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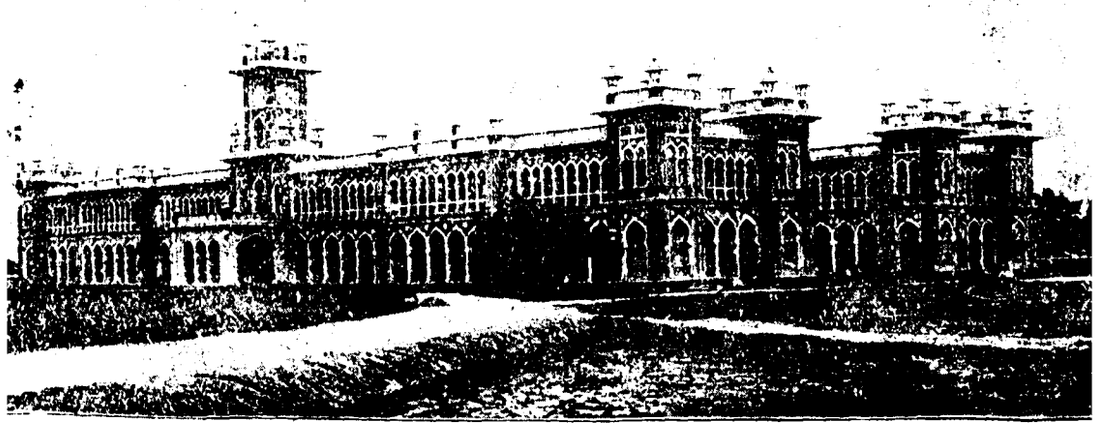

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T. S. Lakshmanan,
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Editorial 309

Technical Assistance for Economic Development: We publish elsewhere in this issue extracts from reports of the meetings held under the Food and Agriculture Organisation of the United Nations. These meetings dealt with three allied aspects, namely (1) Technical assistance for Economic Development, (2) Social Welfare in Rural Communities and (3) Educational Approaches to Social Welfare and a number of very interesting and practical conclusions have been summarised in these extracts.

The methods of technical help discussed were those designed to be given by an extra-national agency to a national Government for assisting the country towards greater economic development. Why is it then that some countries are more advanced and more developed than others ? or in other words, why does a backward country remain backward ? In many cases the reason is an incongruous relation between the area of the country and its population. A country is poor because it is under-developed; because it is poor it cannot afford elaborate services for improvement of education, health and agriculture and because it cannot afford such elaborate services, it remains under-developed. To cite as an analogy, because a man is weak and emaciated, he is unable to work hard and earn an adequate living wage, and because he is unable to earn good wages he is unable to feed himself well and therefore remains thin and weak.

In this connection it may not be out of place to consider how far such laudable intentions and programmes as are now formulated by the Food and Agricultural Organisation of the United Nations,

are likely to be helpful to India. As mentioned in the U. N. O. report itself, short visits by foreign experts are of little value, in securing any lasting results. For that, a thorough understanding of local conditions and close personal contact with the farmer and his way of life are undispensable and these obviously cannot be expected from the short visits of foreign experts. And moreover it is always much easier to give advice than to make use of it in actual work, so that ultimately we come round to the conclusion that any real or lasting improvement can only be achieved by the self-exertions of the people themselves. This fact too, has been recognised in the U. N. O. report, namely, that "improvements in Agriculture must depend largely on the individual farmer's own efforts".

Studies on the Depth of Colour in Rice Foliage

By

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and

P. C. SAHADEVAN

(Madras Agricultural Department)

Introduction: In selecting plants or varieties for higher yields, breeders are generally guided by certain external features that are associated with productivity. In rice, for example, selection is based on characters like tillering, number of ears per plant, length of ears and twinning of the grains at the tips of the ears. Another variation observed in rice is with reference to the depth of the green colour of the foliage. Such difference in depth of colour is observed between different varieties and also between strains isolated within a variety.

It is found that environmental and cultural differences also bring about change in colour. Greater age of the seedlings, wider spacing of the plants in the transplant field and heavy dressings of manures, especially nitrogenous, give the plants a dark-green appearance. The colour turns lighter with young seedlings, close spacing and normal or less-than-normal manuring. Small differences in nurture like the above may induce only a temporary change in colour, the colour getting evened out during the growth period itself. Large differences on the other hand, bring about changes which are found to persist till the harvest similar to genetically caused differences.

This paper presents a study made on the agronomic significance of such difference in colour brought by genetical and environmental factors.

Sreenivasan (1926) was the first to record differences in colour of rice foliage and he found that the rice strains which had given higher yields in the variety ***Krishnakatukalu*** possessed light green foliage in contrast to dark green ones. According to Morinaga (1932) the yellow leaved plants, called by him as ***Chlorinas*** were of slow growth and less productivity than the normal greens. Ramiah and Ramanujam (1935) working on the chlorophyll deficiencies of rice concluded that the ***Chlorina*** forms of Morinaga were probably genetically different from those isolated in ***Kristnakatukalu***. No other study would seem to have been made regarding the agronomic aspects of this character in rice.

Experimental: In an experiment with different ages of seedlings in two varieties of autumn rices, PTB. 1 (***Aryan***) and PTB. 5. (***Veluthari-kayama***), differences in colour of foliage were observed in all the three years of trial. PTB. 1 has light-green foliage compared to PTB. 5 but

the varieties have other morphological differences. Three durations were given to seedlings in the nursery, namely 72 days, 57 days and 21 days and all the seedlings were transplanted on the same day in the normal season in replicated randomized blocks. In each variety the depth of colour increased with duration in the nursery. PTB. 5. of 72 days was the darkest in colour and PTB. 1. of 21 days had the lightest foliage, PTB. 5. of 21 days appeared to have almost the same colour as PTB. 1. of 57 days. In order to see if and how far the quantitative factors are affected, measurements were taken of the earbearing tillers and the length of the ears. The results are tabulated in table I.

TABLE I.

(a) Ear-bearing tillers.

Summary of results for varieties.

	PTB. 1. (Light green)	PTB. 5. (Dark green)	S.E.	I.
Percentage on General mean	104·3	95·7	3·28	7·00

Significant at 5% level.

Summary of results for ages.

	72 days (Dark green)	57 days (Green)	21 days (Light green)	S.E.	I.
Percentage on General mean	96·6	95·2	108·2	4·02	8·57

Significant at 5% level.

(b) Length of ears.

Summary of results for ears.

	PTB. 1. (Light green)	PTB. 5. (Dark green)	S.E.	I.
Percentage on General mean	97·8	102·2	0·49	1·04

Significant at 5% level.

Summary of results for ages.

	72 days (Dark green)	57 days (Green)	21 days (Light green)	S. E.	I.
Percentage on General mean	103·5	101·3	95·2	0·61	1·30

Significant at 5% level.

The results indicate that in each variety, the length of ear increases with increase in depth of colour while the number of ear-bearing tillers is reduced.

Following this, pure lines differing in greenness of leaf only, were studied quantitatively in order to see if genetically caused colour differences produce results similar to that caused by nurture, as in the above experiment.

Among the winter varieties two cultures 8643 and 8719 isolated in the variety ***Muthuchemba*** were selected for the study. Culture 8643 has light green foliage compared to the culture 8719. The experiment was laid out in Beaven's reversed pair arrangement in strips of 5″ x 15″ with 12 replications. Planting was done with a spacing of 6″ x 6″ at two seedlings per hole. Statistical analyses of the measurements of the ear-length and the number of ear-bearing tillers of 25 plants in each strip are presented in table II.

TABLE II.

	8643	8719	S. E.	I.
Ear-length–% on general mean	98·6	101·4	1·13	2·49
Ear-bearing tillers–% on general mean	104·1	95·9	00·7	0·15

Significant at 5% level.

It will be seen from the table that the green type has longer ears and fewer ear-bearing tillers; more tillers and shorter ears are produced by the light green type.

In the autumn season three light green and three green cultures isolated in the variety *Chornali* were studied. Cultures A, B and C belonged to the green group and cultures D, E and F to the light green group. The lay-out was in randomized blocks with four replications. The size of the sub-plot was 5′ x 20′ and the seedlings were planted at a distance of 6″ x 6″ at two seedlings per hole. For counts of tillers, 25 plants were taken at random from each strip and 10 plants for the measurements of ear-length and grain weight. The results are given in table III.

TALBE III.

Summary of results—*Chornali*.

		Green			Light green			
		A	B	C	D	E	F	
		Percentages on general mean					S. E.	I.
I.	Ear-length:	102·9	100·0	107·7	95·2	100·0	94·2	1·70	3·62

Significant at 5% level.

	Green			Light green				
	A	B	C	D	E	F		
II. Ear-bearing tillers:	94·2	94·8	82·4	197·2	111·5	109·9	3·96	8·44
					Significant at 5% level.			
III. Yield:	95·1	107·2	107·4	80·9	105·7	103·8	7·78	16·58
					Significant at 5% level.			
IV. Yield-four year average:	92·9	102·6	106·1	99·2	104·5	96·8		

The light-green cultures D, E and F have more ear-bearing tillers than the green cultures A, B and C, the difference being statistically significant. Shorter ears are produced by the light-green cultures, an exception being the culture E which has the same length of ear as the culture B, the shortest-eared one in the green group. The results, in general confirm the finding that the variaties in quantitative factors indicated by colour difference and brought about by nurture, are true in the case of genetical differenoes in colour.

The behaviour of the culture E is of interest. It has good tillering capacity associated with light-green foliage. It has long ears also, the length being equal to that of the culture B in the green group. Similarly, if more selections are studied, a dark-green culture might be found which combines good tillering as well. It is such combinations that are of practical value to the breeder.

It will also be seen from the results that the most important factors influencing the yield are tillering and the weight of the ears. Of the three factors that go to make up the weight of the ears, the number of grains per ear and the weight of the grains are more important than the length of the ear.

Discussion: If selection is based on the overall yield, the final choice may fall on the green culture C or the light-green culture E. During the four years of trial these two cultures have given the best yields (Vide item IV, table III). It is however necessary to find out how the two cultures would behave under differing soil and climatic conditions. This will probably give an idea of the agronomic significance of the colour difference. It may also be advantageous to combine the capacity for both tillering and length of ear in one strain by artificially crossing the cultures C and E.

The mode of inheritance of the depth of colour of rice foliage has not so far been worked out. But its association with characters like tillering and the length of ear, which are themselves governed by multiple factors would suggest that it is of a complex nature. The effect of all the possible agronomic influences that modify the character have to be studied first. Such a study alone would lead to a clearer insight into the behaviour of this character from generation to generation.

Summary: 1. Differences in the intensity of colour of rice foliage were noticed when the seedlings of the same variety were given different durations in the nursery. The colour could be grouped into dark-green, green and light-green.

2. Measurements of ear-bearing tillers and the length of the ears indicate that longer ears are obtained as the colour gets darker with reduction in the number of tillers. Light foliage groups have better tillering but shorter ears.

3. The study was extended to the genetic differences in colour observed in strains isolated within autumn and winter varieties in order to see if the differences in quantitative factors brought about by nurture and as indicated by shade differences would be true in the case of genetical differences also.

4. The association was found true in the case of tillering and length of ear in two winter strains. When six strains were studied in the autumn season, the association was complete with regard te tillering; one culture in the light-green group was found to have the same length of ear as the shortest-eared culture in the green group.

5. The importance of the association is discussed and future lines of work are outlined so as to get more data on the expression of colour as influenced by genetical and environmental variations and to find out which of the two types is of greater agronomic value.

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2. Ramiah, K. and Ramanujam, S. (1935). Chlorophyll deficiencies in rice (*Oryza sativa*). Proc. Ind. Acad. Sci. Vol II. No. 4. pp. 343-368. Unpublished records-Agri. Res. Stn. Pattambi.

The Deposition and Retention of certain Plant Pest Control Materials in relation to their Biological Performance

*I. The Influence of the Mode of deposition and other factors on the recovery of 1 : 1 : 1 trichloro-2 : 2-bis (p-chlorophenyl)-ethane (D. D. T.) from leaf surfaces**

By

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Introduction: The release of 1 : 1 : 1 trichloro-2 : 2 bis-(p.-chlorophenyl)-ethane (p-p' DDT) for civilian consumption with the cessation of hostilities and its extensive use in agriculture and horticulture has given rise to a number of problems, many of which are still a matter of speculation and await solution. The voluminous literature available on the subject, is sometimes vague and contradictory. For example, the great stability and extraordinary persistence of DDT are well known (Fleck, 1944, Fleck and Haller, 1945, Balban and Sutcliffe, 1945). Cages treated with solution of DDT in kerosene killed flies even after a period of 8½ months (Lindquist, 1944), and one application of DDT was found sufficient to prevent an infestation of plums by the Japanese beetle for one full season (Fleming, 1944). Despite this accredited stability Gunther (1945) reported that deposits of DDT lost their toxicity in less than 2½ months under the climatic conditions of California where the shade temperature reached 125°F. Whether this loss is due to volatilization of the insecticide or to some other factors like absorption by the tissues or drying up of the films and dropping off is not known with any degree of certainity. Apparent contradictions of this nature may be attributed to the suddenness with which DDT has risen to prominence and to the fact that there is as yet no satisfactory method of estimating the p-p' DDT content (the insecticidally important isomer) of DDT samples.

