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EDITORIAL

Partners in Agricultural Progress. This is the title of an interesting report recently issued by the authorities of the University of California. "It attempts to present a composite but brief picture of some of the more important and significant investigations and researches conducted by the Californian Agricultural Experiment Station of the College of Agriculture during the past two years." It is not our intention now to review in any detail the contents of the above publication. What we propose to do is to acquaint our readers with the similarity of the work done by a sister department in distant America and by ourselves in Madras. In doing this we may be excused if we quote *in extenso* portions of the report which have a direct bearing on the particular aspect we are dealing with.

" Partnership in Agricultural progress calls for mutual co-operation between those who discover new facts and those who apply such facts to their own enterprises. This type of co-operation between the research workers of the Agricultural Experiment Station, the teachers of the Agricultural Extension Service and the agricultural producers of the state is responsible for the increasing efficiency of California Agriculture and for its ability to meet successfully various problems and emergencies ". Comparisons may not always be happy or convincing. But in this particular case our position in Madras is almost identical with what is described above. The partners in the agricultural progress of this presidency also consist of the three units, viz., the research worker in the Agricultural College and Research Institute at Coimbatore, the propaganda officers working in the districts and the very large number of farmers for whose welfare the first two are labouring. A report similar to the one under reference has been recently published by the Agricultural Department in Madras.* The same Department published a Popular Account of its work in the year 1922 and the present publication refers to the period between that year and 1935. The publication, periodically, of such information " was necessary by way of educating the general taxpayer to a sympathetic attitude towards the provision of funds with which to develop nation-building activities of which Agriculture is the most important." This publication gives in brief the activities of the various sections of the Agricultural Department in their attempt to improve the lot of the South Indian peasant. It is a vast store

* A Popular Account of the progress of work of the Madras Agricultural Department 1922—35. Rs. 1—4—0. Government Press, Madras.

house of useful information for the educated farmer and the peoples' representatives in both the legislatures. It was a surprise to us that some of the latter who were in the forefront in criticising the work of the Agricultural Department during the last budget debate were, not in touch with, if not in complete ignorance of, the actual state of affairs and we commend this useful publication to their notice in particular as well as to that of every one interested in the improvement of the lot of the agriculturists in Madras.

As stated above both these publications give a very accurate, though necessarily brief, resume of the various improvements recommended by the agricultural department and which are being adopted by the cultivators. The fundamentals and the actual techniques in most cases are the same whether in Madras or in America. But yet we find that there is a difference in the result. In both countries the officers of the department are concerned with educating the cultivator in the proper method to follow. The two factors, the research worker and the propagandist, are doing identically the same kind of work. But the third factor "the farmer" does not seem to occupy the same happy position in Madras as his compeer in the antipodes. The fault is evidently not of the Department of Agriculture. As an instance in point we will take the case of the control of an insect pest or a fungus disease. A perusal of the two publications mentioned above will convince the reader that the remedy suggested is identical in both countries; but whereas in America all the three partners combine and root out the evil through individual as well as co-operative effort, in Madras various factors over which the Agricultural Department have no control prevent such necessary co-operation. Illiteracy of the farmer and his indebtedness combine to make him conservative and unable of incurring any expenditure even on such comparatively inexpensive improvements. At most, the officers of the Agricultural Department can only tell the farmer what he should do; they may and can also show him how to do it, but beyond that one wonders what the departmental officers are expected to do. The removal of illiteracy and the providing of the wherewithal for satisfying the farmer's needs are both beyond the legitimate activities of the Agricultural Department.

It is the duty and the responsibility of the College, however, to study impartially all of the problems with which the farmers of the state are faced, to make known the findings of research and to recommend procedures and practices based upon attested conclusions. This it does to the best of its ability *within the limits of the resources at its command. The work of the College is not and cannot be spectacular. Its objective is to discover and teach.* To be of value, scientific research must have ample time in which to establish its findings conclusively. Relatively speaking all real progress is slow. Particularly is this true in the case of agriculture in which are involved so many physical and economic factors, including those *of human equation.* The above remarks are no less true of the condition in this presidency, as they are said to be of those prevailing in the agriculturally more advanced America.

STUDIES IN SUGRACANE III.

Preliminary Note on the responses of Sugarcane to Different Nitrogenous Manures.*

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In the course of some pot culture studies undertaken to investigate the differential influences of several types of nitrogenous manures on the quality and the proportion of the non-sugar-organic matter in the cane juice (1) which was indicated previously to have a considerable influence on the crystallisability of sucrose and the quality of jaggery (2), some very interesting differences were noted in the effects of the several manures used on some of the important agronomic characters of both the varieties of cane experimented upon viz., Co. 213 and Co. 421. These responses were consistent in all the repetitions in both the varieties.

As they appear to be general in character with an interesting bearing on the agronomy of sugarcane and possibilities of some definite practical utility, they are embodied in this paper.

The following manures were used in this experiment:

(a) No manure (for control)
(b) Castor cake
(c) Ammonium sulphate
(d) Groundnut cake and
(e) Farm yard manure

The canes were grown in glazed pots of uniform size using 13 Kilo grammes of good paddy soil in each case. In addition to this, two other soils, viz., soil from Field No. 15-A (Central Farm, Coimbatore), and red soil, were also used. As a preliminary no manure was used in the cases of these two latter soils.

Although initially two separate buds were planted in each pot, after germination and the putting on of the first two leaves, one plant from each pot was removed, so that the experiment was confined to the study of the primary shoot and of the tillers resulting from a single bud in each case. Four repetitions were used in each treatment with each variety.

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* Paper presented before the twenty-fifth session of the Indian Science Congress held at Calcutta, 1938.

The following amounts of Manures were added :

	N%	No. of grams added.
(a) Farm yard Manure	1·25	416
(b) Castor cake	6·00	86
(c) Ammonium sulphate	20·00	26
(d) Groundnut cake	8·40	64

At regular intervals of 10 days tiller counts and height measurements of both primary shoots and the tillers were taken. As the tillers were found to interfere after a stage with the normal development and the growth of the primary shoots, large numbers of the least promising of them were removed on 14—9—1936. The height measurements were continued at usual intervals on those remaining.

The height of the growing cane was measured from the level of the soil in the pot to the point of the highest visible ligule, the point indicated by the arrow in Plate 1.

TABLE I.

Statement showing the periodic heights of the primary shoots and the average number of the tillers.

Date.	No Manure		Castor cake.		Ammonium Sulphate.		Groundnut cake.		F. Y. M.	
	H	N	H	N	H	N	H	N	H	N
					Co. 213.					
May, 5	6	Nil.	6·75	Nil.	5·4	Nil.	6 58	Nil.	8 5	Nil.
May, 15	7·88	,,	9·42	1	7·5	,,	8·83	,,	10·0	0·66
May, 25	8·42	0·33	11 83	2	8·88	,,	9·98	1·25	12·67	2·00
May, 31	9 50	0·66	12·57	2·3	10·00	,,	11·31	1·25	13·98	2·00
June, 9	10·00	1·33	14·08	3·66	10·56	,,	12·75	2·00	15·33	2·33
June, 19	10·13	2 00	15·58	4·70	12·25	2·25	14·19	4 00	17·33	3·66
June, 29	12·13	2 75	17 25	6·70	13 88	2·75	15·81	4·75	18 50	6·00
July, 9	15 58	3·50	19·00	7·66	16·75	3 50	18·44	6·20	19·50	5 33
Aug. 9	24·50	4 00	25·62	9·33	23·12	4·50	23·50	7·50	23 66	7·33
Aug. 20	27·62	4 00	26 66	9 33	24·33	4·75	25·81	7·50	26 80	7·33
Sept. 1	32·12	3 75	30 17	9 00	26 00	5 25	27·81	7·25	30·58	7·66
Sept. 14	36·83	3·00	33·50	7·00	27·25	5·50	28·88	7·25	33 58	7 66
					Co. 421.					
May, 5	9 00	Nil.	5 67	Nil.	6·33	Nil	6·50	Nil.	5·88	Nil.
May, 15	9·63	,,	8 67	,,	7·38	,,	8·17	,,	8 25	,,
May, 25	12·19	,,	12 25	,,	10·21	,,	11·17	,,	11 25	0·50
May, 31	13·10	,,	14·02	,,	11·82	,,	12 70	,,	13·00	0·50
June, 9	14·75	,,	15 88	,,	14·06	,,	14·50	,,	15·25	0·50
June, 19	15·42	,,	19 08	0 67	16 99	,,	17·17	0 66	16·63	2·50
June, 29	16·00	,,	20·16	1·00	18 31	1·00	18·83	1·33	19·25	3·25
July, 9	18 58	0·66	22·42	1·67	21·19	2 25	20·67	3·00	20·25	4 00
Aug. 9	24·25	1·33	28 10	5·00	30·69	4·75	28 08	5 00	24·00	5·50
Aug 20	25·92	1·33	30·75	5·30	32·44	4·75	30·06	5·00	26·00	6·66
Sept. 1	30 83	1·33	36·33	4 67	34·50	4 75	34 50	4·50	31·33	6·66
Sept. 14	37·50	1·66	40·33	4 33	36 38	4·75	36·75	5 00	34·75	4 00

H : Average height of primary shoot in inches.
N : Average number of tillers.

