duraiswami, A. D. Salem.	do Erode.
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Marketing of Turmeric

by

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Turmeric (*Curcuma longa* L.) is an important cash crop largely grown in the districts of Coimbatore (4,000 acres) Tiruchirapalli (1500 acres) and Salem (900 acres) in Madras State. It is grown mostly as a pure crop under canal or lift irrigation, in well manured, fertile and well drained soils. The yield of processed and dried turmeric is about two tons per acre. The yield of green rhizomes are about four time greater. Both the finger ("virali") and round ("Kizhangu") turmeric is used as seed material, though there are different ideas about the final yield of the crop in terms of fingers and rounds. Generally in the harvested crop the proportion of bulbs to fingers is about 1:4 by weight. The cost of cultivation of turmeric is roughly about Rs. 1,200/- per acre. The produce is harvested between January to March and is in the market after processing from February onwards. It is mostly exported to Calcutta, Bombay, Delhi, Colombo and other places outside the Madras State.

The wet turmeric tubers, soon after harvest are boiled in cowdung water. The boiled tubers are dried in the sun. The shrunken dried tubers are polished in baskets, rolling them along with stones, or in mechanical polishers, peeling off the outer dirty coloured skin, by friction. These cleaned tubers are treated with castor seed powder, alum and turmeric powder so that the turmeric gets a glistening golden colour. Most of the agriculturists bring the produce after boiling it in cowdung water and polishing it slightly in the baskets. The rest of the processing takes place in the trader's premises, after purchase from the agriculturists.

The important assembling centres for turmeric are Erode, Salem and Karur. At Salem and Karur, there are mostly Commission merchants only, and the produce assembled in these places is brought to Erode for

ultimate export. Hence Erode is the most important assembling and trading centre for turmeric in Madras State. At Erode there are 40 commission merchants and 35 exporters involved in turmeric trade. The arrivals of turmeric into the Erode market are from different sources. The turmeric grown in Coimbatore district in Gobichettipalayam and Erode taluks from within a radius of about 30 miles around, arrive for marketing at Erode to the extent about 1½ lakhs of bags (1 bag = 140 lbs.) from January to April mostly. The produce of the Tiruchirapalli district from the Karur area, to the tune of ½ lakh of bags and from Salem area to the extent of ¼ lakh bags are in the market between February and April. Some quantities from the Andhra and Kerala States also find a sale at Erode between May to September. Roughly 15,000 tons of turmeric are handled at Erode annually. The quality of turmeric coming from the Gobichettipalayam taluk is considered to be the best, having a core of sparkling yellow with a fine scent. As between the fingers and the rounds, fingers always fetch a decidedly higher price.

The growers themselves bring their turmeric to the Erode market. It has to be taken to any one of the forty commission merchants, who are all members of the Erode Commission and mundy merchants Association. No direct sales to exporters are permitted, as the Commission merchants wish to recover their loans, at the time of the sale of the produce. The agriculturist takes the produce to the commission merchants, from whom he would have taken a loan for cultivation or other expenses. The commission merchant arranges for the sale of the produce to the exporters. Generally, each grower would be getting about 3 to 5 bags (140 lbs) of turmeric in a lot for sale. A commission on an advalorem basis at Rs. 0—0—6 to 0—1—0 per ruppe is charged from the agriculturist. Weighing charges of Rs. 0—4—0 per bag of turmeric are also charged. Sometimes weighing charges are taken in kind at the rate of about 50—70 lbs of turmeric per 50 bags weighed. These weighing charges in kind include the labour for unloading the bags from the carts or lorries after weighment. An extra 1½ lb is allowed to the purchaser while weighing each bag of turmeric (140 lbs). A 'Takka' of Rs. 0—12—0 per Rs. 100/- is collected from the grower in addition to the commission to compensate the loss sustained by the mundy owner if the value is not paid by the purchaser within three days of the sale. No storage charges are collected separately. Sometimes, a broker is also employed and is paid at 0—0—6 per bag by the grower. It will be seen, from the above, that the commission merchants have organised themselves very securely under the Association. The method of sale, as fixed by the Association, changed considerably, with experience. At first, the lots were auctioned by shouting, exhausting mundy after mundy. As this procedure took a lot of time, each mundy got a chance once in 15 to 20 days only. Later tender system of sale was adopted. In this system, a Kalasi from the Commission mundy took samples of 14 lbs turmeric from the lots and

accompanied by the owners of the produce, took them to the exporters, one by one. The price offered by the exporter for each lot, was written up by him in the book brought by the Kalasi, wherein separate pages were allotted to the individual exporters, so that the prices offered by them may be kept a secret, from one another. If the grower was prepared to accept the price offered in writing by the exporter, he should do so on the spot, at the exporter's premises itself. When the grower left the exporter's premises without accepting the offer, the offer made, was deemed to have been cancelled then and there. In this system, the sales were quickly made, but the grower, had no opportunity to accept the highest price. At present a central place has been provided where commission merchants with the growers exhibit their stocks through samples of 14 lbs each and the purchasers come and offer prices as they like. It is left to the owner or the commission merchant to accept the price offered or not. Thus sales are quickly effected, every day between 10 A. M. to 12 noon, depending on the arrivals. This system is an improvement, in the sense that the grower has an opportunity to accept the highest price offered. Still there are some defects to be rectified further. A part of the sample is taken away by the purchaser, and when the goods actually arrive at his premises, there is scope for the purchaser to bargain further, on the plea that the bulk is not according to the sample. The actual stocks are not exhibited for sale. The weighments are not made correctly and impartially. The grower is not at liberty to sell his produce without the intervention of a commission agent. The commission and other charges are exorbitant.

The ideal method of sale should be to afford opportunities to the agriculturist to sell his produce on fair terms for the best price, without much of expense. This can be possible only if the produce is marketed through the regulated market of a market committee. It would not cost anything for the agriculturist, as all the services given by a market committee are free to the producer. The expenditure incurred by a ryot while marketing his turmeric through the commission mundy and through a regulated market is given below.

Expenses per bag of 140 lbs.:

Marketing of turmeric through			
A commission mundy at Erode		The regulated market at Erode	
1	Brokerage (on sale price of Rs. 25/- per bag)	Rs. 0-75 nP.	Nil
2	Commission (On sale price of Rs. 25/- per bag)	" 1-56 "	Nil
3	Weighing charges	" 0-25 "	Nil
4	Extra allowances in weighing	" 0-30 "	Nil
5	Takka	" 0-19 "	Nil
Total Rs.		3-05 "	Nil

The purchaser pays
the weighing labour
in the committee.

Against an expense of about three rupees per bag costing of Rs. 25/- for the ryot while he sells his turmeric through the Commission mundy, he need not incur any expenditure if he should sell his produce through the regulated market.

Further the prices obtained in a regulated market would be the best, as the method of sale adopted is the secret tender bid system, where the purchasers have to offer their prices to the lots exposed for sale in writing and then take the chance of getting the lots, only if their price offered, was the best for the lot. Hence in the sale of a commercial crop like turmeric involving transactions amounting to more than a crore of rupees annually at Erode, it is essential that the interests of the grower is protected by giving him all the marketing facilities, establishing a regulated market at Erode. It would be a great satisfaction to note that the turmeric in Coimbatore district has been declared by the Government as a commercial crop under the Madras Commercial Crops Markets Act and that the Coimbatore Market Committee has been taking steps to establish a regulated market for turmeric at Erode. The day of deliverance for the ryot from the tight grip of the commission merchant is fast approaching.

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