To enable DDT to be applied in a variety of ways, such as dusts, suspensions, solutions, emulsions, ærosols etc., it is compounded with solvents like Freon and Tetralin which not only differ in their physical constants, but also in their chemical properties. This wide variety was not confined to the solvents alone, but extended to the emulsifiers as well. Applied in these multifarious forms it is but natural to expect variations in the biological performances of these preparations, and even the

*The investigations presented in this article formed part of a thesis submitted for the PH. D. degree of the University of London, and were conducted at the East Malling Research Station, Kent, during the years 1946-1947.

same preparation is likely to react differently depending upon the nature of the surface, the prevailing climatic and weather conditions, and the test insect. For example, when a preparation is tried on a non-absorbent surface like glass its response will be something different from that obtained when the same preparation is made on a porous and absorbent surface like a mud wall, especially if the solvents used in the compounding of the insecticide possess such strong penetrative powers that the solvent penetrates the tissue, carrying the insecticide with it. Thus the amount of the insecticide that is rendered unavailable and ineffective depends upon the mode of its deposition, the nature of the solvents used in the preparation of the insecticide, and the nature of the surfaces used.

The ability of non-agricultural materials like clothes, woodwork and many articles used in building construction to absorb DDT preparations, is well known. Stiff and Castillo (1946), studying the absorption of DDT by building materials like wood, canvas, rubber, etc., found that a greater portion of the insecticide penetrated into the materials when deposited in the form of a straight solution. Estimating by a rough qualitative test, they demonstrated the differential absorption capacities of the several materials, and concluded that similar results might be obtained with vegetation. Parkin and Hewlett (1946), working on the absorption of DDT by building materials (especially stones), demonstrated by biological tests the large-scale penetration of the insecticide. They showed that this could be effectively checked by pre-treating the surfaces with material like starch, size, etc., which are impenetrable and non-absorbent.

Ebeling (1944) was the first to demonstrate the absorption of DDT by agricultural crops. Leaves and twigs of Citrus when painted with DDT in kerosene were found to have absorbed considerable quantities of the insecticide, but this could be retarded to a great extent by preparing emulsions using aluminium stearate. Gunther (1946) sprayed orange and lemon trees with preparations of DDT made from kerosene and mixtures of kerosene with Tetralin and Velsicol A. R. 60, and found that the amount left as a residue on the surface varied with the nature of the solvent. He also found that with certain of the solvents used, the insecticide first penetrated the tissue and came up to the surface subsequently. Symes (1946), and Barlow and Hadaway (1946, 1947), working on the control of tsetse fly and mosquito in Uganda, reported considerable loss of the insecticide by absorption by the leaves and mud walls. The amount absorbed varied with the nature of the vegetation. A portion of the insecticide that was sprayed was found to be easily recovered, whereas the rest was not. This sort of penetration was not only confined to leaves which have stomata to facilitate the process, but was found to occur, by Wichmann (1946), in the case of apples which were hard and smooth.

Apart from the few references cited above, no other strict experimental evidence seems to be available in literature to indicate the result of depositing a known quantity of DDT on any specific surface and attempting to recover it. Previous investigators like Fathey (1945), Gunther (1945), and Wichmann (1946), who studied the accuracy and suitability of the methods available for the estimation of DDT sprayed their experimental materials by the ordinary orchard practice. In all such cases it may be possible to spray uniformly, but it is not possible to deposit any desired amount with exactitude. This limitation was well recognised by Symes (1946), who aptly obsered that an attempt to spray 100 mgm. per square foot might result in a deposit varying from 50 - 300 mgm. By the ordinary spray practice it may be possible to obtain samples which are uniformly sprayed, and analysis of duplicates drawn from such samples are bound to agree since the absorption and loss of the insecticide, if any, would be common as the spraying is done under a standard set of conditions. The agreement between duplicates does not, therefore, prove the existence or non-existence of any factor. Unless one knows exactly how much is deposited, one cannot be sure how much is recoverable. Especially, when straight solutions are dealt with, the loss by penetration and absorption is maximum, and the time lag that intervenes between deposition of the insecticide and its estimation is sufficient to allow most of the insecticide to disappear. A balance sheet must, therefore, be drawn up before the loss of insecticide either by absorption or from other causes can be established.

Object and scope of the present investigations: In view of the insufficient and conflicting information available in the literature, it was proposed to study the absorption of DDT by vegetation under a variety of conditions and obtain information on :

(i) The influence of the nature of solvent used in the preparation, on the recovery of DDT.

(ii) The amount of insecticide recovered when equal quantities are deposited in the form of solutions and emulsions.

(iii) The effect of the nature of the emulsifier used in the preparation of the emulsion and the nature of the emulsion on the recovery of insecticide.

(iv) The concentration of the insecticide in the preparation, the concentration of the solvent used in the preparation of the emulsion and the nature of the surface on the amount of DDT recovered.

Methods and Materials: A perusal of literature showed that in many cases the exact details were not available, and even the few that were available differed widely from deposition to estimation of the insecticide.

Ebling deposited the insecticide by painting with camel hair brush ; Stiff and Castillo distributed it in the form of fine drops and then spread it into a thin film ; Gunther, Symes, and Barlow and Hadaway adopted the ordinary spray practice. The last two workers also deposited with a micropipette exact amounts in some cases. After deposition, the materials were allowed to remain for 48 hours before being extracted in the case of Stiff and Castillo, whereas Gunther analysed them from the time the drip ceased to 86 days after spraying. The quantities of material used for extraction also were widely varying. Fathey, Gunther, and Wichmann used 25 apples in every trial. Ebeling extracted 60 citrus leaves having an area of 2,000 sq. cms.; and Gunther (1946) employed 75 leaves of orange or lemon.

Benzene appears to have been uniformly selected as the solvent for extraction, and the extraction procedure ranged from mere washing with a jet of benzene by Gunther, to an extraction for a period of 15 - 30 minutes as suggested by Carter and Hubanks (1946). Symes, and Barlow and Hadaway removed the surface deposits by washing every square foot of leaf sample with two 20·0 cc. portions of benzene. The extracted material was then dried, powdered and re-extracted in a Soxhlet to recover the insecticide which penetrated the tissue.

The hydrolisable chlorine method of estimating DDT was chosen by Gunther, Barlow and Hadaway, Carter and Hubanks, and Wichmann *et al.* The latter two also used the total chlorine method by reducing with sodium and iso-propyl alcohol. Fahey (1945), on the other hand adopted the combustion method of Winter. When the hydrolysable chlorine method was adopted, hydrolysis was carried out for 30 minutes by Wichmann *et al.*

In view of the above - mentioned variations, it was found necessary to evolve a suitable technique which would be practicable, reproducible and capable of extracting the insecticide which would normally be considered useful for insecticidal purposes. It was also intended to allow maximum contact between the insecticide and the material under test so that the absorption factor could be investigated. The solvents used for the preparations of solutions and emulsions were chosen on a broad basis so that they differed not only in their physical characteristics but also in their chemical nature. Similarly, the emulsifiers used were chosen so as to represent different ionic activities.

Apple leaves (Cox's Orange Pippin) were used in all the tests. After wiping off the moisture with a clean towel, the freshly picked leaves were cut to the desired area, either 16·0 sq. cm. or 20·0 sq. cm. by superimposing a cardboard of known area over them, and trimming off the edges. The cut leaves were weighted down to flatten them and then spread in petri dishes for the deposition of the insecticide. 200·0 sq. cms. of leaf area was used for each test.

Except where the effect of the concentration of the insecticide on its recovery was studied, all the preparations contained 1·0% of p-p' DDT. (Pure p-p' DDT was obtained by crystallising the commercial product thrice from 98% alcohol and had a m. p. 107-108°C). No special procedure was involved in the preparation of the solutions.

In the case of emulsions, where soap was used as the emulsifying agent, little difficulty was experienced for the emulsions could be easily prepared by mere shaking by the hand, but with other emulsions, however, the emulsions were not easily formed, and they had to be put through an emulsifying mill. Thus, in all cases where the relative efficiencies of the different emulsifiers were compared, the requisite quantity of the insecticide, solvent, emulsifier and water were mixed and the mixture put through the mill four times. Good stable emulsions were thus obtained and their final DDT content determined by analysis. In all cases the amount ef solvent used was the minimum required to dissolve the insecticide.

In a few preliminary experiments conducted with the idea of depositing uniform quantities by spraying with Tattersfield's apparatus, it was found that the amount of insecticide deposited varied with the solvent in the preparation of the emulsion. (Table I)

TABLE 1

Amount of DDT deposited when emulsions prepared with different solvents are sprayed with Tattersfield's apparatus.

Sprayed in petri dishes of uniform diameter

Pressure used :— 35 cms.

Vol. of emulsion used in each case } 2·0 c.c.

Volume of solvent in emulsion :— 12·0%

Emulsifier :— Sodium oleate 1·0 %.

Solvent used for preparing the emulsion.	% of DDT in emulsion	Amount of DDT deposited (mgm.)
Benzene	0·9647	4·627
Dekalin	1·0070	6·151
Cotton seed oil	1·0420	5·832

Depositing by this method was, therefore given up, and the following technique adopted.

Portions either of solution or emulsion 1 c. c. in volume, containing about 10·0 mgm. of DDT, were measured accurately with a micropipette and deposited as uniformly as possible by gently leading the end of the pipette over the entire leaf area. In the case of solutions the liquid penetrated quickly, but in the case of emulsions, as the penetration was not so quick the liquid was uniformly deposited in the form of fine drops over the entire area, and then spread by means of a bent needle. Whereas no particular difficulty was experienced in the case of the upper smooth surface, the presence of midrib and veins on the under surface made the uniform distribution rather difficult.

After deposition the materials were left in a room at a fairly constant temperature near 15°C (there being no direct sunlight) for a period of 24 hours. At the end of that period the leaves were carefully transferred to a 500 c.c. conical flask without touching the deposits on them, (the petri dishes in which they were kept were wiped with a swab of cotton wool dipped in benzene and this was also put in the flask) and were shaken successively three times with 50·0, 30·0 and 25·0 c. c. portions of benzene. The flasks were well stoppered, and the shaking done by hand each time for a period of five minutes. The whole shaking operation, therefore, took fifteen minutes to complete and this was assumed to be sufficient to recover all the insecticide that would normally be considered useful. At the end of each shaking period the solutions were decanted into a 100·0 c. c. volumetric flask, finally made up to volume, and aliquots of 50·0 c. c. taken for analysis.

Since pure p-p' DDT was employed throughout, the estimation of DDT was done by an estimation of its total chlorine content by reducing with sodium and ethyl alcohol. After removing benzene the reduction was effected by using 2 grams of sodium and 25·0 c. c. of ethyl alcohol (98%) at 80° for 30 minutes. The contents of the flask were diluted with water, neutralised with nitric acid and after adding nitrobenzene and ferric nitrate the chloride was estimated by the usual Volhard procedure.

Discussion: *The effect of the nature of solvent used in the preparation of the solution on the recovery of DDT* (Table 2).

TABLE 2

The effect of the nature of solvent used in the preparation of the solution on the recovery of DDT.

1·0 c.c. of 1·0% solution containing 10·0 mgm. of DDT, distributed over a leaf area of 200 sq. cms.

	Solvent used	Specific gravity	Boiling point °C	DDT % Recovered		Increase or decrease of the upper surface over the lower.
				Upper surface	Lower surface	
1.	N-hexane	0·6603	69	78·02	69·45	+8·57
2.	Benzene	0·8794	80	74·75	70·91	+3·84
3.	Petroleum ether	...	80–100	69·50	60.99	+8·51
4.	Pyridine	0·9029	115·3	74·99	74·30	+0·69
5.	Diacetone alcohol	0·9306	164–166	52·49	52·49	0·0
6.	Dekalin	0·934	188–190	73·75	57·89	+15·86
7.	Cotton seed oil	0·917	...	79·43	85·09	—5·66

The boiling points of the solvents tested ranged from 70° – 190°C and their specific gravities from 0·66 – 0·93. They differed too in their chemical properties : two were aromatic and two aliphatic hydrocarbons, one alcohol, one base and one vegetable oil. The differential property of the last solvent, cottonseed oil, from the rest of the solvents was exhibited throughout with both solutions and emulsions. It had neither the penetrative power, nor the scorching effect, produced by the rest.

In all cases when DDT was deposited in the form of a solution, cotton seed oil excepted, there was severe scorching action on both the surfaces, and at the end of the 24 hour period crystalline deposits were noticed when the leaves were taken up for analysis. Cotton seed oil being non-volatile, did not leave any visible white deposit, but only oily patches were present. The apearance of the insecticide on the outside, therefore, did not appear to be an indication of the amount recoverable, since the values obtained in the case of cotton seed oil where no deposits were visible were higher than those obtained with dekalin, etc., where deposits were clearly visible on the surface. Working with 1% solutions, and under the experimental conditions where the insecticide was given an opportunity of remaining in contact with the surface for a sufficiently long time, 100 per cent recovery was not possible in any case, even after shaking for 15 minutes.