From the figures presented, the following points become clear:

1. Excepting the no manure series, the number of tillers is lower in the ammonium sulphate series and greater in the cases of castor cake and farm yard manure, in both the varieties. It will be further noticed that this maximum number of tillers was attained in the cases of the two latter manures even in August, while in the other two cases, it took much longer. The relevent figures from Table I are presented below:

	No Manure.	Castor cake.	Ammonium Sulphate.	Groundnut cake	F. Y. M.
		Co. 213.			
Max. No. of Tillers.	4	9·33	5·5	7·5	7·66
Date	9—8—36	9—8—36	14—9—36	14—9—36	20—8—36
		Co. 421.			
Max. No. of Tillers.	1 66	5·3	4 75	5·0	6·66
Date	14—9—36	20—8—36	9—8—36	9—8—36	9—8 · 36

2. Another interesting point to be noted is that for every variety there appears to be a minimum of vegetative growth as indicated by the height of cane, before which is attained, no tillers would begin to appear ordinarily. This is as can be seen from the following figures:

Height of primary shoot when first tillers made their appearance.

	No Manure.	Castor cake.	Ammonium Sulphate.	Groundnut cake.	F. Y. M.
		Co. 213.			
Height in inches	8·42	9 42	12·25	9 99	10·00
Date	25—5—36	15—5—36	19—6—36	25—5—36	5—5—36
		Co. 421.			
Height in inches	18·58	19 09	18·31	18·83	16·63
Date	9—7—36	19—6—36	29—6—36	29—6—36	9—6—36

These figures further reveal that the magnitude of the minimum for Co. 421 is far greater than the corresponding minimum for Co. 213 and this is so in each treatment.

Again, this minimum growth at which tillers appear, is attained earlier in the castor cake and the farm yard manure series than in the ammonium sulphate and the groundnut cake series. Both the varieties respond similarly in this respect.

Between the two varieties under experiment it will be seen that tillering occurs earlier in Co. 213 than in Co. 421.

	Time of Appearance of Tillers.	
	Co. 213	**Co. 421.**
Farm Yard Manure	5—5—36	9—6—36
Castor cake	15—5—36	19—6—36
Groundnut cake	25—5—36	29—6—36
Ammonium Sulphate	19—6—36	29—6—36
No manure	25—5—36	9—7—36

These also indicate that ammonium sulphate tends to delay the appearance of the tillers.

4. Under any one treatment, Co. 213 is a better tillerer than Co. 421.

Thus from the foregoing it would appear that the character of manure seems to exercise a considerable influence both on the tillering capacity and on the time of tillering of any given variety. Castor cake and the farm yard manure seem not only to increase the number of tillers formed, but also to hasten their formation.

TABLE II.

Height Measurements of the Primary Shoots and of the Promising Tillers Under Different Manurial Treatments.

	No Manure Paddy soil.	Castor cake.	Ammonium Sulphate.	Ground-nut cake.	F. Y. M.	No Manure Red Soil from F. No. 15-A Central Farm.	
			Height in inches.				
			Co. 213.				
Primary Shoot	49·00	48·33	38·50	35·75	48·17	33·75	37·50
Tiller (1)	...	50 33	33 83	27·75	26·50	...	...
Tiller (2)	...	29·50	29·50	23·12	13·13	...	...
Tiller (3)	...	24·0	...	...	...	...	...
			Co. 421.				
Primary Shoot	49·63	57·83	54 63	46·06	49·50	45·00	28·50
Tiller (1)	...	42 00	33·40	32·83	26·83	...	...
Tiller (2)	...	17·50	17·00	28·50	17·00	...	...
Tiller (3)	...	...	...	...	...	...	...

The figures show that the number of the more promising tillers is greater in castor cake series in Co. 213. Comparing the heights of the primary shoots and of the tillers in the several treatments, it would seem that manuring with castor cake is considerably more advantageous. This observation appears to hold good in both the varieties.

A sugarcane is valued for its capacity to tiller, and to tiller early in its life, so that large numbers of canes of uniform, or very nearly uniform state of maturity, could be secured into the final harvested sample. The indications of the foregoing considerations appear to be that manuring with castor cake and farm yard manure seem to go a long way to contribute towards this end. Plot and field scale experiments are proposed to be carried out to verify these conclusions.

Mutual influence of the primary shoots and of their tillers on each others growth.

An examination of the periodical height measurements of the primary shoots and of their tillers appears to show that they mutually adversely influence each others growth and development. Growth curves of some typical main shoots and of their tillers are represented in Plates 2 and 3. A study of these curves seems to lead to the following inferences.

PLATE 1

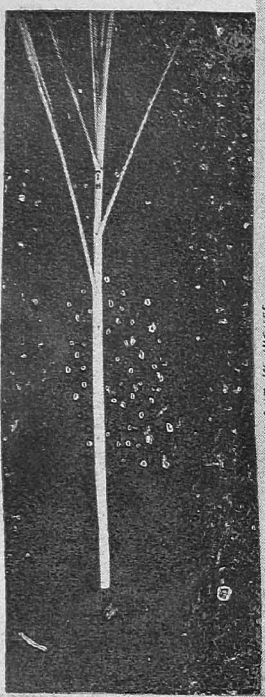

PLATE 2.

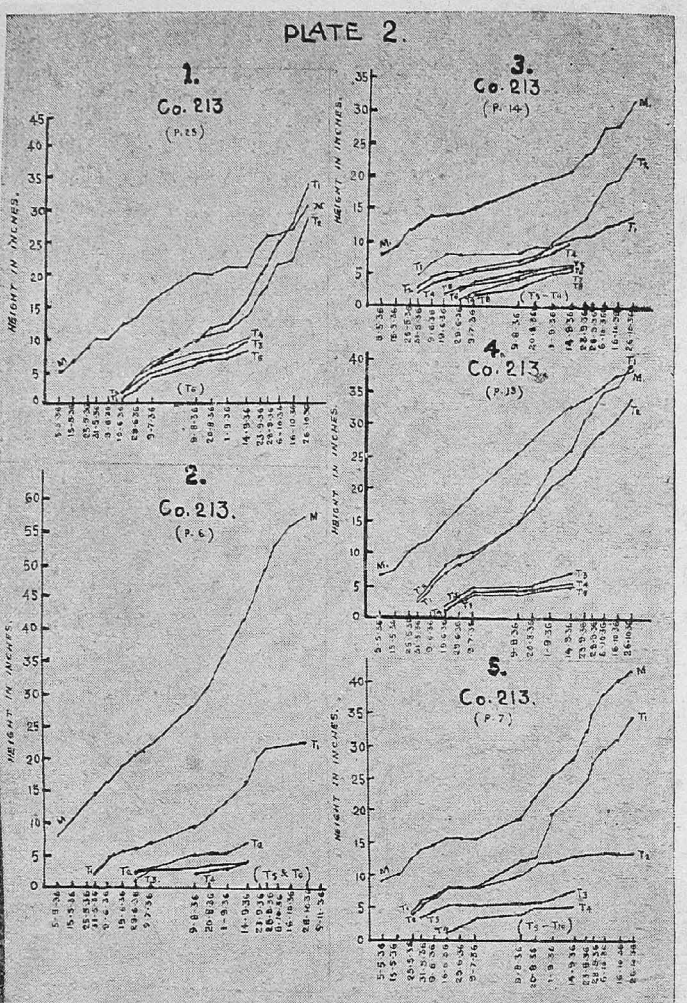

PLATE 3.

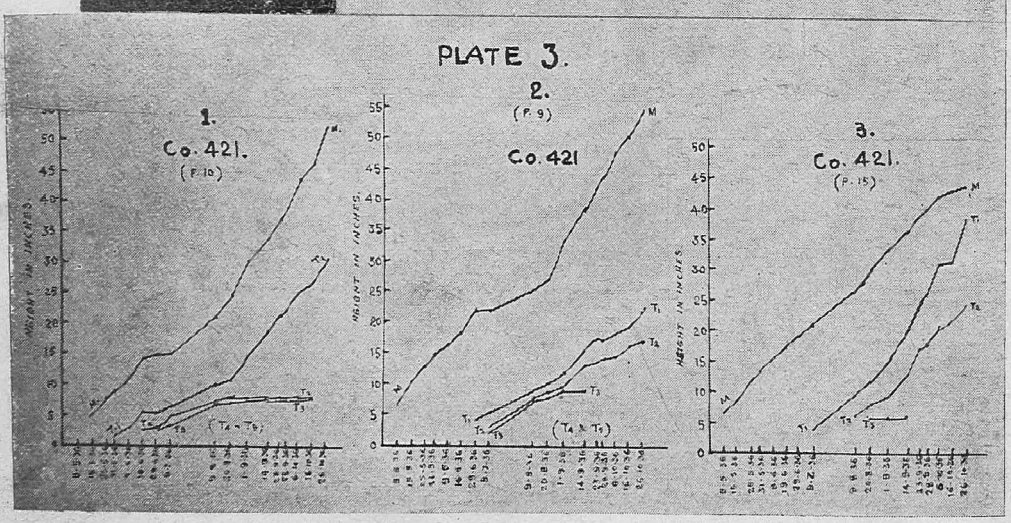

PLATE 2. Co. 213.