Excluding cotton seed oil, it appears as though there is a slight correlation between boiling point of the solvent and the recovery of DDT. If a generalisation is permitted; preparations made with solvents having low boiling points give higher recoveries, whereas those made with solvents having higher boiling points give lower ones.

It does not, however, appear to be easy to establish any relationship between the chemical nature of the solvent and recovery of the insecticide. Gunther (1946) working with preparations made from kerosene and other auxiliary solvents, also met with a similar experience. When preparations made either with kerosene or with 90% kerosene and 10% tetralin as auxiliary solvent were sprayed, the insecticide first penetrated the tissue along with the solvent, and was subsequently brought to the surface during the next 24 hours. But no penetration and emergence was found to take place when the solvent used was a mixture of 90 parts of kerosene and 10 parts of Velsicol A. R. 60. No explanation for this differential behaviour was given, but it was suggested that when such preparations are employed it is advisable to draw the sample 24 hours after spraying, by which time the insecticide would have had enough time to stabilize itself. Symes (1946), and Barlow and Hadaway (1946) sprayed scrub vegetation with 5% DDT dissolved in 50% kerosene and 50% cotton seed oil and found that of a total of 104 mgm. recovered 54 mgm. were obtained by mere washing of the surface, and the rest (50 mgm.) from inside after continued extraction in a Soxhlet. They suggested a

a differentiation of DDT into two portions, one the "inner" which is recovered with difficult by extraction and the other "outer" which is easily recovered by washing of the surface.

The amount recovered from the lower surface is usually slightly less than that recovered from the upper and this difference might be due to the ease with which the solvent penetrates the tissue through the stomata as indicated by Rohrbaugh (1934).

The effect of the nature of solvent used in the preparation of the emulsion on the recovery of the insecticide. (Table 3). As usual cotton seed oil behaved differently from the rest. In all cases when emulsions were deposited on the lower surfaces there was scorching (browning) of the tissue. No such effect was noticed when they were deposited on the upper surface, not even when the emulsion contained 95% benzene. (Table 6). In the case of cotton seed oil there was no scorching on any side, but only oily patches were visible. There seems to be little relationship between this scorching effect and the recovery of the insecticide.

As the emulsions dried, with all excepting cotton seed oil, white deposits of DDT became visible on the surface. As in the case of solutions this was again found to have no direct correlation with the amount recovered. The recovery values from both the upper and lower surfaces were considerably higher than the corresponding values obtained with solutions, but still in no case was 100% recovery possible. As in the case of solutions, emulsions prepared by using solvents having a low boiling point gave slightly higher values which again suggests the existence of a correlation between volatilisation and recovery. The large differences in recovery noticed between the low and high boiling solvents when used in the form of solutions were considerably levelled up in this series and were attributed to the physical states of the two sets of preparations.

TABLE 3

The effect of the nature of the solvent and the emulsifier used in the preparation of the emulsion on the recovery of DDT.
1·0 c.c. of emulsion spread over 200 sq. cms. of leaf area in each case.

Solvent used	% of solvent in the emulsion	% of DDT in the emulsion	Emulsifier used	% of emulsifier in the emulsion	% Recovery		Increase or decrease of the upper surface over the lower
					Upper Surface	Lower Surface	
Benzene	3·0	0·989	Sodium oleate	0·50	88·40	85·31	+3·09
	3·0	0·993	Product M-B. 220*	0 025	92·87	81·31	+ 11·56
	3·0	1·007	Fixanol	0·025	88·25	89·51	—1·33
	3·0	1·064	Triton-X-100†	0·500	90·70	83·99	+6·01
Average.					90·6	85·05	+5·01

Solvent used	% of solvent in the emulsion	% of DDT in the emulsion	Emulsifier used	% of emulsifier in the emulsion	% Recovery		Increase or decrease of the upper surface over the lower
					Upper Surface	Lower Surface	
Petroleum ether (80–100°) B. P.	30·0	1·091	Sodium oleate	0.50	92·31	94·91	—2·60
	30·0	0·993	Product M.B. 320	0·10	92·78	91·57	+1·21
	30·0	0·936	Fixanol	0·10	92·38	89·33	+3·05
	30·0	0·950	Triton-X-100	0·50	88·05	91·06	—3·01
Average.					91·38	91·72	—0·34
Dekalin	9·0	0·9175	Sodium oleate	0·50	85·02	86·58	—1·56
	9·0	0·9501	Product M-B. 320	0·025	83·62	77·64	+5·98
	9·0	1·077	Fixanol	0·025	85·60	84·28	+1·32
	9·0	1·035	Triton-X-100	0·50	97·68	93·17	—5·49
Average.					85·48	85·42	+0·06
Cotton seed oil	12·0	1·007	Sodium oleate	0·50	83·12	84·80	—1·68
	12·0	1·042	Product M.B. 320	0·10	88·46	83·03	+5·43
	12·0	1·085	Fixanol	0·10	86·28	86·28	0·0
	12·0	1·106	Triton-X-100	0·50	85·92	85·92	0·0
Average.					85·95	85·01	+0 5·8

* Cyclohexylamine salt of sulphonated lorol (anionic)
x Cetyl Pyridinium bromide (kationic)
† Alkylated, aryl, polyether alcohol.

Amount of DDT recovered when deposited in equal amounts in the form of solution and emulsion. (Table 4). As the physical states of solutions and emulsions are different, their rections towards the surfaces on which they are deposited are also bound to be different. The resultant effect of all these will be reflected in the recovery values, and the results of the present investigations bear out this fact. The solutions being highly reactive penetrate the tissue quickly carrying the insecticide with them, and possibly bring it again to the surface as they evaporate. The emulsions, on the other hand, are not so reactive and do not penetrate so quickly, as the solvent used in the preparation of the emulsion is enmeshed by the layer of the emulsifier and the continuous phase. With all solvents, excepting cotton seed oil where it is apparently immaterial whether it is deposited as a solution or an emulsion, higher values were obtained when they were deposited as emulsions than in solutions. The differences in percentage recoveries vary from 6–40%. Ebeling, Gunther, Symes, Barlow and Hadaway, Stiff and Castillo, had similar experiences. Ebeling, working with 4% preparations obtained 15% recovery with solutions and 62% with emulsions.

TABLE 4

Average percentage recovery values of DDT obtained from the surfaces of apple leaves when deposited in the form of solutions and emulsions.

Solvent used	% DDT in preparation	Upper surface			Lower surface		
		Emulsions	Solutions	% difference between Emulsions & Solutions	Emulsions	Solutions	% difference between Emulsions & Solutions
		%	%		%	%	
N-Hexane	1·0	93·61	78·02	+15·59	75·45	69·45	+6·00
Benzene	1·0	90·18	74·75	+15·43	85·05	70·91	+14·14
Petroleum ether	1·0	91·38	69·50	+21·88	91·84	60·99	+30·85
Dekalin	1·0	85·48	73·75	+11·73	85·42	51·12	+27·30
Cotton seed oil	1·0	85·95	79·43	+6·52	85·01	85·09	—0·08
Benzene	0·7	85·80	64·75	+21·05	70·66	49·63	+21·03
„	0·4	71·33	49·66	+21·67	78·19	35·48	+42·69

The nature of the emulsifier used in the preparation on the recovery of DDT. (Table 5). The nature of the emulsifier, whether it be anionic, kationic or non-ionic, had no appreciable influence on the recovery. Whatever be the emulsifier used, cotton seed oil gave very poor emulsions. Using soap, the emulsions were easily prepared, even by mere shaking with hand. The remainder had to be put through the mill to obtain satisfactory emulsions. The emulsions prepared by using Fixanol as emulsifier seemed not to wet the glass surfaces in which they were stored.

TABLE 5

Effect of concentration of DDT in the preparation on its recovery

% of DDT in preparation	DDT Deposited	Upper Surface		Lower Surface	
		DDT recovered	% recovered	DDT recovered	% recovered
	mgm.	mgm.		mgm.	
BENZENE SOLUTIONS					
1·000	10·0	7·475	74·75	7·091	70·91
0·700	7·0	4·537	64·75	3·475	49·63
0·3997	3·997	1·986	49·66	1·418	35·48
BENZENE EMULSIONS (Emulsifier — Sodium oleate at 0·5%)					
0·9891	9·891	8·739	88·40	8·437	85·31
0·7025	7·025	6·027	85·80	4·964	70·66
0·4076	4·076	2·907	71.33	3·187	78·19

Recovery as influenced by the concentration of the insecticide in the preparation. The amount of DDT recovered, expressed as a percentage of the amount deposited, decreased with the decrease in concentration both in the case of solutions and emulsions.

This decrease was greater in the case of solutions than with emulsions, and as usual the lower surface gave smaller values than the upper.

This lowered recovery with decrease in concentration may have an important practical bearing, especially when low concentration of the insecticide are applied. If the surfaces sprayed have great absorptive power most of the insecticide sprayed penetrates and gets locked up, while very little remains on the surface to act as a contact insecticide.

Effect of the concentration of the solvent used in the preparation of the emulsion on the recovery of the insecticide. (Table 6). Benzene was used as solvent with 0·5% sodium oleate as the emulsifier. The amount recovered decreased slightly with concentration of solvent in the initial stages, and remained fairly constant subsequently. The recovery values, even with 95% benzene in the emulsion, were much higher; - 88·3% and 82·9% respectively from the upper and lower surfaces compared to values similarly obtained with solutions, viz., 75% and 71%, which clearly illustrates the differential nature of the emulsion from the solution. An emulsion containing even 95% benzene is, therefore, different in behaviour to a solution which contains 100% of it.

TABLE 6

Effect of the concentration of solvent in the emulsion on the recovery of DDT.

% solvent in emulsion	% recovered		Increase of decrease of the upper over lower surface.
	Upper Surface	Lower Surface	
2·0	95·72	95·72	0·0
6·0	78·72	79·43	—0·71
25·0	79·43	70·92	+8·51
50·0	87·23	85·10	+2·13
75·0	85·09	85·10	−0·01
95·0	88·30	82·96	+5·34

Influence of the surface on the amount of DDT recovered. (Tables 2, 3 and 6).

Whereas lower recoveries were usually obtained from the lower surfaces when DDT was applied in the form of a solution, the effect of the surface on the recovery was practically nil when deposited in the

form of an emulsion. The almost parallel recovery figures in the case of emulsions from both the upper and lower surfaces taken in conjunction with the absence of any injury when the emulsions are applied on the upper surfaces of leaves, strongly suggests that there is hardly any relationship between the amount of DDT recovered, and the scorching effect produced either by the emulsions or the solutions.

From a consideration of the several points discussed in the previous sections, it is evident that when the insecticide is allowed to remain in contact with the leaf surface for a sufficiently long time all the material originally deposited is not recovered. The amount recovered varies with the nature of the solvent used in the preparation; the mode of deposition, i. e. whether in the form of solution or emulsion; the concentration of the insecticide in the preparation, and the nature of the surface tested, etc. The recoveries in the case of solutions are always low, and though they are higher in the case of emulsions they are never complete. This failure to attain complete recovery may be attributed to a variety of factors such as the decomposition of the insecticide by catalytic action, absorption and retention of the insecticide by the tissues, the efficiency of the extraction methods, and lastly the methods employed in the estimation of the insecticide itself.

Loss due to weathering and climatic conditions are ruled out, since all tests were conducted under strictly controlled laboratory conditions. Of these, the method of estimation could not have been responsible, since it was selected as the most suitable after a detailed examination of the available methods. Of the rest, considering the catalytic decomposition first, a number of chemicals, chiefly the anhydrous chlorides of iron and aluminium dehydrohalogenate DDT with ease, giving rise to the ethylene compound which is non-insecticidal. Also, a number of solvents iike nitrobenzene are also known to accelerate this change. Since in the present investigations the insecticide was in contact with the leaf surface for a considerable time, it was considered likely that either the leaf may have contained, or been contaminated with, substances which bring about such a decomposition. To throw light on this aspect, a few experiments were conducted adopting the procedure described by West and Campbell (1946). Using the same kind of apparatus, 2 grams of apple leaf powder was intimately mixed with 2 grams of DDT and introduced into the test tube fitted with a cork having two holes through which bent glass tubes were passed. The test tube was immersed in a paraffin bath kept at a constant temperature of 125°C, and a current of carbondioxide, free air was drawn through the apparatus for two hours. The dehydrohalogenation products, if any, were absorbed in a solution of deci-normal sodium hydroxide, and at the end of the operation, the solutions in the absorption tubes were back titrated with standard acid and the amount of alkali used during the process calculated. The results

presented in Table 7 indicate the absence of any catalytic action by the leaf material, and even the presence of nitrobenzene which is said to accelerate such a change did not affect it. The low recoveries obtained in these investigations cannot, therefore, be attributed to any decomposition of the insecticide involving loss of the chloride.