Fig. 1. Tillers T_1 and T_2 were vigorous and the growth of main shoot (M) was arrested. When T_3—T_6 were removed on 14—9—36, M also put on more vigorous growth. As T_1 & T_2 were improving by strides M could not keep pace.

Fig. 2 M is very steep and all six tillers were stunted. M became more steep after removal of tillers on 14—9—36. T_1 was flat after this.

Fig. 3. Eleven tillers, all formed early, stunted even the growth of M. Removal of 9 tillers on 14—9--36, caused M & T_2 to put on vigorous growth. T_1 was lagging behind.

Fig. 4. M and early formed tillers T_1 & T_2 were vigorous, and T_3—T_5 were stunted. M was flat after 14 -9—36, and T_1 and T_2 became more vigorous, T_1 even overtaking M.

Fig. 5. M and all the tillers were stunted as the latter are excessive. Removal of T_3—T_{10} on 14—9—36 enabled M & T_1 to grow by strides. This made T_2 flat.

PLATE 3. Co. 421.

Fig. 1. Excessive tillers adversely affected both M and T_1; but when these two commenced to grow vigorously, T_2 and T_3 ceased to grow and T_4—T_9 had to be removed.

Fig. 2 T_1 and T_2 were vigorous and the growth of M was arrested. When T_3—T_5 were removed on 14—9—36, M put on more vigorous growth. As T_1 and T_2 were improving by strides, M could not keep pace.

Fig. 3. The tillers were few and were formed at long intervals. Hence, M as well as all the tillers, excepting the one last formed, grew well.

1. The rate of growth of the primary shoot tends to get reduced considerably when profuse tillering occurs.

2. If on the other hand, the main shoot grows vigorously the tillers would either wither or die, if too young, or would grow only very slowly, if they are already sufficiently advanced in age and growth.

3. The removal of the tillers which are superfluous and are not promising appears to result in enabling the main shoot and the surviving tillers to grow well.

These observations point to the desirability of removing the superfluous and the late formed tillers. This practice of removing the superfluous and the late formed tillers obtains very widely in the northern districts of this province, and it is evidently based on a very rational basis.

Summary. 1. The differential influences of castor cake, farm yard manure, ammonium sulphate and groundnut cake on two cane varieties Co. 213 and Co. 412 were studied in pot cultures.

2. The character of manure appears to influence both the tillering capacity and the time of tillering of any cane. Castor cake and farm yard manure seem not only to increase the number of tillers, but also to hasten their formation. Ammonium sulphate on the other hand appears to have a tendency to delay the formation of the tillers.

3. There appears to exist a minimum limit for the vegetative growth of every cane variety before the attainment of which no tillers would begin to form, and that the magnitude of this minimum varies with variety and with treatment.

4. The primary shoot and the tillers appear to exercise a mutual adverse influence on each others vegetative development. This points to the desirability of removing the superfluous and the late formed tillers, as this operation afforded evidence of exercising a beneficial influence on the growth of the surviving plants. This operation obtains as a practice in the northern districts of this province, and is evidently based on a very rational basis. By this means the presence of canes of widely varying degrees of maturity in the final harvested sample appears to be possible to avoid. Manuring with castor cake and farm yard manure would also appear to be beneficial in this respect as indicated by the results embodied in the present paper.

5. Field scale experiments are proposed to be carried out to verify the indications evidenced in this paper.

References.

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2. **Varahalu. T.** Physical and Chemical Studies on Sugarcane Jaggery and its Manufacture. Unpublished thesis for the M. Sc. Degree of the Madras University (1935).

Semiothisa (*Macaria*) *pervolgata* Wlk. a Geometrid pest of *Daincha* (*Sesbania aculeata*)

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and

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Introduction. The members of the family Geometridae commonly known as 'span worms' or 'measuring worms' are serious pests of orchards in western countries, while most of the species, occurring in the Indian region, according to Lefroy, are hill and forest forms. Even the few forms found on the plains have not been observed as serious pests. One species—*Semiothisa* (*Macaria*) *pervolgata* has, however, been noted for the first time in 1936 in Coimbatore doing severe damage to Daincha (*Sesbania aculeata*) one of the important green manure plants in the Madras Presidency. The paper deals with the life history and habits of the pest together with information on its natural enemies and control methods tried.

Description of the Moth. *Semiothisa pervolgata* belongs to sub family *Boarmiinae*. The moth is described in the Fauna of British India, Moths Vol. III, p. 205, as follows :—

" Whitish, slightly suffused with brown and striated with fuscous. Forewing with obliquely-waved antemedial, medial and postmedial dark lines angled below the costa ; a black spot at end of cell ; some fuscous suffusion beyond the postmedial line ; a dark patch on costa and spot below vein 5 ; a series of marginal black specks. Hind wing with black spot at end of cell ; ante-and postmedial waved lines, the latter with fuscous suffusion beyond it and a black spot or spots at vein 2 ; a marginal crenulate black line. Underside the marginal area largely suffused with rufous and with white patches on it.

Hab. Bengal ; Poona. *Exp.*, Male 26, Female 28 millim ".

Life History. The female lays eggs singly on leaves and tender shoots of the food crop. The eggs are oval in shape and of blue green color with a depression in the middle and measure 0·5 mm. by 0·3 mm. A day before hatching, the eggs turn pale or light green in color. The egg period is 3 to 4 days. A single female moth laid as many as 283 eggs under laboratory conditions while four others laid 259, 226, 212 and 156 eggs respectively.

The newly hatched caterpillar has tiny white hairs all over the body and measures 1·5 mm. in length. The head capsule is orange or orange yellow and the thorax and abdomen dark green in color. Two black dots are prominent one on each side of the 2nd abdominal segment. The sixth and the last abdominal segments bear a pair of sucker feet. The

caterpillar undergoes four moults before pupation. After the first moult the larva measures 5—6 mm. and is light green in color. After the 2nd moult it is 8—9 mm. long and green in color. It is about 15 mm. and dark green in color after the third moult and after the final fourth moult it is of pink color and measures about 22 - 25 mm. when the black dots on the second abdominal segment disappear. The full grown larva just before entering the soil for pupation is about 30 mm. The larval period varies from 8—12 days.

Pupation takes place in the soil or sometimes on the surface of the soil, the pupae being found within slight webbings of soil. In fields where the soil is hard naked pupae have been collected from cracks and crevices also. The pupa is reddish brown in color and measures about 12 mm. long. The pupal period is 6—8 days.

Total Life Cycle. The total life cycle is about 17 - 24 days, the egg, the larval and the pupal periods being, 3--4, 8—12 and 6—8 days respectively.

Longevity of Moths. In captivity, when fed with honey solution, the moths lived up to 12 days.

Status of the Pest. The Daincha crop was sown in the middle of February and by the middle of May the pest had increased in enormous numbers and almost the whole of the two acre plot was completely defoliated. The attack was so serious that only very few leaves were left on the plants. The pest began to invade the adjoining areas also. By June, however, Braconid parasites appeared in large numbers and checked their progress.

Natural Enemies. A Braconid—*Apanteles hypsipylae* Wlkn., has been noticed attacking the caterpillar. By June, these appeared in large numbers so that almost every other plant had one or two clusters of parasite cocoons. Each cluster had about 6 to 20 cocoons. Medium sized caterpillars seem to be preferred by the parasite. The parasitised caterpillars are greenish yellow in color and appear active and continue feeding till the full grown grubs come out. The full grown grubs are pale yellow in color and measure 3·5 mm. They generally arrange themselves under the shrunken body of the caterpillar and spin cocoons which are dirty white in color and pupate inside them. The total life cycle from egg to adult is 14 days. Parasites when fed with sugar solution lived upto 14 days.

Two kinds of hyper parasites were noted and these have been sent for identification.

Control Methods. 1. *Light traps.* Light trap was tried with encouraging results. A 300 candle power Petromax light was put up in the affected area between 7 and 10 P. M. for about a week and the following table gives the records of catches.

Light Trap Catches.

Date.	Females		Males.	Total.
	Gravid.	Spent.		
6–6–36	69	28	41	138
7–6–36	52	31	56	139
8–6–36	18	15	106	139
9–6–36	22	10	78	110
10–6–36	9	6	25	40
11–6–36	0	21	53	74
12–6–36	0	22	43	65
13–6–36	0	7	9	16
Total	170	140	411	721

2. *Insecticidal trials.* As an experimental measure, Calcium arsenate mixed with lime (1:6) was applied to the plants on a small scale, both as dust and as spray. The results were not very encouraging. The spray or dust when applied do not adhere to the leaves properly as they are small and a good amount is wasted. This is not economical also as the crop is not a money crop, being grown only for green manure purposes.

3. *Lures.* Daincha pod extract mixed with molasses and the same scented with a few drops of Citronella oil were left separately in shallow dishes on the bunds but did not attract the moths.

4. *Handnetting.* In a serious outbreak of this kind moths can be disturbed in large numbers, handnetted easily and destroyed.

Acknowledgments. The thanks of the authors are due to the Director, Imperial Institute of Entomology, London, for kindly identifying the specimens.

GLEANING

Soya Bean Cultivation in England. A year ago the Soya Bean Cultivation and By-Products, Ltd. sowed 23 acres of land near Oxford with soya bean. The crop has now been threshed, and it is reported that the Company proposes to plant this year about one thousand acres. (*Chemistry and Industry*, March 26, 1938.)

MONKEYS IN RELATION TO AGRICULTURE IN S. INDIA *

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Introduction. Among the various animals which levy their toll on the South Indian agriculturist, monkeys occupy a fairly important status in many areas of the province ; this is particularly the case in localities situated in the vicinity of hill ranges or along forest areas. Though the writer has very little experience of conditions outside this province it is probably similar in the neighbouring provinces also since we had newspaper reports of monkey trouble in places like Belgaum and Khandesh in the Bombay Presidency. Though in some countries outside India cases have been recorded of monkeys being trained in farms for useful items of work such as fruit picking, coconut gathering, scaring away other pests like crows, etc., in India so far as the writer is aware, the monkey is only notorious for its destructive habits. Any one visiting places of pilgrimage situated on hills like Tirupati, Palni, etc., can easily convince himself of the acts of mischief and the depredations caused by monkeys to pilgrims in various ways. I noted the monkey trouble even in Puri (Jagannath). In this paper attempt is made to record the writer's experience with monkeys on his small farm and in some of its adjacent villages, all situated along the foot hills of the western ghats, in South India in the Malabar Dist.

The economic role of the monkey in South India. In many of the thickly wooded and hilly areas in S. India cultivators have often to contend against the depredations of other higher animals like elephants, wild boar, porcupine, deer, etc., which occasionally cause wholesale damage to crops like paddy, root crops, sugar cane, banana, etc., but such a trouble is mostly confined to areas far away from homesteads not very freguented and is solely confined to growing crops and is preventible to a great extent. The monkey nuisance on the other hand extends to villages and even small towns some distance away from forest areas and is perennial in nature and the depredations caused are, as most of us know, in other ways, confined not merely to growing crops alone. Nor is the control of the monkey pest found easy for various reasons noted below. The nature of the damage caused by monkeys, unlike as with many insect and other pests which confine their attentions to particular crops or agricultural products, is of a multifarious nature and varies with local conditions and circumstances. Among the numerous human belongings which monkeys interfere with, may be mentioned many growing crops, different vegetable products either stored or exposed for drying in the sun and cooked food of all kinds. In fact their close

* Paper read at the Indian Science Congress, Calcutta (Agricultural Section) in January 1938.

zoological relationship with man's ancestors has developed in them scientific methods of damage known to us as robbing, thieving, housebreaking, etc. They are of course almost entirely vegetarian though occasionally one finds a monkey chasing and killing crabs or small birds. Cultivated crops which monkeys attack in South Malabar include paddy and millets of all kinds, root crops such as sweet potato, *koorkai* (Coleus), colocasia, cassava and yam and almost every variety of vegetable grown in South India ; they do not however interfere with crops like chillies, momordica, hibiscus or pepper. Often they pull off tender bamboo shoots and feed on them. They cause very appreciable damage to crops like tamarind, mango, jak, banana, pineapple, guavas, etc. Though the writer has not yet come across damage caused by the monkey to coconut and arecanut palms, he has had reports from distant villages to the effect that the monkey occasionally attacks tender coconuts also. In farms and houses stored provisions of various kinds cannot be kept for drying in the sun safely unless properly guarded against monkeys ; their incursions occur unexpectedly. Monkeys even enter houses through windows or open doors and carry away cooked food and provisions to the utter dismay of the house keeper. Sometimes cooked food or other eatables are removed even with the containers to tree tops or remote corners of compounds or fields. Sometimes fruits and other eatables are actually robbed by them from little children if the latter do not take proper care. Some of you might have experienced trouble with monkeys in some hill side railway stations like Kodaikanal Road, etc. In these various directions the monkey pest in some localities has become a veritable and perpetual nuisance.

South Indian monkeys and their habits. The commonest monkeys of South India are of two main groups. The first group includes forms with long tails and limbs and having no cheek pouches. These, which are known as *Langurs* or leaf monkeys, are typically arboreal in habits and are only found in thick and well wooded forest areas ; they usually avoid human presence and do not go beyond forest areas. They generally make a long howling noise. We have two or three species of the langur in South India and of these the Malabar langur, *Pithecus johnii*, F. is the commonest in the forests of S. Malabar. Except in villages situated very close to thick jungles, langurs do not cause any widespread damage. The second group includes monkeys known as *Macaques* which are the commonest monkeys of the plains. They have conspicuous cheek pouches short and broad limbs and unlike the langurs venture into villages and even towns. The common macaque of the S. Indian plains is *Macacus sinica*. This has a dusty brown color with the face often brown to reddish. This is the typical monkey pest of S. India, and according to Jerdon "it is the most inquisitive and mischievous of its tribe and its powers of mimicry are unsurpassed". This is the species usually taken by village mendicants as show and performing animals. These creatures move about in gangs usually led by a hefty male (patriarch) and each gang usually includes three or four younger male lieutenants, half a dozen females some with their young ones attached to

their mothers and 10 or more of different ages and sexes. Each tribe generally confines its depredations to a limited area; the sphere of their activities generally comprise a furlong or two of a public road with avenue trees, an adjacent hill or two with brush jungle, and a few wet land valleys surrounded by dry areas dotted with homesteads and farms. As though there was an understanding, one gang does not generally trespass into other areas which are often the foraging grounds of other similar gangs and occasional trespasses give rise to very furious combats between members of the rival gangs. One great consolation in connection with the monkey trouble is that these creatures are purely diurnal in their activities and during night time the whole gang rests on a tall and well grown tree like a banyan, mango or jak situated usually in some isolated corner of their jurisdication, away from human haunts. Soon after day break they start on their foraging expeditions which continue right up to sunset. Usually the leader either alone or accompanied by just one or two lieutenants first reconnoitres the proposed area of attack from a convenient vantage spot, often inspecting the landscape standing erect on its hind legs and then slowly ventures into the area. He is immediately followed by all members of the gang and they start their activities in the area causing a lot of trouble within a very short period. If it is a homestead compound the range of mischief is of a miscellaneous nature. Some polish away fruits from half ripe banana bunches, others tear open jak and mango fruits and drop the seeds after feeding on the pulp while some bolder ones venture into the house and explore the kitchen or pantry. Immediately an alarm is raised by any one, these creatures rapidly make good their escape by moving on to some vantage spot on tall trees. But during the short interval between the alarm and their retreat these creatures cleverly manage to cram their capacious cheek pouches with plenty of the spoil—be it fruit, food, or stored grain. The stalwart gang leader very rarely deserts any of his followers and does his utmost towards their rescue even at great risks. After some time the game is repeated either in the same place or in some adjacent one which is not properly guarded. In this way the monkey is found a very chronic pest practically throughout the year in some of the areas; this is especially so during the fruit season, February to July, and then during paddy harvest time, August and September.

Status of the monkey as a pest and its control. There is no doubt that in some parts of S. India the monkey is found to be a major pest causing very great harm to the cultivator and householder. In the opinion of the writer two or three main reasons which have made the monkey an increasingly important major pest in some tracts appear to be (1) continuous and unrestricted destruction of small forests both in the plains and in the vicinity of hill ranges; (2) gradual disappearance of old avenue trees along trunk routes; and (3) the blind veneration paid to this cunning creature as God's lieutenant and on that account a general aversion to harm the creature in any way. In the older days with the existence of plenty of reserve

forests in the vicinity of villages, monkey gangs generally had the habit of remaining confined to trees in these areas where they were able to get plenty of food and convenient lodgings. Gradually with the rapid destruction of forests these creatures had to find new avenues for their existence. The same is the story with many of the avenue trees along trunk roads. Huge fruit trees like *peepul*, Eugenia, tamarind, mango, jack, etc., were affording food and shelter to monkey bands; but with the death or destruction of these shade givers and monkey protectors of the old days, hardly any attention is being paid to renovate old shade giving avenues along trunk roads in many of these monkey-ridden areas. In addition to these two causes is the specific privilege and protection which the monkey has gained from people all over the country; just as in the case of the poisonous cobra, the monkey is held in some religious reverence and in some places of pilgrimage this mischievous imp is pampered as a divine being and even given food by pilgrims as the 'Sacred Hanuman'. Well protected under the cloak of this sentiment the monkey escapes the treatment it rightly deserves and carries on its depredations with impunity.