TABLE 7

Studies in the catalytic decomposition of DDT by leaf powder:
The mixtures were heated at 125°C for 2 hours.

	Composition of mixture	Amount of 0·1N NaOH used up cc.
1.	2·0 gm. leaf powder air-dried (control)	0·65
2.	2·0 gm. leaf powder air-dried + 2 gm. DDT	0·65, 0·75
3.	2·0 gm. leaf powder air-dried + 2 gm. DDT mixed with 5·0 cc of benzene and allowed to stand 30 minutes before heating.	0·60
4.	2·0 gm. leaf powder air-dried + 2 gm. DDT 5 cc. nitrobenzene.	0·50
5.	2·0 gm. leaf powder steam oven-dried + 2 gm. DDT + 5 cc. nitrobenzene.	0·70
6.	2·0 gm. leaf powder air-dried + 5 cc. nitrobenzene.	0·50

The other two factors, viz., the insufficiency of the method of extraction, and absorption and retention of the insecticide by the tissues, being closely related to each other, will be considered together. In reviewing the methods of extraction available in literature, it was pointed out that no standard procedure has as yet emerged. The published methods varied from a mere washing with a stream of benzene to a shaking period of half an hour, as suggested by Carter and Husbanks. In the present investigations shaking by hand for a period of 15 minutes was uniformly adopted in the hope that it would be possible to recover all the amount originally deposited. The insecticidal value of that part of the insecticide which is not extracted even after such vigorous shaking appears doubtful, at least in the case of insects that are killed by contact action. Further investigations were, however, conducted to see whether it would be possible to recover all the insecticide initially deposited either by prolonging the shaking period or by continued extraction in a Soxhlet.

Continued shaking by hand (experiments with emulsions.)

1% emulsions prepared using benzene (3%) and sodium oleate (0·5%) were spread as usual, and instead of the usual three shaking periods of five minutes each, six (each again of five minutes duration) were made, thus making a total extraction period of 30 minutes. The amounts of benzene used in the six shakings were 50·0, 35·0, 30·0, 30·0, 30·0 and 30·0 cc; which finally gave an extract of about 200 cc. After making the volume to 200 cc., 100 cc. aliquots were analysed, and the

results obtained (Table 8) showed that an additional shaking period of 15 minutes gave a higher recovery of 7% from the upper surface, and 10% from the lower surface. But how far this supplementary amount extracted, expending nearly double the amount of time and solvent, is really insecticidally useful remains to be decided.

TABLE 8

Effect of the period of shaking on the recovery of DDT.

% DDT in emulsion	% Benzene in emulsion	Emulsifier used	Duration of shaking	DDT deposited mg.	% DDT recovered	
					Upper surface	Lower surface
1·028	3·0	Soap 0·5%	30 min.	10·28	97·34	95·21
0·989	3·0	Soap 0·5%	15 min.	9·89	88·40	85·31
0·993	3·0	Product M.B. 320	15 min.	9·93	92·87	81·31
1·007	3·0	Fixanol	15 min.	10·77	81·25	89·58
1·064	3·0	Triton-X-100	15 min.	10·64	90·70	83·99
Average			15 min.		90·06	85·05

Continued extraction in a Soxhlet (experiments with solutions). As the recoveries in the case of solutions were much less than in the case of emulsions, a more drastic method of extraction was adopted. 10·0 gms. samples of apple leaf powder were weighed into fat extraction thimbles, and they were allowed to stand for a period of 24 hours in Soxhlets containing benzene to which was added 25 mgm. of DDT. This procedure enabled the insecticide to remain in prolonged contact with the leaf material, thus permitting maximum absorption by the tissue. At the end of the 24 hour period the Soxhlets were connected to suitable flasks, and the materials extracted with benzene continuously for 36 hours. The extracts after removing benzene were reduced as usual with sodium and ethyl alcohol, neutralised with acid, and as they were densely coloured, extracted thrice with 50 cc. portions of a mixture (1:1) of ether and amyl alcohol. The united ether, and ether alcohol extracts were washed twice with water, added to the aqueous layers containing the chloride, and the estimation carried out as usual. Out of 25·0 mgm. of DDT originally taken 19·0 and 21·57 mgm. were recovered, thus representing a recovery of 76% and 86·28% respectively, or an average of 81·1%.

In another experiment 10·0 gm. samples of leaf powder were weighed into thimbles as usual, and before keeping them in contact with the DDT solution, they were extracted with ether for 8 hours to remove the colouring matter, waxes, etc. The residues which were brown in colour were air-dried, and the procedure repeated as above by making them stand in Soxhlets containing solutions of DDT for a period of 24 hours, and extracting for 48 hours after that to recover the absorbed

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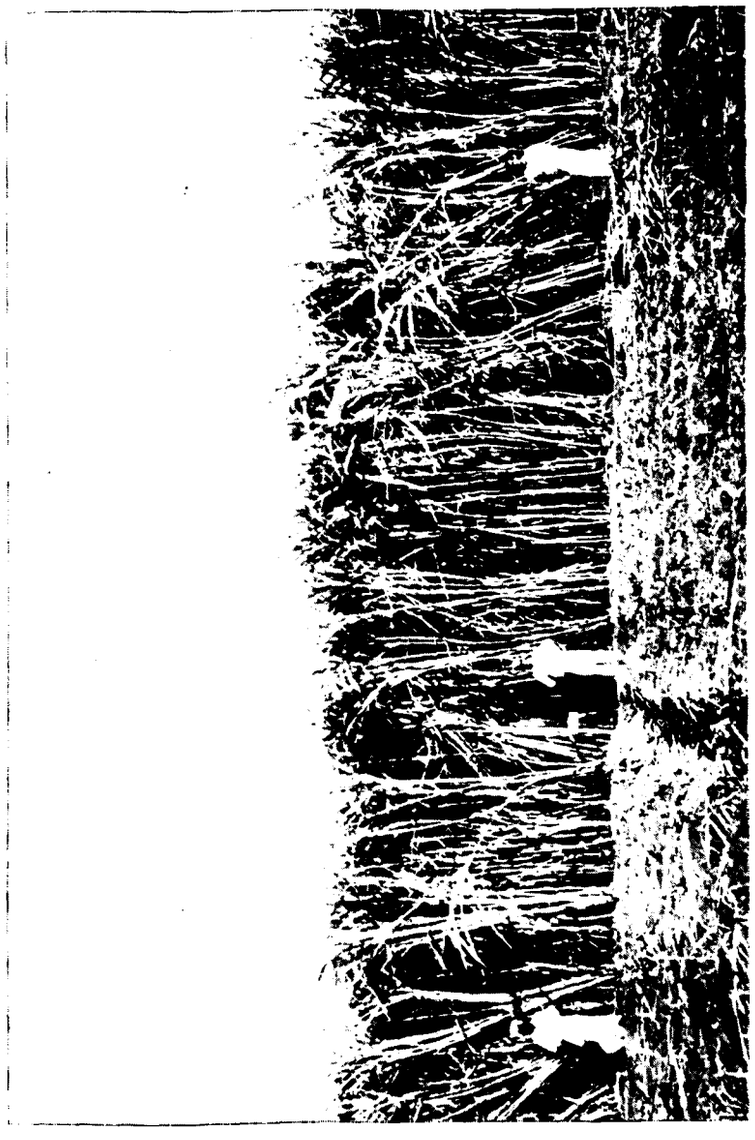

RECORD CROP OF CO. 419 SUGARCANE
Kuniyamuthur Village, Coimbatore

A Note on the Record Yield of C0419 Sugarcane in Kuniamuthur Village, Coimbatore.

By

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Maximisation of food production is the crying need of the hour but increase in sugar production is also equally important. Results of research are translated in the cultivators' fields with the object of securing increased yields. The following is an account how increased yields of sugarcane were obtained by a progressive farmer, Sri P. G. Venugopal Naidu, Kuniamuthur.

The field which gave such a phenomenal yield of 20,240 lb. of jaggery per acre is situated on a village road running parallel to the Kurichi channel on its northern bank four furlongs away from the Madras-Calicut trunk road, and about four miles from Coimbatore. The area planted with cane was six acres, irrigated from a well. The soil is black loam and well-drained. The crop was planted in furrows 36 inches apart and and watered regularly every tenth day, earthed up properly and the canes were induced to grow erect and tall. The canes were also propped up.

After the harvest of the previous crop of ragi in June 1949, six ploughings were given up to August 1949. Ridges and furrows were formed 36 inches apart as against 30″ which is the local practice. The crop was planted by the middle of August, 1949.

The previous crop of ragi was not manured, nor was any basal dressing of organic manure given. During the period September to October 1949, one acre was top dressed with 960 lb. of Parrys' Manure Mixture giving 172 lb. of Nitrogen and 5 acres were manured with 70 cwt. of ammonium sulphate, giving 1575 lb. of Nitrogen. The application was done in a single dose and the crop was then earthed up. Thus the crop was earthed up thrice, during October 1949, December 1949 and February 1950. The crop was also trashed twice, by removing all dry leaves. In April 1950 clumps of canes in adjacent rows were tied up at the top with green trash, to prevent lodging. The crop arrowed in September to October 1950 and the over-all height of the crop was 22-24 ft. The average length of millable cane was 11 to 12½ feet.

The early-planted crop in two acres was harvested by the end of October 1950. 3·14 acres were harvested from 1st November 1950 to 4th

A Short Note on Rainfall at Pattambi

By

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Pattambi is a place situated in South Malabar. There is an Agricultural Research Station at this place for the past twenty-three years. Data of the daily rainfall for twenty-three years are available at the station. These data were taken up for statistical analysis with the object of gaining an insight into the distribution of the rainfall during the monsoons at Pattambi.

Though only 16% of the total precipitation is received in the North-East Monsoon period as against 71% in the South-West Monsoon period, in view of the agricultural importance of both the monsoons, the rainfall in each of them was considered separately. Further, since Pattambi is a heavy rainfall tract with an annual precipitation of 101·43 inches a day of 10 cents and above has been considered as a rainy day.

(ii) The total monthly and annual rainfall are given in Table I. The total annual precipitation ranges from 69·41″ to 139·75″ with a mean of 101·43″. The variability from year to year is high, particularly during the months of April and May. Further, it will be seen that the rainfall is practically nothing in the first three months in the year. In April and May it gains some importance. June and July are the rainiest months of the year. The subsequent three months are fairly rainy. In November the intensity decreases and it is again rainless in December.

(iii) The distribution of rain in the year is as follows :—

South–West Monsoon (June to September)	71%
North–East Monsoon (October to January)	16%
Summer Showers	13%

The rainfall during the North-East Monsoon is important, since the success of the second crop of paddy depends mainly on this monsoon.

Details about the seasonal showers, their range of variation, coefficient of variability and number of rainy days are given in Table II.

(iii) The two tables (I and II) indicate that rain-water run-off occurs in the months of June and July and is likely to continue in August as well.

(iv) Table III gives the number of days per month in which a rainfall of 10 cents and above was recorded, for all the twelve months, with its range of variation and coefficient of variability. The range of variation is highest in May since the South-West Monsoon breaks at times in the second half of this month. The fact that the South-West Monsoon is more regular in June and July is indicated by the narrow range of variation and low coefficient of variability. August and September are the crucial months and the wide variation in rainfall during these months is one of the reasons why Malabar suffers even in the midst of plenty. The rain in the remaining three months, on which the second crop of paddy depends for its success shows a wide range of variation.

(v) Sixty-six inter-monthly correlations were worked out. Out of them only two, namely, May and September and August and October were found to be significant. Even in these, that of August and October was found to be negative.

The maximum vigour of the South-West Monsoon is in June and July. The 'break' of this monsoon is very punctual and it invariably occurs between 1st and 4th of June. Its normal duration is twelve weeks and it recedes generally by the end of August. If the South-West Monsoon breaks in May, its distribution is slightly irregular and it extends at times even upto September, which accounts for the existence of the significant positive correlation between the rains of May and September.

If showers in August are very heavy, it may be taken that in that year the South-West Monsoon may be above normal, which, in turn, connotes that the North-East Monsoon in that year would be below normal. This is further substantiated by the almost significant but negative correlation existing between the rains in August and the total rainfall during the North-East Monsoon period. Further, October is the heaviest rainfall month of the North-East Monsoon period and this partly accounts for the existence of the significant negative correlation between the showers in August and October.

Since the South-West Monsoon is the major monsoon at Pattambi, the monthly rainfall during this period (June to September) was considered separately in relation to the total annual precipitation with the object of predicting the nature of that year's showers from the rains received in these four months. Though all the four correlations were found to be positive, only one namely, that of June rainfall to the annual rainfall was found to be significant. The South-West Monsoon

commences by the end of June. If the start as well as the development of this monsoon are normal and satisfactory in June, it may be said that in that year the rainfall will either be normal or above normal. This inference is supported by the highly significant and positive correlation existing betweeen the South-West Monsoon rainfall and the total annual rainfall. The showers received in the other two periods, namely, October to January of next year and February to May, have positive signifiicant relationship with the total annual precipitation, but that of the South-West Monsoon showers is very high showing thereby that if the South-West Monsoon showers are normal, the rain in that year will be normal or near about normal.