In the experience of the writer the problem of tackling the monkey pest is one which is beset with many difficulties. In spite of the patent and perennial damage caused by the monkey the villager is afraid to adopt the drastic method of killing it either by shooting or by trapping, due very much to sentiment. The usual practice adopted in the many monkey ridden areas is to drive the gangs every time they are found in compounds or crop fields by shouts and threats, and by throwing missiles often with locally made catapults. There are some specially trained men in some villages whose trained howls and threats the monkeys are particularly afraid of and the help of these men is often sought after by others. During fruiting and harvesting seasons special guards are kept to watch trees and crops from being attacked by monkeys and unless the watchman is exceptionally vigilant the creatures successfully carry on their exploits easily. Very often little boys and girls suffer at the hands of the gang leaders when they attempt to drive these monkeys from the fields or gardens. In some monkey ridden places there are stray cases of domestic dogs trained to drive, catch or even kill monkeys. But due to the fear of killing the monkey by using the dog, the ryots do not generally adopt this method though effective. There is little doubt that merciless shooting down of the gang leader or one or more of its lieutenants will give some substantial relief, but not a single cultivator could be induced to take this step in spite of the serious and perennial damage caused by the pest. Under the circumstances the only possible measure which might be tried appears to be to trap them in portable cages by means of baits and deport them some good distance away—beyond some natural boundary like a river or a steep hill. Of course a good deal of co-operation is necessary among neighbouring farmers since individual ryots cannot eradicate the nuisance easily. In the case of localities where the local ryots are too poor to resort to such a measure it must be

the duty of the village officer or the local panchayat to help the poor folk to get rid of the monkey pest. It is also desirable that the local and district boards which have control of trunk roads should improve the condition of avenue trees by planting and protecting more trees which will revert the activities of monkeys from their present undesirable spheres to their original haunts. The writer will be greatly benefited if any one interested or having had experience in this matter would help him with suggestions in this connection.

EXTRACTS

The Relation of Nutrition to Health, Agriculture and Economic Policy.

Final Report of the Mixed Committee of the League of Nations, Geneva, 1937.

(Extract from Summary and Conclusions).

The Adaptation of Agriculture. Improved nutrition must immediately or in a short lapse of time prove of general benefit to agriculture and fishing. Better nutrition means an increase in the demand for foodstuffs; and an increase in the demand for foodstuffs implies greater agricultural activity. Certain adjustments in agricultural production will no doubt be required; adjustments are always required whenever social progress occurs. It would, however, be a mistake to exaggerate the magnitude of these adjustments. The change in dietary habits to which we look forward will be steady and gradual: it will not occur in a day. Moreover the majority of the protective foodstuffs (milk, vegetables, etc) are of a perishable character, so that they must necessarily be produced not far from their place of consumption. As these foods come to play a more prominent part in national diets, therefore, their production will offer a natural stimulus and protection to domestic agriculture. But the energy-bearing foods still remain, and will remain, the basis of the diet: they play an essential role in human nutrition. We have dealt in this report only with European and certain other countries of Western civilisation. If the inadequacy of the diet of the lower-income groups in these countries, even as regards energy-bearing foods be considered, it is clear that an improvement in the nutrition of these classes should benefit the arable farmer; if the world problem of nutrition be viewed as a whole, the enormous scope for increase in the consumption and production of cereals and certain other foodstuffs valued chiefly for their energy-yielding qualities becomes at once apparent.

While national agricultural systems will thus benefit by the growth in the demand particularly for the more perishable protective foods, countries producing for export will benefit, as the primary needs of the poorer classes for energy—producing and less perishable protective foods are more adequately satisfied.

We have argued that agriculture has adapted itself successfully — albeit not without some difficulty — during the past twentyfive years to changes in the structure of demand, in particular where increased demand has expressed itself in higher prices. The adaptation required in the future will not involve a rapid transformation of the whole structure of agricultural systems, but merely the gradual change in and expansion of production to meet the new requirements. Policy must be directed towards helping the orderly expansion of agriculture and its adaptation to the changing demand.

All adaptation and expansion, whether in industry and commerce or in agriculture, requires capital; but in most countries industry and commerce have far readier access to capital to assist them in their adjustments than has agriculture. In considering the agricultural aspects of the nutrition problem, we desire, therefore to emphasise at the outset the need for an improvement in agricultural credit. We have not been able to make an exhaustive study of the questions of agricultural assurance and credit. The question of long-term agricultural credit is one which the Financial Organisation of the League has already considered, and to which the Financial Committee has reverted in its last report. Furthermore, the International Institute of Agriculture has concerned itself in the past, and will, we understand, concern itself still further in the future, with the problem of agricultural indebtedness, insurance and credit especially medium-and short-term credit. We hope that the appropriate national authorities will, in framing their general nutrition policy, give weight to the necessity for developing agricultural credit institutions in countries where adequate machinery does not already exist.

We also attach great importance to the encouragement and development of agricultural co-operation. The service which co-operation has rendered to producers and consumers alike are well known. Adjustments which are difficult for an individual producer may be facilitated by the joint action of many producers. Improvements in methods, the joint use of machinery, access to scientific knowledge, information regarding market conditions, the rational organisation of marketing—these are only a few of the benefits which have been derived from agricultural co-operative societies. These organisations should be strengthened and developed in countries where they already exist, and established in countries where they do not exist.

The state and agricultural organisations can help the adaptation of agriculture through the education of farmers. We have in mind not only the spread of knowledge about agricultural methods and processes—an important element to which we refer below—but also the dissemination of information regarding the general trends in the demand for foods which are likely to result from better nutrition. By educating agriculturists to the importance of increasing where possible, their output of protective foods, the State can contribute at once to an improvement in agriculture itself (through, for example, the enriching effect of animal husbandry on the soil) and to an improvement in nutrition. We are also convinced of the necessity for teaching farmers, so far as soil and climate allow, to grow more of the protective foods for their own use.

The adaptation of agriculture to changed requirements can, however, be impeded as well as facilitated by State action. Thus tariffs and other forms of trade restriction may, if excessive, so affect prices as to draw farmers into the production of foods for which demand is shrinking and consequently prevent them from expanding their production of foods the consumption of which it would be desirable to increase. Subsidies to consumption on the other hand, may provide equally valuable assistance to agriculture and at the same time serve to promote, rather than impede, the necessary adjustments. Protection to the farmer can often be most effectively, and without prejudice to nutritional standards, by improving methods of agricultural production and distribution by keeping the farmer currently informed of the latest discoveries of science and of market developments, by combating animal disease, by facilitating the purchase of better seed, by watching over fodder and fertiliser prices, by improving transport facilities, by strengthening the agricultural credit system, and by stimulating national consumption. Improvements in agricultural methods result in high yields per acre, while measures of artificial stimulation frequently bring under cultivation inferior land and may result in lower yields.

An effective method by which Governments or private bodies may encourage improved efficiency in agriculture is through the development of schemes for recording output. The value of such schemes may be enhanced by combining them with local or national competitions, which serve to arouse the interest of individual farmers and result in a rapid spread of information regarding new and successful technical methods and in their early and general application.

In view of the importance attached by nutritional experts to an increased consumption of fish and fish-liver oils, the development and preservation of sea fisheries by national and international action would constitute a valuable contribution to nutrition policy.

The orientation which should be given to commercial policy in the light of nutritional requirements is a very complex problem. Many interests are involved, and the most careful analysis and study are required before action can be taken. We have tried to throw some light on the problem in our remarks on the elasticity of demand. It should be clearly understood that the demand for protective foods cannot be greatly increased if the price of the energy-bearing foods is high in relation to incomes. Indeed, the demand for high quality protective foods may, in such circumstances, be considerably increased by reducing the price of the energy-producing foods. This problem requires most careful study in each country, for the solution which is correct in, for instance, a rich country or one where natural conditions favour diversified farming may well be wrong for a poor country or where natural conditions are unfavourable.

If steps are taken to facilitate changes in agricultural production, European as well as non-European agriculture will derive great benefit from the movement towards better nutrition. Not the least of these benefits will be the improvement in the nutrition of the agriculturist himself. We have reported on the paradoxical fact that the producer of food in Europe is not seldom badly nourished. In certain countries, this must be ascribed in part to the fact that he has been encouraged to concentrate his productive resources on one or two crops. Now, better nutrition always means more diversified nutrition. This diversification of demand implies a reciprocal diversification of agriculture, especially more dairy and fruit farming and more vegetable-growing. Under the technical conditions of cultivation which prevail in Europe, diversification is likely in many cases, though not of course always, to affect the individual farm as well as national Agricultural systems. In short as the movement towards the better nutrition spreads and grows, individual agriculturists will be encouraged to produce more of the valuable foods mentioned above, and their own state of nutrition will in consequence rise. In this connection, we may repeat that we attach special importance to the education of the small farmer to the nutritive value of dairy produce, vegetables and fruits, so that whilst directing his chief efforts to production for sale, he will at the same time realise the importance of providing, where conditions allow, foods of high nutritive value for consumption in his own household.

Food Supplies and Food Prices. Farmers and consumers alike frequently complain of the wide discrepancy between the selling price of foodstuffs at the farm and their price at retail. This margin is composed of transport and distribution costs and taxes. It is clearly not possible for us to form an opinion concerning the justification of the complaints to which we have referred; but we would draw attention to the fact that certain authorities have been able to reduce the margin of cost as a result of the careful scrutiny of its component parts and the adoption of appropriate measures whenever the cost of transport and distribution proved excessive.

In view of the perishable nature of many protective foodstuffs special attention has been paid in certain countries — rightly, in our opinion — to improving

refrigeration and storage facilities and to the organisation of quick and adequate transport at low rates.

At the retail stage of distribution, the problem of margins is particularly complicated and difficult to analyse. In many countries, special committees have from time to time been set up to investigate it; but their findings have more often than not been inconclusive. It is, indeed, difficult to assess the cost or value of the services with which some retailers of food provide their customers—cleanliness, variety, attractiveness of presentation, credit, delivery. There are grounds for believing however, that the volume of turnover might be increased in certain areas, were the retail margin per unit reduced, without any loss of profit to the retailer.

In many countries, the consumers' co-operative movement has resulted in an appreciable reduction in margins, both to its own customers and through its competition — to those of private retail establishments. Elsewhere non-credit shops, where the consumer does not pay for delivery which he does not require nor for bad debts incurred by retailers on sales to their customers, have resulted in lower prices. In most countries on the continent of Europe, special markets, where the grower of fruit or vegetables keeps his own stall, help to eliminate or reduce both overhead cost and excessive middlemen's profits.

A major factor affecting the prices of foodstuffs to the consumer in some industrial States is constituted by taxes on imports. Such taxes are imposed in most countries mainly to protect agriculture — revenue taxes with their corresponding excise being generally limited in number. It is for each Government to weigh for itself the claims of agriculture for protection and of the consumer for cheap food. It is not sufficient that the food supplied should be normally plentiful, its supply must also be assured. The problem of agricultural commercial policy is thus one of considerable complexity.

We have given in the body of our report examples of comparative prices of certain foodstuffs in different countries. After all allowance is made for differences in local qualities, no one can study these tables without being struck by the very wide discrepancy in prices that exists to-day even between neighbouring States. Governments of all countries with disproportionately high prices of any valuable food should, we suggest, consider very carefully whether there are imperative reasons for depriving large sections of the community whether they be wage earners or others with relatively low incomes, of the advantages of cheap food which are enjoyed by other countries.

While each country must decide on its own commerical policy, there is one principle the universal acceptance of which we would urge—namely, that adequate nutrition be one of the factors determining such policy. The advice of nutrition and social-economic experts should, in our opinion, be sought whenever a question of agricultural or commerical policy arises. The National Nutrition Committees which we have recommended would appear to provide a useful channel through which this advice might be obtained.

Studies in the Preservation of Fruit Juices I. Some Observations on the Preparation and Preservation of Citrus Squashes. By Lal Singh and Girdhari Lal. *The Indian Journal of Agricultural Science*, Vol. VIII (i), February 1938.

On the basis of analysis of samples of eighteen different brands of citrus squashes available in the market, various sets of squashes of orange (Malta), lemon (imported varieties and *galgals*), with different sugar concentrations (35°, 45° and 65° balling strength), preserved by different methods of preservation were

prepared and stored at room temperature for a period of 1¼ years. Their behaviour during storage has shown that :—

1. Citrus fruit squashes with high sugar content (65°B) retain their fresh-fruit character and stability to a marked degree.

2. Addition of thoroughly ground and strained (through a thick cloth) peel emulsion of two to four per cent. fruits used for juice extraction, considerably improves the flavour and aroma of the bottled product. This phenomenon is more marked in squashes with high sugar density, whereas a slightly bitter taste (though palatable) is imparted to the product with low sugar content.

3. Preservation with sulphur dioxide yields a product superior in taste, flavour and odour to that preserved with sodium benzoate or Pasteurization. Sodium benzoate, even in the purest form, imparts a peculiar chemical odour, resembling iodoform, and a burning taste to the product, whereas Pasteurized squash develops an unpleasant cooked flavour. Sulphur dioxide imparts a slight sulphurous odour to the freshly prepared product which is not noticeable in the diluted beverage, but this adverse effect disappears in about nine months' storage at room temperature.

4. For effective preservation, maximum permitted concentration of sulphur dioxide (350 parts per million) can be fairly diminished (say 100 to 200 p. p. m.) in squashes with high sugar content. It is convenient to add sulphur dioxide in the form of potassium meta-bisulphite (a salt containing about fifty per cent sulphur dioxide).

5. Pasteurized squash, once opened during summer months, gets spoiled within three to four days, whereas the chemically preserved squash, occasionally opened and recorked in the laboratory, shows no sign of infection even when kept in this condition for over two months.

6. Sets of squash, other than those preserved with sulphur dioxide, undergo marked colour changes (light yellow to deep brown) in about 1¼ years' storage, whereas the bleaching action of sulphur dioxide seems to arrest these adverse colour changes effectively.

7. Rate of settling of sediment in the Pasteurized squash is much slower than in the chemically preserved squash; colloidal suspension (cloudiness) persists in the former even after one year's storage.

Method of preparation and standardization of orange and lemon squash has been given, their recipes and cost of production have been worked out. Cost per 24 oz. capacity bottles (second-hand empty bottles being used), excluding supervision charges and depreciation, varies between Re. 0—4—6 and Re. 0 6—11 for different sugar densities of various squashes. [*Authors' abstract*]

Agricultural Jottings.

(From the Director of Agriculture, Madras)

MARKETING SURVEY OF MILK IN THE MADRAS PRESIDENCY.

The value of milk as a food for the maintenance of satisfactory growth and health of man cannot be exaggerated. The total output of milk in the Madras Presidency is exceptionally low, being 3,800 million lb. (valued at Rs 237½ millions), consisting of 1,835 million lb. of cow's milk, 1,855 million lb. of buffalo milk and 110 million lb. of goat milk. The milk production in Madras constitutes only 6·3 per cent. of the total output of milk in India which is estimated at 60,000 million lb. The inadequate supply of milk cannot, however, be attributed to a shortage in the number of cows, as, on the contrary, the livestock figures point

to an overstocking of cattle including cows. The number of cows and she-buffaloes was, according to the latest census (1934-35) 4·28 and 2·4 millions respectively. On human population basis, this means that there are for every 100 persons 14 cows (buffaloes included) as against 8 in England. Though they are numerically strong, the Madras cows constitute a poor lot as milkers. The annual milk yield of a cow and a buffalo is found to be 425 lb. and 775 lb. respectively (average 600 lb.) whereas in England, a cow averages 5,000 lb. The milk production of a district or a particular area is governed by the number of she-buffaloes maintained therein, since a buffalo usually gives twice as much milk as a cow. There is also extreme variation in the milk yield of individual breeds of cow. For instance, while an Ongole cow produces on an average 8 lb. of milk a day, nothing more than 1½ lb. can be expected from a West Coast or Tanjore cow. The largest milk producing district is Guntur which accounts for 303 million lb. or 8 per cent of the total production. Nellore comes easily the second with its output of 249 million lb. Generally, there is maximum production in December—March in all the districts due to the greater calving of cows in October—November.

About one half of the output of milk of the province is retained by the producers for conversion into milk products such as ghee and curd, and the other half is sold as fluid milk. Of the latter, 12½ per cent. (or 6¼ per cent. of the total output) is converted into milk products by the purchasers. The balance of fluid milk available for consumption, therefore, amounts to 1,662½ million lb. or 43¾ per cent. of the total production.

The presidency also imports a small amount of condensed milk and milk powder. The average annual imports of these during the five years ended with 1934-35 amounted to 18,051 cwts. valued at Rs. 12 lakhs, the chief supplying countries being the United Kingdom (56%), Denmark (27%) and Netherlands (14%). As regards milk powder, the United Kingdom is the main source of supply and accounted for 97 per cent. of the imports of the province in 1934-35. The supply of condensed milk reaches the peak in December to February and the lowest level in May to July. This indicates a storage of larger stock in winter for distribution in summer. In the case of milk powder the supply is more or less uniform as there is no fear of its getting spoiled in summer, being in the form of dry powder. About fifteen per cent. of the milk products is re-exported to the neighbouring states of Hyderabad, Mysore and Travancore. The net imports in terms of fluid milk, therefore, amount to 17·18 million lb. taking 1 lb. of condensed milk or milk powder as equal to 10 lb. of fluid milk.

The net available supply of fluid milk for consumption works out to 1,680 million lb. or 1·6 oz. per head daily for a population of 47 millions. A comparison of our figure with that of England with her consumption of 10 oz. per capita vividly illustrates how inadequate our supply of milk is. It is also interesting to note that not satisfied with the present rate of consumption, the authorities in the United Kingdom have launched a "Drink More Milk" campaign. Owing to a regular flow of milk from villages to urban areas the consumption in towns is slightly better in our province amounting to 2·9 oz. per capita while the village consumption is only 1·4 oz. Among the towns Coimbatore ranks first in the rate of milk consumption being 3·4 oz. followed by Pollachi (3·1 oz.). Next in order are Madura (3 oz.), Madras (2·8 oz) and Cuddalore (2·3 oz.).

Buffalo milk is in great demand for conversion into milk products, as it contains 7 per cent of butter fat as against 4 per cent in cow's milk. Preference is always for cow's milk where fluid milk is consumed as such. Goat milk has some medicinal value attached to it and it is usually preferred for feeding children and invalids.