Further, since the North-East Monsoon is also important agriculturally, four correlations were worked out to study the relationship between the rains received in the South-West Monsoon and the North-East Monsoon periods and also rains received in the months of June, July and August and total precipitation in the North-East Munsoon period. All of them were found to be significant. The July and August rains were found to have a negative correlation with the total rainfall received in the North-East Monsoon period.

Summary: (i) The total annual rainfall at Pattambi is 101·43″. The record fall received so far is 12·87″ on 28—5—1941 and the next record fall was 11·99″ on 10—6—1941. It is to be noted that both the record falls were received in one and the same year, namely, 1941. Even then, in that year the total annual rainfall was only 128·6″ whereas the maximum fall was 139·8″. This indicates that sporadic high falls do not increase the annual total rainfall.

(ii) Nearly three-fourths of total annual rainfall is received in the South-West Monsoon period of four months commencing from June. It is in this period that most of the agricultural operations are attended to.

(iii) The steadiness of the South-West Monsoon is indicated by the low coefficient of variability in the number of rainy days during the period June to August.

(iv) If the rainfall in June is normal, it may be inferred that in that year the total annual rainfall will be normal or near about normal.

(v) The two principal monsoons have no relationship existing between them. But, if the rains in August are above normal, it may be taken that the North-East Monsoon in that year will be below normal.

Acknowledgement: The authors are indebted to the staff at Pattambi, for the collection of the data, forming the basic material of this paper.

TABLE I

Characteristics of the Monthly Precipitations 1927 to 1949. (23 years' data)

S. No.	Month	Mean in inches	Range in inches	Coefficient of Variability
1.	January	0·24	0 to 2·21	254·2
2.	February	0·29	0 to 2·34	206·9
3.	March	0·89	0 to 4·55	134·8
4.	April	3·42	0·10 to 7·18	56·4
5.	May	8·29	0·41 to 26·75	102·1
6.	June	25·21	10·61 to 39·37	33·3
7.	July	25·70	11·22 to 40·21	28·8
8.	August	14·40	3·76 to 46·86	65·6
9.	September	6·56	0·56 to 16·21	23·2
10.	October	10·68	4·11 to 19·48	45·3
11.	November	4·53	0 to 11·51	64·9
12.	December	1·22	0 to 7·94	155·7
	Year	101·43	69·41 to 139·75	17·90

TABLE II

Particulars regarding seasonal Rainfall (23 years' data)

S. No.	Name of season	Rainfall in inches	Range of variation of total precipitation in inches	Coefficient of variability %	No. of rainy days	Remarks.
1.	Summer	12·89	3·11 to 21·37	64·10	15	Day on which precipitation is 10 cents and above is taken as a rainy day.
2.	South-West Monsoon	71·87	45·68 to 98·71	18·61	75	
3.	North-East Monsoon	16·97	6·75 to 31·14	36 95	20	

TABLE III

Average number of rainy days per month

S. No.	Month	Mean No. of days	Range in days	Coefficient of of variability percent	Remarks
1.	January	0·43	0 to 3	220·9	
2.	February	0·61	0 to 6	214·8	
3.	March	1·35	0 to 4	105·9	
4.	April	4·61	1 to 10	54·7	
5.	May	8·00	1 to 18	63·0	Day on which precipitation is ten cents and above is taken as a rainy day.
6.	June	22·52	18 to 26	9·3	
7.	July	24·61	17 to 31	15·2	
8.	August	17·30	7 to 31	35·4	
9.	September	10·61	4 to 21	49·1	
10.	October	12·17	5 to 20	34·5	
11.	November	6·43	0 to 11	43·7	
12.	December	1·39	0 to 7	138·1	

A note on the Chromosome Numbers of Citrus Species

By

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At the recent conference on " Symposium on the Origin and Distribution of Cultivated plants of South Asia " held at New Delhi under the joint auspices of the UNESCO and the Indian Society of Genetics and Plant Breeding it was expressed by the worker in Citrus that the chromosome numbers in the citrus species grown in India were not known and their knowledge would help in the proper classification and study of the species. At the Fruit Research Station, Kodur a fairly large collection of the species and varieties of citrus of commercial importance to S. India has been maintained. As a preliminary step in the cytogenetical study of these citrus plants the chromosome numbers of some of them were determined and as it may help other investigators the following list has been published. The numbers recorded relate strictly to the seedlings raised from fruits collected from trees at Kodur. The materials for study of the root tips were collected from seedlings growing at the nursery by carefully washing away the soil. In other cases raising the seedlings in pots with higher quantity of sand facilitated collection. Flower buds were fixed in Karpechenko and root tips in Craf A and B. It is to be noted that there are no triploids met with in this collection and seedless forms are all diploids. Except *Citrus madraspatana* Hort. *C. pennivesiculata.* Tanaka. and *C. jambhiri*, Lush. the others are known species and investigated numbers conform to those already determined.[1] *C. jambhiri*, Lush. is probably synonymous with *C. limonia*, Osbeck.

Acid lime	*C. aurantifolia*, Swingle	2n = 18
Herale	*C. aurantium*, Osbek.	,, = 18
Lemon	*C. limonia* Osbeck (Lucknow, seedless)	,, = 18 n=9 (tree No. 32/3)
Italian lemon (seedless)	do.	,, = 18
Villa Franca (seedless)	do.	,, = 18
Nepali round lemon	do.	,, = 18
Pummelo	*C. grandis* Osbeck.	,, = 11
Sathgudi	*C. sinensis* Osbeck.	2 = 18 n = 9 (S.R.T. tree No. 4 guard row)
Bengal citron	*C. medica* Lin.	n = 9 (Tree No. 3215)
Kichli	*C. madraspatana*, Hort.	2n = 18
Gajanimma	*C. pennivesiculata* Tanaka	n = 9 (S.R.T. tree No. 4 guard row.)
Jambhiri	*C. jambhiri* Lush. *(C. limonia* Osbeck*)*	n = 9 (S.R.T. tree No.6. S. guard row)
Kumquat	*Fortunella crassifolia*, Swingle	n=9 (tree No. 18/4)

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Sclerotial Disease of Ginger

By

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Cultivation of ginger (*Zingiber officinale* Rosc.) is widespread in Malabar district. This crop is subject to a serious disease viz., rhizome rot and wilt, caused by three species of *Pythium* (*P. aphanidermatum* (Edson) Fitzpatrick, *P. myriotylum* Dreschler and *P. vexans* de Bary). Infection is prevalent in storage and in field. During 1950 when large quantities of seed material had to be purchased from the growers for experimental purposes at the Agricultural Research Station, Pattambi, it was found that many of the rhizomes were considerably shrunk and had a white growth of fungal mycelium on the surface. Careful examination of the diseased material showed that the rhizomes were infected by *Sclerotium rolfsii* Sacc. Mustard-seed-like sclerotia were observed on several of the diseased rhizomes. Park (1937) has recorded from Ceylon, the occurrence of this fungus, infecting ginger rhizomes superficially, Examination of the local material revealed that the infection was not merely superficial but also internal. Therefore experiments were conducted to find out the role of *S. rolfsii* in causing the rotting of rhizomes in ginger.

Materials and Methods: Typical diseased rhizomes were selected for the isolation of the fungus. It was brought into culture from single sclerotia and by using bits of tissue aseptically removed from surface-sterilised rhizomes. Inoculation experiments were conducted on healthy rhizomes kept in moist chambers as well as on healthy plants in pots.

Cultural Studies: The isolate grows rapidly on common agar media producing a number of sclerotia in the course of a week. The cultural characters observed on oat, french bean, and malt agars (5% malt and 2% agar) after a lapse of 10 days' growth are described below. The cultures were grown at room temperatures varying from 76 to 86°F.

Macroscopic growth characters of Sclerotium rolfsii,

Media	Mycelial characters	Sclerotial characters
French bean agar	Thick, white, woolly aerial growth, turning light buff in certain portions.	Sclerotia numerous along the margin of dishes, brown, mustard-seed-like. Size 1·05×0·84 mm (0·72–1·6×·65 – 1·0).
Oat agar	White, stringy and thinner aerial growth.	Sclerotia fewer in number but scattered over the surface. Size 1·13×1.0 mm (0·8 – 2·05× 0·7 – 1·2)
Malt agar	Thin, stringy, white aerial growth.	Sclerotia not formed.

French bean and oat agars appeared to be more suitable for the culture of this fungus.

Infection Experiments

1. **Inoculation of rhizomes:** Healthy rhizomes of ginger were obtained and surface disinfected with 0·1% mercuric chloride solution. These were further washed in two changes of sterile water and kept in sterilised moist chambers. Inoculations were made by placing bits of culture on the surface of these rhizomes. In the course of seven days the fungus grew over the rhizomes in strands causing shrinkage of the rhizome. Sclerotia also developed on the surface. The controls remained healthy and did not exhibit shrinkage.

2. **Inoculation of rhizomes in pots:** Healthy rhizomes were first wounded by sterilised needles and then inoculated by placing bits of culture on the wounded portions. These were later planted in pots. Twenty units were inoculated and 12 were kept as control. After 25 days all the rhizomes in the control pots had germinated producing aerial shoots while only 6 of the inoculated rhizomes gave rise to aerial shoots. The unsprouted rhizomes were taken out and examined. They had rotted and the fungus was re-isolated from them. In another fortnight the sprouts from the inoculated rhizomes died down and *S.rolfsii* was re-isolated from the dead shoots. All the controls remained quite healthy.

3. **Inoculation of aerial shoots:** Healthy ginger plants were raised in pots by planting selected rhizomes. After the shoots had grown for a month and produced a number of leaves they were inoculated with the culture of the fungus by placing the inoculum at the base of the aerial shoots. After inoculation the shoots were kept covered by bell jars for 72 hours. In ten days the shoots turned yellow and in a fortnight they completely rotted. The fungus grew on the surface as a white thin film twelve shoots were inoculated and all of them were affected. The controls remained healthy. The fungus was re-isolated from the infected shoots.

Sections through the leaf sheath exhibited the presence of hyphæ both inside and between the cells. The concerned rhizomes also commenced to rot, beginning from the base of the infected shoots. The shoots and rhizomes of the controls were quite healthy.

The above experiments conclusively prove that *S. rolfsii* is pathogenic on ginger and is capable of causing rotting of rhizomes and aerial shoots. It is clear that *S. rolfsii* should also be considered as an important agent in the causation of rhizome rot and wilt of ginger in Malabar in addition to the three species of *Pythium* mentioned above.

Acknowledgement.

My thanks are due to Sri D. Marudarajan, B. A, Government Mycologist, for affording all facilities for carrying out these experiments.

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Extract taken from "Report on the 5th Session of the Conference"

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F. A. O. of the U. N.

(Technical Assistance of the F. A. O. of the U. N. O. for Economic Development)

General principles: The greatest gap in knowledge within the field of the Food and Agricultural Organisation is usually that between knowledge of a country's experts and the knowledge of its producers. With a view to formulate a programme of technical assistance to member countries the Director.-General called for their opinion on the subject. The replies received have been summarised below:

Improvements in agriculture must depend largely on the individual farmer's own efforts. Programmes and methods have to be adjusted to capabilities of the national staff that will have to carry them out. External assistance must ultimately be replaced by local resources. The prime need is for the local adaptation of existing knowledge, its communication to the farmer and its adoption by him. Success will therefore depend largely on the establishment of closely integrated research and extension services and laboratory results must be followed by practical application. A large part of the initial effort has to be concentrated on activities that increase the national income, on encouraging food and agricultural production and on the development of transport, power and industry.

Methods in general: The methods of technical help discussed herein are those whereby help of a technical kind is given by an extra-national agency to a national Government with the aim of assisting the country towards greater economic development. Why is it that some countries are more advanced and more developed than others? In other words why is an under-developed country under-developed? In some cases it is the relative newness of the country concerned or its incongruous relationship between area and population. Under-development is usually due to inability to use the resources of the world. A country is poor because it is underdeveloped, because it is poor it cannot afford elaborate services and because it cannot afford elaborate services it is under-developed. Plans must be related to the resources which exist or can reasonably be expected to be forthcoming. Choice of method and projects have to be based on a careful consideration of the existing economic make-up and potentialities of the country. In some cases materials for such consideration may already exist but where this is not so it seems essential that such a survey precede a decision on the method and content

of external aid. The general working method will then be to aim at raising the existing economic level by bringing to fruit the special potentialities disclosed by the survey. In most countries much of the material for such a survey already exists. It is suggested that the Food and Agriculture Organisation's help may be required in the interpretation of such material, or if no adequate material exists in the collection of such material. A possible method is to send to each region a few workers of recognised standing with experience in working with people less economically advanced than themselves, acquainted with conditions in underdeveloped countries and with a knack of inspiring confidence, to speak on technical subjects and world problems in a way which the common man can understand. These men should meet not only leaders and officials but ordinary people in their homes and at their work. Another method suggested is the establishment of a relatively permanent international commission to evaluate programmes or at least a set of temporary regional commissions.

In selecting both the methods and the objects to which they are to be applied, due regard should be paid to the need for effective co-ordination of all resources and services so that methods and objectives are complementary to existing methods and resources. Closely integrated research and extension services result in successful development. Technical assistance may be rendered either within a country or outside it and either to individual countries or to groups of countries. Methods may vary from merely supplying information or advice which a Government may use for itself, to active co-operation in applying technical knowledge and skill. Emphasis should be placed on methods which will best secure lasting results.

SPECIFIC METHODS

Regional and group agencies: The planning of technical assistance on a regional rather than individual basis is suggested by many countries. Permanent regional bodies for the exchange of technical information appears to be a more general idea. A close linking of the F. A. O. W. H. O. in the case of diseases affecting both men and animals is necessary, as also close co-operation between countries with similar local conditions.

Missions: The sending of foreign experts has very considerable differences in the scope and functions of such missions. Short visits by foreign experts is of little value. Local experience and understanding are important and close personal contact with the farmer and knowledge of local language, traditions, way of life etc., are equally essential. Preconceived notions have to be adjusted to local organisations and practices. Foreign experts may be necessary for inspiration, leadership, training and operations and such assistance must be closely geared to the actual working life of the country. Local practices have to be respected and the expert must have the capacity to work under local conditions as well as technical knowledge related to local needs.

Survey missions and operational missions: The need for preliminary surveys is obvious but its results have to be utilised. Survey missions investigate and frame findings on their investigations. Advisory missions advise the Government on a specific subject. Their effectiveness depends on the extent to which

means exist to implement the advice given. Operational mission is one which involves actual participation of foreigners in the execution of a national project. The greatest effect is produced by missions which are jointly constituted by the foreign agency and the national Government. Missions engaged solely in training local experts are a rather specialised class who come under training schemes.

Joint agencies: This is a specialised form of long-term joint mission. These agencies similar to 'servicios' of Latin-American Countries are established within the ministry of the Government and are jointly staffed, jointly financed and jointly directed by the foreign agency and the national Government. Such agencies have the advantage of stability and become integral parts of the national administration till finally replaced by the national staff by it.

Research and experimental stations and laboratories: Research and experimental stations and laboratories may be established with the assistence of foreign staff. Their success will, however, depend upon the degree of their integration and on their relationship with and affectiveness of the national advisory services and their contact with the farmers.

Individual experts: Individual foreigners are employed in specialist posts. The aim of such experts should be to identify themselves with the country they are serving and to arouse and maintain interest in their subjects among fellow workers, leaders and people of the country. To get good men for such appointments – the jobs should be made attractive.

Demonstrations: Demonstrations are the backbone of the foreign collaboration programmes. Demonstration farms have proved to be the best single medium for influencing the farmer. Only where the advantage has been demonstrated beyond doubt will the farmers carry on the work. The simple method is one of selecting "contact men" on whose land demonstrations can be conducted and the idea spread rapidly. Planned village or group improvement rural centres are also an alternative.

International education: The prime necessity is to lessen the chasm between knowledge and practice. The farmer's knowledge has to be improved by contact between him and the expert. Local experts have to be trained to teach the farmer. This may be done in two ways: (1) instruction by foreign experts within the country and (ii) instruction of nationals in foreign countries. The peculiarity of agriculture demands a much greater degree of familiarity with the local conditions under which the new knowledge is to be applied.

Combination of training with other activities and in-service training: Training while working imparts a high degree of practical knowledge, at a lower cost. It also gives the necessary flexibility to the training.

Expansion of educational institutions: Such expansion may be of two types (i) new institutions staffed largely by foreign experts or (ii) specialised courses by foreign instructors within the curriculum of existing institutions. Exchange of instructors for higher education directed towards long-range development is desirable.

Training students in foreign educational institutions: The training abroad of students of underdeveloped countries in academic studies is very promising. Such schemes involve financial assistance. Such instructions will be valuable where the student has already an established position in the agricultura services of his country. Such studies have to be located in suitable countries.

Visits by foreign observers: Among professional men such visits promote greater insight into foreign achievements and an increased mutual understanding.

Productivity teams: Groups of workers from one country can go and study the productive methods of another and it is desirable that the studies are mutual. This method gives direct contact between farmers of two countries.

Exchange of technical information: Dissemination of technical information between countries and between experts aids in keeping abreast with the latest developments.

Equipment and supplies: Provision of technical equipment and training in its use and maintenance should be part of the general programme of agricultural development.

Conferences: International conferences provide means of keeping in touch with new developments and promote mutual understanding. Professional meetings make possible pooling of national experiences.

Permanent contacts through diplomatic missions: Technical members of foreign missions provide a valuable means of conveying information.

Migration: Migration may be an inevitable part of agricultural improvement. International assistance in facilitating movement and care of migrants is essential.

Other considerations: Increased international co-operation on subjects of developmental direction appear essential for successful results.

Extract taken from "Social Welfare in Rural Communities"

Published by

(The F. A. O. of the U. N. O.)

Introductory: Social welfare may be interpreted as covering anything which affects the well-being of the individual in a society. In the matter of social welfare, there are many differences in relative needs, in physical environment and social relationships. The achievement of other countries may provide guidance but it may sometimes be a costly mistake to endeavour to duplicate the types of service and methods of organisation and administration which have succeeded elsewhere.

Contrast between the approach to social welfare in developed countries and less developed countries. In modern states advanced social welfare programmes aim to regulate conditions of work and remuneration, to provide against unemployment, sickness and old age, and to provide education recreation and other facilities for development. Improved health, education or recreation will increase productivity and capacity to provide better services. Countries where social welfare programmes are well-developed are normally well advanced industrially and

have large urban populations. It does not however mean that industrialisation and urbanisation are necessary before there can be social welfare services, rather they are conducive to establish social welfare programmes. It is usually cheaper and easier to administer welfare services in urban areas than in country districts where the people are scattered.

Rural welfare in less developed agrarian countries. A different approach is necessary in less economically advanced communities from that in highly industrialised countries. Society being poor, the initial steps for improvement may be very difficult. Even in countries with advanced social welfare programmes, rural populations have usually benefited later and to a lesser degree. The problem is more difficult; the content and method of approach are different from those in economically better developed countries. For Village Communities welfare programmes should make an approach through both the farm and the home and cater for all members of the family. In other words, the family group should be tackled rather than the individual. The individual is usually taken in urban and commercialised areas. The best contribution to individual security and well-being is to increase the capacity of the group. In the attempt to tackle all the above problems, social welfare becomes substantially identified with Rural Development in which the emphasis is on developing resources latent in the community rather than in the distribution of ameliorative benefits to individuals.

Community approach to social welfare. A social welfare worker has to be familiar with local conditions, and he should also know what assistance can be relied upon from outside the rural community and under what conditions. In his effort to gather rural statistics, the skilled investigator may learn more from conversation at a coffee shop than from questionnaires.

The "absorptive capacity" for social welfare of a community must be considered. A programme largely based on self-help will be limited by the economic resources of the community, the number of competent local leaders available, ability to take in the necessary technical knowledge, and the rate of receptivity to new social ideas. These programmes should be planned to formulate basic Minimum Welfare Standards covering production, health, housing, education, recreation etc.

Preliminary decisions. Preliminary decisions include the extent and location of the area to be tackled, problems to be solved at the commencement, selection, equipment and training of personnel. The area depends upon the number of workers, transport, density of population and type of service.

A school may be a village affair but a drainage scheme, soil conservation or malaria control project or advisory services in Agriculture may have to cover several villages. A comprehensive approach is needed covering the "spiritual", recreational and other non-material needs in addition to the basic requirements of food, clothing and health.

It is desirable to start with needs as felt by the people because it provokes a readier response for other schemes. Special attention is to be paid to these needs, which, when satisfied will release other potentialities. Primary emphasis on production is justified because it affects food supply, thereby improving health and energy and also provides additional income. The wealthy society may consider extended hospital, educational and recreational services as necessities for full life but the hungry peasant will think of them, if at all, as distant luxuries until he has more food.

Sometimes the most useful approach is indirect. Where disease is rife, the main impediment to increased production is often the lack of energy of the producer. Medical treatment and improved sanitation and water supply are then more important than increased production of more food. In any case, it is a sound principle to aim first at improvements likely to succeed which show obvious benefits, for this will bring support to other parts of the programme.

Education and Rural Organisation. The main approaches to rural reconstruction by self-help are through education and rural organisation.

Education. Rural folks are indifferent to education. People should be persuaded rather than compelled to take up education. Method of education should be interesting and related to practical everyday needs and should combine recreation and instruction. The rural school not only trains the future generation but it may be made a useful centre of community interest and activity.

Social welfare workers. There can be a network of local agents working close to the community who would be advised and guided by a nucleus of highly qualified specialists. There would be research institutions whose work would disseminate to the farmer. There is scope for great improvement in production, care of the home, health and the like. The local agent should himself demonstrate the methods and reinforce demonstrations by discussions, films, and bulletins. He must adjust his methods to local conditions. Sometimes he may have to link it with some other activity. The local agent need not be a highly specialised technician. He must be a practical man himself, understand and sympathise with the people and their problems and gain their confidence. He must be of the people.

Rural Organisations. Rural Organisations have two important aspects, namely, the use of existing organisations and institutions and development of new ones.

Co-operative Societies. Co-operative Societies are potentially the most important types of organisation for rural communities. Villagers are accustomed to mutual aid for many purposes in a wide variety of forms but there is scope also for Societies operating under recognised and enforceable rules giving the members definite rights and responsibilities and providing more effective agencies for continued economic activities in common. These societies should have effective inspection. Audit and enforcement of the law are important requirements among people who are inexperienced in business practice.

National and Community Programme. A Government may perform useful functions in assisting the communities with facilities beyond the resources of the rural communities. The local activity can be stimulated by grants-in-aid from the Government. In the United Kingdom it has become a powerful instrument of overall national planning. Aid to communities may also be given in other ways by the national services in agriculture, nutrition, house economics, health or education which make advanced knowledge and technique available to the field workers. Effective aid has often been hampered by lack of co-ordination between national services. The local agent must know what help is available from whom. He must not be involved in jurisdictional disputes between departments and must be able to keep his promises. This requires an efficient administration with open lines of contact and clear lines of authority between the field worker and the responsible national authority.

Extract taken from "Educational Approaches to Social Welfare"

(Papers submitted to the technical meeting on Agricultural Extension Turriallea, Costa Rica, August 23rd to September 2, 1949)

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I

In most countries the educational system has been extremely inadequate to meet the growing needs of the rural population. The rural school tends to become a mere literacy school without giving any attention to the vocational needs of the rural child. This results in the shortage of trained personnel in a country and thereby directly affects the progress and prosperity of the nation.

The new curriculum is centered around three major fields of agriculture, health and home life education. It is an activity programme which teaches by doing and in which the basic subjects are taught as an integral part of the activity programme and as tools of learning. To apply this effectively teachers have to be specially trained for this kind of teaching. Not only has he to teach this in school, it is necessary in addition to extend what is taught to the home and community if the work of the school is to have a permanent effect. It is not enough to delouse a child in the school room if his home is infested. So it is highly necessary that the surroundings in which the child grows, also comes up to the same level. To this end the teacher has to extend the idea of personal cleanliness and environmental sanitation to the home if his work is not to be lost.

To carry out this new programme of education two things are mentioned.

(1) The rural school has to be organised in a manner which would make possible the close supervision of the work of the large majority of untrained teachers by a small group of trained supervisors;

(2) To make the parents' and childrens' organisation an integral part of the programme of the rural school. The first point is to be worked out in two ways.

(i) The rural schools, of a given geographical area are to be organised in the form of a constellation under a single trained Director or Supervisor;

(ii) To put into effect a school programme which is contained in a basic teachers' guide, made available to all teachers. This guide gives the methods to be employed in the rural schools and other information on agriculture, animal husbandry, home life education, health, rural school organisation, club work etc.

This kind of extension work is being carried on in the Rural School in Guatemala, and they have been quite satisfied with the progress made in this new venture. There, the extension work is carried on through two organisations, one to give effective community assistance to parents and adults, while the other takes care of the children and teaches them to stand on their own legs. Thus Agricultural Extension covers any educational approach to increasing agricultural production and improving the well-being of rural populations.

II

The purpose of Rural Reconstruction is to bring about a complete upward development, toward a more abundant life for rural people—mental, physical, cultural, social and economic. This approach permits the use, application and adaptation of any and all proved methods of Extension Teachings. It is designed to reach and help even the poorest and most needy.

The functioning of these ideas are carried out through different rural centres. The activities of these centres depend on the needs of the people around them. A centre must be situated near an agricultural village, to which a large number of rural people naturally and conveniently come to trade. This rural centre must have a staff of well-trained workers who understand all sides of rural life. These workers though trained and educated, must be prepared to meet the rural people on their own level, even to go with them and help them face their everyday problems in the right spirit.

The Rural Centre with Extension Approach uses any or every known method of extension which is applicable and useful to any particular situation and it can serve all people big farmers, little farmers, farm labourers, the well-off and the poor men, women and children.