The price of milk in the same year does not fluctuate so often as the other commodities. The highly perishable nature of milk leads to the necessity of finding a speedy sale on the part of the producers and this has the effect of keeping the price level fairly uniform. In urban areas, where the trade is better organised than in villages, milk fetches an enhanced price, and consequently the proximity to a town is a great impetus to the producers. The wholesale price of milk in most urban areas showed a decline of about 40 % from 1931 to 1935, and prices have been steady thereafter. The price of cow's milk supplied to the General Hospital, Madras was 2·3 annas per lb. in 1930–31 and 1·5 annas in 1933–34 and 1934–35. The rate at which Bellary Hospital got its supply was 1·4 annas per lb. in 1932–33 and 0·75 annas in 1935–36. The price now prevailing in Madras is 6 annas a measure or 1½ annas per lb. The price often varies according to the type of milk ; cow's milk is dear at most places and cheap at few centres while both cow and buffalo milk is sold at the same rate at some other places. In Malabar buffalo milk is costly in both urban and rural areas on account of the shortage of she-buffaloes. For example, the price variation in different types of milk at Tirur, a small town in South Malabar, is 2 annas, 1·7 annas and 1·3 annas a lb. for the milk of cow, buffalo and goat respectively. The price of milk in many places also varies according to the degree of adulteration.

Usually the producers' and the consumers' price is identical since the bulk of the fluid milk is retailed by the producers themselves. Where milk passes through intermediary agencies, the producer secures about 75 per cent of the consumers' price.

The quality of milk offered for sale is anything but satisfactory. Ordinarily, the producers do not strain the milk, nor do they observe hygienic principles of cleanliness in the production and handling of milk. Adulteration of milk is a general practice followed throughout the presidency. The extent may be gauged from the fact that in 67 per cent of the milk samples taken in the municipalities where Food Adulteration Act is enforced, water was found to be added to a variable extent, ranging from 7½ to 75 per cent.

Adulteration of milk is so common that a consumer gets no satisfaction unless milking is done in his presence. It is therefore, a common practice in most towns to have the cows taken from door to door for the purpose of milking though buffaloes do not readily submit to this treatment. One serious defect of this system is the fact that when milk is drawn from a cow in three or four instalments in order to supply the requirements of different buyers, the first man gets the poorest and the last man the richest part of the milk. It has been found on analysis that the first strippings of milk contain only about 1 per cent of butter fat while the last portions show as much as 10 per cent.

The main movement of milk is directed from rural to the urban areas within a distance of 2 to 6 miles though in the case of large towns supplies arrive from a radius of even 25 miles. The city of Madras draws a daily supply of about 8,000 lb. mostly by rail. Estimated roughly, the rural quota to Coimbatore and Trichinopoly towns is 5,000 and 4000 lb. per day respectively.

Over short distances milk is conveyed as headloads in pots uncovered or covered with straw, leaf or cloth. Milk when transported by train is filled in brass pots of 20 to 40 lb. capacity with their mouths plugged with a thick pad of straw. Usually, the mouth of the vessel is too narrow to permit of proper cleaning.

As regards the transaction in milk trade, it is very striking that unlike in other trades, milkmen sometimes pay advance to coffee shops in order to secure a regular sale of their milk. The amount advanced varies from Rs. 25 to Rs. 150

according to the quality of milk to be sold. This practice often leads to unhappy consequences. There is neither an entry in the payee's book nor a receipt given to the payer. The milkmen make it a point to supply only adulterated milk and the shop keepers have either to tolerate this or return the advance. There are instances in which the shop keepers closed their business and disappeared from the scene without returning the advance. Sometimes shops are even opened with the money received from a number of milkmen. Where the transaction is carried in good faith, rather a rare happening, money is repaid in instalments without interest within a period of one or two years.

In our province the improvement of cows from the standpoint of milk yield has not so far received adequate attention; concentration has been much more on the breeding of work cattle, cattle labour being an important item in agricultural operation. The system of breeding cattle adopted by ryots has much to do with the low return from cows. The cow is simply looked upon by the cultivator as the mother of his bullocks and she generally gets the remnants of straw from the mangers of work cattle. At the same time he feeds the she-buffaloes well which he keeps for milk purposes. It is right that he looks after his buffalo well, but there is no reason why he should neglect his cow. The majority of milch cattle are seriously underfed as is apparent from the slow rate of growth, the late maturity and the long dry periods of cattle kept under village conditions. Proper feeding no less than breeding can only bring about an improvement of cows, and consequently growing of fodder crops seems to be quite essential in view of the fact that the growth of population has led to an extension of cultivation and grazing is becoming increasingly difficult. Mixed farming including the rearing of dairy stock offers a bright prospect for increased output of milk.

Goat keeping for the purpose of milk production merits more careful attention. Although at present goats contribute only a small percentage (3 %) of the total output of milk, poor people who cannot afford to keep cows can easily maintain a few goats Many persons are under the impression that goat milk has an undesirable flavour. If the animals are kept healthy and clean, there is no cause for trouble on this score. Goat milk is nutritious and easily digestible.

The use of skim milk as a food has to be encouraged wherever it is available. During certain seasons it is found wasted in places like Coimbatore, Trichinopoly etc. Skim milk contains protein, sugar and minerals in a higher percentage and these constituents make it a fine food.

As regards adulteration of milk, legislation exists, but the checking is not done effectively. Drawing of more samples and extension of the Food Adulteration Act to all the important centres are essential. A deterrent punishment seems to be desirable to reduce the offence. Small fines that are commonly imposed are not having any desired effect.

In order to give free grazing facilities for cows in the Madras city during the dry period and prevent undue slaughter of good cows, special reduced rates for movements of cows from Madras to the Guntur district and back have recently been given at the instance of the marketing section.

The organisation of milk producers in villages to pool the milk and assemble it under hygienic and sanitary conditions for delivery to urban areas is a profitable line of improvement that can immediately be undertaken. In centres where milkmen are already operating they can be organised and educated about sanitary methods of milk marketing and arrangements made for proper testing and delivery of supplies through a controlled and distributed system of milk depots.

MARKETING OF GHEE AND BUTTER IN THE MADRAS PRESIDENCY

Of all the milk products that enter into the dietary of Indians, ghee is the most important. About one-half of the total output of milk in Madras Presidency is converted into ghee, and the milk required for the purpose is largely buffalo milk. Though the total production of milk is made up of nearly equal quantities of cows' milk and buffaloes' milk, the proportion of the former to the latter utilised in the manufacture of ghee is about 1 : 3. The fact that buffalo milk contains nearly twice as much butter fat as the cows' milk obviously accounts for this preference. The total output of ghee in this province amounts to 888,450 Imperial maunds (valued at Rs. 3·55 crores) consisting of 127,500 maunds of cow ghee and 760,950 maunds of buffalo ghee. For the whole of India, the quantity of ghee produced is 200 lakhs of maunds of value ranging from 80 to 100 crores of rupees, excluding vegetable ghee of which about 7 lakhs of Imperial maunds are manufactured annually in North India. The total production of butter in Madras is estimated at 65,996 maunds (value Rs. 20 lakhs) consisting of 64,000 maunds of country butter and 1,996 maunds of creamery butter.

The concentrated production of ghee is confined to the large area covered by the districts of Guntur, Nellore, Kistna, Kurnool and Cuddapah where there is a large preponderance of she-buffaloes over cows. These five districts produce between them 341,727 maunds or 38% of the total output. The largest producing district is Guntur which accounts for 111,379 maunds or 12½% of the total. The districts of low production are represented by South Kanara, Malabar and Ramnad, each with an output of about 17,000 maunds. Generally there is maximum production in December—March in all the districts due to greater calving of she-buffaloes in October—November.

Imports into Madras province of ghee amount to 2,798 maunds and of butter 3,951 maunds per year. The former arrives mostly by rail from Bombay, Mysore and Rajputana. The sources of supply of butter are the foreign countries Australia, Canada and United Kingdom, while the rail-borne trade is monopolised by Bombay. Roughly 2,000 maunds of tinned butter of the brands Polson, Lords, Champion and Express Dairy butter are annually imported from Bombay.

The export trade is of the order of 113,262 maunds of ghee, 94 per cent. of which is rail-borne. Among the provinces that purchase ghee, Bengal, Bihar and Orissa and Mysore are important, their respective shares in 1935—36 being 58%, 16% and 14%. Guntur is the greatest centre of export (88,000 maunds) and Calcutta is the largest purchaser (74,710 maunds). Foreign export trade represents 5 per cent. of the total exports or 6,224 maunds. The chief importing countries are Straits Settlements, Ceylon and Federated Malay States, their share of purchase in 1935—36 being 64%, 24% and 12% respectively. This trade is now declining owing to the restrictions set up by the importing countries.

In this country ghee is used for all purposes to which butter is put in Europe, such as cooking of vegetables, curries, rice, meat, fish etc., or utilised in the preparation of sweet-meats and is also eaten uncooked with rice. Cow ghee is also used for medicinal purposes; sometimes it is preserved for a number of years. Ghee which is ten years old has a strong pungent taste and is of the colour of lac. The longer it is kept the more efficacious it is said to be for external application. Temples of which there are a large number in South India require some ghee for lighting and *puja* (religious worship) purposes. During annual festivals which last for a period of a few days to a fortnight a lavish use of ghee is in evidence in many temples. Another use to which ghee is put is for flavouring snuff. For this purpose ghee with a strong aromatic smell is preferred and it is mixed with the snuff in the proportion of 1 : 100 by weight approximately.

Butter is scarcely used except by Europeans and a small number of Indians who have acquired a taste for it. About 90 per cent. of the market supply of butter is ultimately converted into ghee. Most people purchase butter with the object of preparing their own ghee under the impression that the product so obtained would be genuine unlike the ghee offered in the market. This demand has built up an internal trade in butter. Of the total market supply of butter, 10 per cent. (6,947 maunds) represents the quantity consumed as such.