The following principles have been evolved from research, careful and detailed study, and constant evaluation of actual practices in the rural centre approach over the past twenty-seven years.

(a) Orient the programme to the culture of the area by working and studying right out among the people, giving heed to their abilities, wishes, beliefs, and superstitions.

(b) Follow a comprehensive programme for a complete upward development on all sides of rural life simultaneously;

(c) Foster self-help but give intimate expert counsel;

(d) Develop Rural Centre and Extension Services so that they are of the whole people, by the whole people, for the whole people;

(e) Recognise the time element, long-time and short-time features;

(f) Where possible, have workers with a rural background.

(g) Insist on thorough practical training;

(h) Place the centres in rural areas;

(i) Develop the centres to serve for headquarters, experimentation and training and to illustrate many helpful features;

(k) Establish simplicity as a key note;

(l) Foster Rural Area and Urban Co-operation;

(m) Apply adaptable and flexible methods to fit each local situation.

III

The Jamaica Social Welfare Commission was formed in 1938 to make the land self-sufficient. Some of the main events which took shape under this commission are the progress of the Banana Industry and the building of the Panama Canal. The construction of the canal had its progressive effect on the banana industry.

It was then that the people started migrating to the United States in quest of higher education and employment. There was unemployment and uneasiness all over the place. At this time the Social Welfare Commission took shape. This helped to form a general awakening and the Jamaica Welfare work was launched. Funds were raised to back this movement. But with that it was also emphasised that an emergence of a spirit of self-help, thrift and independence should come about among the West Indian people themselves.

Government services were expanded notably. The establishment of Land Department, Labour Department, the appointment of a Secretary for Social Welfare Services, increase in Health Services, expansion of Agricultural Societies, all took place one after another. 4-H clubs were introduced. Co-operative movements developed. To develop the general community, community education co-operative developments, home and village industries, educational cinema units, libraries, were all formed.

Having laid down the policy of creative work and of collaboration with other organisations the Jamaica Welfare Commission proceeded as follows:—

Cinema units were formed to educate the people. Community centres were developed to mobilize local leadership and co-operative societies were formed te help the public in procuring their needs.

IV

The last article contributed by St. Francis Xaviour University describes an experiment in social reconstruction, carried on in the maritime provinces of Canada viz., Nova Scotia, New Brunswick, and Prince Edward Island. This area is taken as a compact region with the most of the present-day world problems expressed into a small space and hence aptly suited for experimentation. These maritime Provinces were predominently agricultural several years ago. But through the years people have been migrating to the industrial west, fishing and farming had become unprofitable and rural depopulation threatened these provinces.

The following were the main aims of the Extension Services of the Department.

(a) To build faith in the country, dispel pessimism and slow down unnecessary migration;

(b) To spread the wholesome idea of rural life, its advantage and its possibilities for abundant living;

(c) To teach the people to depend upon themselves;

(d) To organise the people to help one and other;

(e) To teach the people to approach problems scientifically;

and

(f) To teach people to come together irrespective of caste or creed.

* * *

At a time when India is pressed by food shortage and has to tackle a variety of social and economic problems, the articles contained here will surely provoke thought and provide the general framework for any comprehensive discussion aimed at the formulation, initiation and implementation of a programme for the betterment of the lot of the majority of our people.

Weather Review — For March 1951

RAINFALL DATA

Division	Station	Total rainfall for the month	Departure from normal in inches	Total since January 1st in chches	Division	Station	Total rainfall the the month	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpur	2·3	+1·7	2·3	Central Contd.	Coimbatore	0·4	−0·1	0·5
	Calingapatnam	0·6	+0·2	0·6		Tiruchirapalli	0·1	−0·3	0·2
	Visakhapatnam	0 0	−0·5	0·0	South	Nagapattinam	0·3	−0·5	1·7
	Anakapalle*	0·0 £	−0·1	0·0£		Adutuari*	0.1	−0·4	0·7
	Samalkot*	0·0	−0·2	0 0		Pattukottai*	1·0	−0·3	2·2
	Kakinada	0·0	−0·5	0·1		Madhurai	0.4	−0·3	0·8
	Maruteru*	0·0	−0·5	0·0		Pamban	0·3	−0·4	5·3
	Masulipatnam	0·4	+J.N.†	0·4		Koilpatti*	1·3	+ §	2·2
	Guntur*	0·2	−0·3	0·2		Palayamcottai	1·9	+0·9	4·6
	Agrl. College, Bapatla*	0·5	−0·3	0·5		Ambasamudram*	1·3	−1·0	5·3
	Agrl. Farm Bapatla*	0·7	...	0·7					
	Rentachintala	0·5	+0·4	0·5	West Coast	Trivandrum	3·1	+1·6	3·8
						Fort Cochin	1·9	−0·1	2·0
Ceded Dists.	Kurnool	2·7	+2·5	2·7		Pattambi*	0·0	−0·8	0·0
	Nandyal*	0·4	+ †	0·4		Kozhikode	0·0	−0 4	0·4
	Hagari*	2·1	+2·0	2·1		Taliparamba*	0·0	−0·5	0·0
	Siruguppa*	0·3	+0·2(a)	0·3		Nileshwar*	0·0	−0·3	0·0
	Bellary	1·3	+1·1	1·3		Pilicode*	0·0	−0·4 @	0·0
	Cuddapah	0·8	+0·6	0·8		Mangalore	0·0	−0 5	0·0
	Kodur*	0·3	−0·2	0·3		Kankanady*	0·0	−0·6	0·0
Carnatic	Nellore	1·1	+0·9	1·4	Mysore & Coorg.	Chitaldrug	0·6	+0·4	0·6
	Buchireddipalem*	0·5	+0·2	0·5		Bangalore	Tr.	−0·4	Tr.
	Madras (Meenambakkam)	Tr.	−0·3	0·2		Mysore	0·4	−0·1	0·4
						Mercara	2·2	+1·4	2·3
	Tirurkuppam*	0·7	−0·5 @	0·7	Hills	Kodaikanal	6·9	+5·1	8·7
	Palur*	0·0 †	−0·6	0·6		Coonoor*	6 8	+5·0	9·8
	Tindivanam*	0·1	−0·5	0·2		Ootacamund*	0·4	−0 9	0·9
	Cuddalore	0·0	−0 7	1·0		Nanjanad*	1·1	−0·1	1·8
Central	Vellore	0·9	+0·6	0·9					
	Gudiyatham*	1·3	+1·0	1·3					
	Salem	2·1	+1·6	2·1					
	Coimbatore A. M. O.*	0·2	J.N.(b)	0·3					

Note:—

1. * Meteorological stations of the Madras Agricultural Department.
2. Average of ten years' data is taken as normal.
3. @ Average of eight years' data for Tirurkuppam and nine years' data for Pilicode is given as normal.
4. (a) Taluk office normal is O. 21″ and rainfall is 0·04″
5. § Actual departure from normal is 0·01″.
6. Tr. Rainfall from 0·01″ to 0·04″.
7. † Actual departure from normal is 0·2″
   Actual rainfall is 0·02″
8. £ Actual rainfall is 0·03″
9. J. N. Just Normal.
10. J. N. (b) The actual departure is − 0·04″.
11. ... Data are not available since the farm is a newly started one.

Weather Review for March 1951.

The month began with a feeble discontinuity over the extreme South Bay of Bengal and this became unimportant the third day. On 4—3—51 a western disturbance was noted over Baluchistan and the adjoining areas. On the third day it was accentuated by another disturbance. Baluchistan and the adjoining areas were under the influence of the western disturbance for three more days thenceforward. For the subequent three days Utter Pradesh was under the influence of a secondary western disturbance. From 14—3—51 Baluchistan was again under the influence of a western disturbance for two days. The remaining portion of the month passed with a number of similar mild western disturbances over Baluchistan, Punjab, Uttar Pradesh, etc.,

In Madras State the month passed with a dry weather throughout in the first three weeks. Then, though the weather continued to be fairly dry, scattered showers were received in isolated places.

Rentachintala recorded the highest maximum temperature of 107°F on 20—3—51. Cuddapah was, as usual, in the grip of summer six days from 19—3—51 with temperatures in the range of 105 or 106 °F.

Particulars about the noteworthy falls and zonal rainfall during the month are furnished below :—

S. No.	Date.	Place.			Rainfall in inches for past 24 hours.
1.	26—3—1951	Kodaikanal	...	...	3·1″
2.	27—3—1951	Kurnool	...	...	1·7″
3.	28—3—1951	Palayamcottai	...	...	1·7″
4.	29—3—1951	Alleppey	...	...	2·3″
5.	31—3—1951	Salem	...	...	2·1″

ZONOL RAINFALL

S. No.	Name of the Zone.		Total Precipitation.
1.	Orissa and Circars	...	Just Normal
2.	Ceded District	...	Above Normal
3.	Carnatic	...	Below Normal
4.	Central	...	Above Normal
5.	South	...	Below Normal
6.	West Coast	...	Below Normal
7.	Mysore and Coorg	...	Above Normal
8.	Hills	...	Far Above Normal

Agricultural Meteorology Section
Lawley Road Post, Coimbatore
Dated 14—4—51.

M. B. V. N., C. B. M., & M. V. J.

Departmental Notifications

GAZETTED SERVICE—APPOINTMENT—POSTINGS AND TRANSFERS

Sri K. Venkateswarlu, Overseas Scholar, is temporarily appointed to to officate as Special Officer for preliminary survey of underground water resources in this State for a period not exceeding three months with effect from the date of taking charge.

Name of officers	From	To
Sri Karunakar, P. D.,		To act as Principal A. C. and R. I., Coimbatore.
,, Alagiamanavalan,	Sugarcane Inspector Nellikuppam,	D. A. O., Vellore.
,, Annamalai, C.,	On leave,	Special Officer for Propaganda, Madras.
,, Anandapadmanabha Pillai, R.,	On leave,	D. A. O., Crop Sampling, Vijayawada.
,, Doraiswami Ayyar, S.V.,	Lecturer in Agrl. Economics, Bapatla,	Lecturer in Agrl. Economics, Coimbatore.
,, Gopala Unnithan, M.,	D.A.O., Chittoor,	D.A.O., Kozhikode.
,, Hanumantha Rao, C.,	Supdt. College Farm Bapatla,	D. A. O. Chittoor.
,, Krishna Pillai N.,	D. A. O., Coimbatore,	Supdt., C. F., Coimbatore.
,, Mukundan, M.,	Sugarcane Inspector, Visakapatnam.	Sugarcane Inspector, Nellikuppam.
,, Narasimham, P.L.,	D.A.O., Kakinada,	D. A. O., Guntur.
,, Narayanan Nair, K.,	Asst., M.O. (Chemical Manures) Madras.	Asst., M.O., Trichinopoly.
,, Parameswara Menon, P. K.,	Addl., D.A.O., Kozhikode,	Asst., M.O., Cuddapah.
,, Ramamurthi, M.,	D.A.O., Guntur,	D.A.O., Anakapalle.
,, Rama Rao, V.,	D. A. O., Anakapalle,	Supdt. College Farm. Bapatla.
,, Raman Moosad, C.,	Supdt. C. F., Coimbatore,	D.A.O., Tirunelveli.
,, Ramasubba Iyer, A.K.,	D.A.O., Tirunelveli,	D.A,O., Mathurai.
,, Ramakrishna Rao, K.L.,	Special Officer for Propaganda, Madras.	Special Officer for Propaganda, Chingleput.
,, Raghava Rao, N.,	Asst., in Entomology Coimbatore,	Asst. Entomologist, Coimbatore.
,, Rangabrahma Rao, T.,	D.A.O., Nellore,	Lecturer in Agriculture, Coimbatore.
,, Srinivasacharya, K.,	D. A. O., Vellore,	Sugarcane Inspector, Nellikuppam.
,, Subramania, Ayyar, K.H ,	Sugarcane Inspector, Pugalur,	Addl., D.A.O., Mathurai.
,, Srinivasan, M. (Dr.)	Lecturer in Agrl. Economics, Coimbatore,	Lecturer in Agricultural Economics, Bapatla.
,, Sanjiva Shetty, K.,	Asst., M.O., Cuddapah,	Addl., D.A.O. Cuddapah.
,, Sivasankara Menon, K.,	D.A.O., Kozhikode,	D.A.O., Coimbatore.
,, Sankara Ayyar, M.A.,	Supdt. A.R.S., Palur	Pulses Specialist, Coimbatore.
,, Sakharama Rao, G.,	Dy. D. A., Visakapatam,	Dy. D.A., Vellore.
,, Subbiah Mudaliar, V.T.,	Lecturer in Agriculture, Coimbatore,	Headquarters Dy. D. A., Madras.
,, Shanmugasundaram, D.,	On leave	Asst., M.O., (Chemical Manures) Madras.
,, Somayya, M.	D. A. O., Crop Sampling, Vijayawada,	D. A. O., Anantapur.
,, Venkataraman, K.,	Dy. D.A. Vellore,	Dy. D.A., Visakapatnam.
,, Veerabhadra Rao, K.,	Special Duty Agency Development, Kakinada,	D.A.O., Kakinada.
,, Venkataratnam, G.,	Sugarcane Inspector, Vuyyur	D.A.O., Nellore.

SUBORDINATE SERVICE

Appointments—Postings and Transfers.

The following B. Sc. (Ag.) graduates are appointed as upper subordinates in the Madras Agricultural Subordinate Service and are posted to the vacancies shown against each.

Sri Augustine, P. R,,	... A.D. Kulitalai
,, Ahmed Syed,	... Special A. D., Bellary.
,, Bhaskara Rao, Y.,	... Asst., in Paddy A.R.S. Aduthurai.
,, Lakshmayya, V.,	... Asst. in Paddy, P.B.S., Mangalore.
,, Muhammad Majaduddin,	... Paddy-Cum-Millet Seed Development Asst., Kozhikode.
,, Narayana Chetti, V.,	... Addl. A.D. Madanapalli.
,, Panakala Rao, M.V.,	... A. D., Palani.
,, Papi Reddy, V.,	... A. D., Kozhiksde.
,, Padmanabhan, S.,	... A. D., Parvathipur.
,, Parthasarathi, S. A,,	... Asst. in Entomology, Coimbatore.
,, Rajeshwara Rao, R.	... F. M., A.R.S., Pattukottai.
,, Ramachandra Reddy, G. L.,	... P.P.A., Kozhikode.
,, Raju, M.D.A.,	... Asst. in cotton, A.R.S., Siruguppa.
,, Shiva Rao, Y.,	... Special A.D., Cotton Scheme, Koilpatti.
,, Subba Reddy, K. C.	... A. D., Nandikottur.
,, Venkatapathi Razu, S.B.,	... Addl., A D., Tirunelveli.
,, Venugopalaswami, S.,	... A.D., Tellicherry.

Names	Form	To
Sri Adivi Reddy, A.,	P. A. to D. A. O., Anantapur,	A. D., Chandragiri.
,, Appalanarasiah, K.,	P,P.A. (Entomology) Srikakulam,	P.A. to D,A.O., Anantapur.
,, Athmarama Iyer, P.S,,	P.A. to D. A. O., Trichinopoly,	Marketting Asst., Trichinopoly,
,, Abdul Azeez,	A.D., Anantapur,	A.A.D., Anantapur.
,, Ambikacharan, K.,	P.A. to D.A.O., Guindy.	A.D., Madras.
,, Bucheswara Rao, A.,	Asst. A. D., Hospet,	A. D., Amalapuram.
,, Chiranjeevi, V.,	On leave	A.D., Amalapuram.
,, Chalapathi, K. V.,	Technical Asst., Visakapatam;	A.D., Anantapur.
,, David, M. J.,	A.D., Saidapet,	P.A. to D.A.O., Saidapet.
,, Guruswami Naidu, R.,	P. A. to D,A.O., Kurnool,	A. D., Madanapalli
,, Hanumantha Rao, M.,	A.A.D., Ongole,	A.A.D., Tenkasi.
,, Jaya Raj, M.V.,	A.D., Palani,	A.D., Sattur.
,, Jayaseelan, D.S.,	A.D., Kallakurichi,	A.A.D., Kallakurichi.
,, Janardana Rao, K.,	A. D., Parvathipur,	P. A. to D. A. O., Srikakulam.
,, Krishnamurthi, P.A.,	A.D., Cuddalore,	A.D., Kallakurichi.
,, Konda Reddy, G.,	On leave,	P. A., to D. A. O., Anantapur.
,, Krishnamurthi, G.,	Marketing Asst., Tadepalligudam,	Asst. in Cotton A.R.S., Siruguppa.
,, Kumaraswami, P.,	A. D., Hospet,	Asst. A. D., Hospet.
,, Krishnamurthi, R.,	F. M. C. F., Coimbatore,	Asst., in Millets, Coimbatore.
,, Krishnan, L.,	Marketing Asst., Trichinopoly,	P. A. to D. A. O., Trichinopoly.
,, Koteswara Rao, K.,	A. D., Alur,	A. A. D., Ongole.
,, Mukundan, T. K.,	A. D., Kozhikode,	A. D., Kotagiri.
,, Muthuswami, P. N.,	P. A. to D. A. O., Coimbatore,	F. M., C. F., Coimbatore.
,, Mohammad Abdul Hamud,	A. D., Polavaram,	A. D., Chintalapudi.
,, Narasimhamurthi, H.,	Spl. A. D., Bellary,	A. D., Hospet.
,, Narayana Ayyar, N.,	A. D., Chingleput.	A. D., Saidapet.
,, Narasimha Sastri, V. L.,	Paddy Asst., A. R. S., Maruteru,	P. P. A., (Mycology) Kakinada.

Names	From	To
Sri Narasimha Ayyar, B. S.,	On leave,	Asst., in Chemistry, Coimbatore.
,, Padmanabhan, P.,	A. D., Anantapur,	Asst., in Cotton A. R. S., Narasaraopet.
,, Perraju, A.,	Special A. D., Narasaraopet	A. D., Madakasira.
,, Papiah, B. P.,	A. D., Tuni,	A. D., Polavaram.
,, Ramakrishna Rao, K. V.,	A. D., Madurantakam,	A. A. D., Cuddalore.
,, Ramamohan Rao, K.,	P. P. A., (Mycology) Srikakulam,	F. M., A. R. S., Guntur.
,, Rama Rao, D.,	F. M., A. R. S., Guntur,	P. P. A., (Mycology) Srikakulam.
,, Rama Rao, P. V.,	A. D., Chandragiri,	A. D., Tadepalligudam.
,, Raghavulu, G. V.,	Marketing Asst., Madras,	Marketing Asst. Tadepalligudam.
,, Ramachandran, L.,	A. D., Madakasira,	A. D., Vayalpad.
,, Rangamannar, D.,	Asst., in Cotton, A. R. S., Siruguppa,	Soil Conservation Asst. Bellary.
,, Raghunatha Reddy, D.,	A. A. D., Kallakurichi,	do.
,, Rangaswami Ayyangar, K.,	P. A. to D. A. O., Chittoor,	F. M., A. R. S., Gudiyattam.
,, Raghunatha Reddy, K.,	F. M., A. R. S., Gudiyattam,	P. A., to D. A. O., Chittoor.
,, Rajarathnam Chettiar, S.,	F. M., C. F., Coimbatore,	P. A. to D. A. O., Coimbatore.
,, Raghunatha Rao, N.,	P. P., (Mycology) Kakinada,	Paddy Asst. A. R. S., Maruteru.
,, Ramachandra Marar,	A. D., Kotagiri,	A. D., Kozhikode.
,, Raghavendra Rao, J.,	A. D., Ootacamund,	A. A. D., Atmakur.
,, Rama Rao, K.,	A. D., Punganur,	A. A. D., Chidambaram.
,, Sankaranarayana Iyer, C. S.,	A. D., Manjeri,	F. M., C. F., Coimbatore.
,, Suryanarayanamurthi, H.,	A. D., Madanapalli,	Soil Conservation Asst., Bellary.
,, Somayajulu, P.,	P. A. to D, A. O., Srikakulam,	P. A. to D. A. O., Kakinada.
,, Suryanarayanamurthi, T.,	On leave,	A. A. D., Tirunelveli.
,, Sankaran Unni, T.,	A. D., Gudalur	Special A. D., Vellaikoil.
,, Sriramachandra-murthy, T.,	A. A. D., Tirunelveli,	Asst., in Cotton, Guntur.
,, Thiruvenkatachary,	A. D., Gurzala,	Chillies Asst. A. R. S., Guntur.
,, Venkaiah, N.,	A.D., Ramachandrapuram.	A. D., Tiruvur.
,, Venkateswara Rao, Y.	On leave,	A. D., Alur.

Agricultural College and Research Institute, Coimbatore

LIST OF ADDITIONS TO LIBRARY FOR MARCH 1951.

1. AUTCHERS (E. C.) and KNAPP (H. B.): Orchard and small fruit culture, 3rd Edn. 1947. John Willey and Company.
2. BELLS (R. R.): Central and South East Asia, 1945 – 1946, 1950. Royal Institute of International Affairs.
3. CANADA AGRICULTURAL MINISTRY: Report for the year ending 31st March 1950 – 1951.
4. COMMON-WEALTH ECONOMIC COMMITTEE: World consunption of wool. 1949 – 1950.
5. Do. Fruit 1950.

6.	C. S. & I. R.:	Wealth of India — Raw materials Vol. II 1st Edn. 1950.
7.	DUTCHER (R. Admas) *etc.*:	Introduction to Agricultural Bio-Chemistry. 1st Edn. 1951. John Willey & Sons.
8.	ESPE (Dwight):	Secretion of Milk. 3rd Edn. 1948. Iowa State, College Press.
9.	FOSTER (A. S.):	Practical Plant Anatomy. II – 1949, Van Nost & Co.
10.	FOX-WILSON (C):	Pests of flowers and shrubs. II – 1950, Britain Ministry of Agri. and Fisheries.
11.	FREAR:	Chemistry of Insecticides and Fungicides etc. II – 1948, D. Van Nost & Co., New York.
12.	HAWKER (L. E.):	Physiology of Fungi. 1st Edn. 1950, University Press, London.
13.	HOWARTH (W. O.) and WARNE (L. G. G.):	Practical Botany. 1st Edn. 1950, University Tutorial Press.
14.	ISRAELSON (O. W.):	Irrigation principles and practices. 1st Edn. 1948, John Willey & Sons.
15.	KLAGES (K. H. W.):	Ecological Crop Geography. 1st Edn. 1947, MacMillan & Do.
16.	METCALF & CHALK:	Anatomy of Dicotyledons Vol. 1, 1st Edn. 1950, Oxford University Press.
17.	Do.	Anatomy V. II, 1st Edn. 1950, Oxford University Press.
18.	MAHESHWARI (P):	Introduction to Embryology of Angiosperms. 1st Edn. 1950, McGraw Hill.
19.	NICHOLSON:	Report on Land and Agriculture Banks in Madras Presidency, Govt. of Madras.
20.	NIXON (ROY W.):	Improved varieties — trials in the United States, 1950, U. S D. A.
21.	NOEL DEERR:	History of Sugar. Vol, 1, 1st Edn. 1949, Chapman & Hall.
22.	Do.	History of Sugar. Vol. II, 1st Edn. 1950, Chapman & Hall.
23.	PEST CONTROL CAMBRIDGE:	Pest Control, 1950.
24.	RANGANATHAN (S. R.):	Colon Classification. 3rd Edn. 1950, Madras Library Association.
25.	RUSSELL (E. J.):	Soil Conditions and Plant Growth. 8th Edn. 1950, Longmans and Green & Company.
26.	RUDOLPH (P. O.):	Forest Plantations in Lake States 1950, U. S. D. A.
27.	ROSS (HERBERT):	Text Book of Entomology. 1st Edn. 1948, John Willev & Sons.
28.	ROE (H. B.):	Moisture requirments in Agriculture. 1st Edn. 1950, McGraw Hill.
29.	SHOE MAKER (J. S.):	Vegetable Growing. 1st Edn. 1949.
30.	STEBBINS:	Variations and evolutions in plants. 1st Edn. 1950, Columbia University Press, Columbia.
31.	SPENCER & MEADS:	Cane Sugar Handbook. 1945, John Willey & Sons.
32.	VAN LEOSCHEL (HARRY W.):	Bananas — Chemistry. Physiology and Technology, 1950. Inter. Sci. Publication.
33.	WRIGHT (F. B.):	Electricity in the Home and in the Farm. 2nd Edn. 1948, John Willey & Sons.
34.		ANNALS OF Royal Agricultural College of Sweeden. Vol. 17, 1950.
35.	ZACHARIAS (C. W. C.):	Madras Agriculture. 1st Edn. 1950, Madras University.

The Madras Agricultural Students' Union.

PATRONS.

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15. ,, K. Tiruvenkata Mudaliar, Munniyur, Andankarai Post, (via) Alattambadi, S. I. R.
16. ,, S. Ramamurthy Iyer of Kunnam, Land-Holder and Secretary, South Rajan Mirasdars' Association, "Vibrajee", Alangad
17. ,, P. G. Karuthiruman. Nanjai Puliampatti, Thukkanaickanpalayam, (via) Bhavani
18. ,, K. Venkataswami Naidu, B. A., B. L., Gopalapuram, Coimbatore
19. ,, V. C. Palaniswami Gounder, M. L. A., Vellakinar, Coimbatore

ANNOUNCEMENT

*

THIRTY-FOURTH COLLEGE DAY & CONFERENCE, 1951

The subject for discussion at the ensuing thirty-fourth College Day and Conference of the Madras Agricultural Students' Union, will be "Manuring of crops in relation to (i) crops, (ii) irrigation, (iii) extension service, (iv) pests and diseases and (v) organic and inorganic manures".

The date of the Conference will be announced in due course, later.

Persons desirous of contributing papers for the Conference are requested to communicate with the Secretary.

T. S. Lakshmanan,
Secretary, M. A. S. Union.

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