The nett available supply of ghee and butter is as follows :—

	Ghee Maunds.	Butter Maunds.
Production	888,450	65,996
Retained by producer	− 50,798 (6%)	− 1,280 (2%)
	837,652	64,716
Imports	+ 2,798	+ 3,951
	840,450	68,667
Exports	− 113,262	− 9
	727,188	68,658
Butter converted into ghee	+ 48,918	− 61,711
	776,106	6,947

The demand for ghee may broadly be classified under five heads and the estimated requirements under each class are as set out below :—

Demand.	Percentage.	Quantity in maunds.
1. Household requirements	75	582,080
2. Confectionery	20	155,221
3. Medicinal	4·5	34,925
4. Temple }		3,480
5. Snuff }	0·5	400
	100·0	776,106

Total ghee available for consumption is given below :—

Nett available supply	776,106 maunds.
Ghee retained by producers for their consumption	12,750 ,,
Ghee from butter retained by producers	960 ,,
	789,816 ,,

The per capita consumption works to 1·4 lb. per annum as against 25 lb. of butter in England. The rate of consumption is much higher, viz. 4·5 lb. of ghee in urban areas. For a comparison of per capita consumption in towns the Presidency may be divided into the following four areas :—

1.	Circars	6 to 7 lb. of ghee per capita per annum.
2.	Central districts	4 to 5 lb. ,,
3.	Southern districts	3 to 4 lb. ,,
4.	West Coast	1 to 2 lb. ,,

The Telugu districts consume twice as much ghee as the Southern districts or four times as much as West Coast. The estimated per capita consumption of ghee in some of the towns is as follows :—

Vizagapatam	7·7 lb.
Bezwada	6·1 lb.
Coimbatore	4·9 lb.
Madura	4·7 lb.

Madras	4·1 lb.
Trichinopoly	3·7 lb.
Tanjore	3·5 lb.
Mangalore	1·9 lb.
Calicut	1·8 lb.

Judged by railway figures the largest demand for ghee and butter is in the city of Madras which in 1935-36 imported 14,248 maunds of ghee and 22,229 maunds of butter. Ghee arrives mostly from Tirupur, Karur, Singarayakonda etc., and butter from Tenali, Gudivada and Repalle. Consumption in rural areas is poor, the average being about 0·8 lb per capita.

These figures cannot, however, give a true picture of the real condition since the ghee consumption is confined to a small percentage of the top strata of communities. The regional variations do not create any difference in the food consumed by the vast majority, the peasants and labourers, who form the bulk of the populations. The latter class, whether in Vizagapatam, Tanjore or Malabar, rarely consume milk or milk products.

The price of ghee unlike that of other commodities has not recovered after the depression period, the tendency being for a downward course. This is attributed to the poor internal consumption necessitated by the low purchasing power of the people and to a small extent the decline in foreign export trade. The adulteration of ghee with vegetable products is also responsible for lowering the general price of ghee. The wholesale price of ghee at Coimbatore during the past four years was Rs 12·1, 12·0, 11·8 and 11·8 per maund of 25 lb. At the same time butter was selling at Madras at Rs. 11·0, 10·6, 10·5 and 9·0 per maund. The retail price of ghee ruling in Madras market is Rs. 2/4 per viss, whereas in places where Food Adulteration Act is not in force the price ranges from Re. 1/2 to Re. 1/11 per viss depending on the degree of adulteration. The tinned butter is now selling at Re. 1/- per lb. whereas creamery butter "loose" is sold at 12 annas to Re. 1/- per lb. In some centres ghee is sold in three to four grades at prices varying from Rs. 15 to Rs. 22 per tin of 12 visses.

In the summer months of April to August the price of ghee in rural areas rises by 15 to 20 per cent., and in December to March there is a corresponding decrease. The producer gets about two-thirds of the price which the consumer pays for ghee.

As regards adulteration it is doubtful whether there are any other foodstuffs that are so grossly adulterated as the ghee. Previously animal fat was largely used as an adulterant which could be easily detected on heating the ghee, but in recent years its place has been taken by vegetable products which mix well with ghee and are difficult to detect except by elaborate chemical analysis. The following is an instance of how extensively ghee is adulterated. In October 1936, 206 tins of adulterated ghee belonging to four merchants in Bellary were found on analysis to contain 85 to 90% of foreign fat. The results of analysis of samples taken from municipalities show that about 40 per cent. of the ghee offered for sale is adulterated. For the whole of India, it is estimated that so high a proportion as 80% is now being adulterated.

Butter is also heavily adulterated with substances such as hardened vegetable fats, boiled starch (rice, corn, wheat), curd, chalk, boiled egg, ash, etc. The fact that ghee is largely adulterated is now well known, and in consequence many purchasers now insist on their ghee being prepared in their presence from butter under the impression that they thus ensure getting a genuine ghee. The figures for butter adulteration show that this impression is a mistaken one.

The remedial measures seem to be heavy fines which are likely to act as deterrent. The Food Adulteration Act needs vigorous enforcement and further

extension to all important ghee centres. At present it is ineffective because the number of samples drawn is so small that a majority of the dealers escape prosecution.

The keeping quality of ghee could be greatly enhanced by adopting clean methods of preparing and handling butter and ghee. The present unclean practice of using hands freely in the preparation of butter can easily be replaced by the use of simple appliances such as ladles, spoons and similar things. Introduction, on a co-operative basis, of cream separators and butter churns in important rural centres is essential for efficient and clean extraction of butter fat from milk.

The present method of packing ghee calls for great improvement. The use of old kerosine tins which are often rusty and indifferently washed is objectionable as the ghee easily gets rancid when packed in such containers. The use of fresh tins provided with proper lids and lacquer coating inside seem to be quite essential.

In order to popularise the use of pure ghee, an issue of a certificate of genuineness after proper testing is quite desirable so that the consumers may have a safeguard for quality and pay adequate prices for certified ghee. It is also essential that the certified ghee is packed, sealed and sold in suitable sizes of containers so that the sale of loose ghee in retail trade may be minimised.

Ghee being the most important factor in the dairy industry, the supply of pure ghee to the consumer is the first step of improvement in its marketing. With this end in view, the marketing section of the Agricultural Department is contemplating a scheme whereby the supply of ghee will be done in specified grades, subject to stringent penalties against adulteration. Specially equipped laboratories will be installed in important markets as Guntur, for testing ghee which will be sold in standard grades, and coloured labels will indicate each class. The selling of ghee in grades will be done under issue of licences. The supply of quality ghee on the market to the consumer which is at present sadly lacking, will therefore be a work of achievement in the immediate future. The price realised by the producer will also be improved thereby.

MARKETING OF EGGS IN THE MADRAS PRESIDENCY

The Madras Province is estimated to have 70 lakhs of country hens, 15,000 hens of imported or cross-bred type and 17½ lakhs of ducks. The total annual production of eggs is estimated to be 5,624 lakhs, the contribution of the three types of birds being 3,505, 15 and 2,104 lakhs respectively, taking the laying capacity of a bird as 50, 100 and 120. The Madras production of eggs is nearly one-sixth of the production of the whole of India, namely 335 crores.

Poultry-keeping though widely distributed is more concentrated in Northern Circars, West Coast, Central districts and Tanjore. It is a cottage industry, mainly of the poor class, each family keeping a few birds. Poultry farms of the kind known in other countries rarely exist in this province, but large flocks of ducks are maintained in the paddy tracts of Godavari, Malabar, Chingleput, Tanjore, etc. The maximum production of eggs takes place during the harvest season which provides plenty of grains to the poultry. The hot months of April to July are the months of low production. In order to provide food for their birds the duck keepers usually move the flocks from place to place in search of harvested fields. From ducks so migrated from Cochin State, the Palghat taluk of Malabar produces annually about 9½ lakhs of eggs in September and October. The records of improved birds maintained at Katpadi poultry farm show that only 36 per cent. of the total output are obtained in dry months of February to July.

Of the total egg production, 808 lakhs or 14 per cent. are retained by the producers mainly for hatching purposes leaving 4,816 lakhs for consumption.

Imports of eggs into the province in 1934–35 amounted to 142·75 lakhs valued at Rs. 2·86 lakhs, the supply being got from Travancore (74%) and Cochin (26%). The trend of imports is upward owing to the fact that eggs from Travancore which previously went to Ceylon are now diverted to Madras as a result of imposition, by the Ceylon Government, of a heavy import duty of Rs. 3 per 100 eggs from July 1934. The total exports of eggs from Madras Presidency in 1934–35 were 49 36 lakhs valued at Rs. 1·24 lakhs. Of these 31·36 lakhs were sea-borne and 18·00 lakhs rail-borne. Ceylon took 19·21 lakhs and Burma 11·13 lakhs in nearly equal quantities from Madras Port and Cocanada. The share of Bombay and Mysore, the two other importing provinces, was 11·02 lakhs and 8·00 lakhs respectively.

Exports to Ceylon and Burma fell heavily from 114 52 lakhs and 90·90 lakhs in 1930–31 to 19·21 lakhs and 11·13 lakhs respectively in 1934–35. The decline is attributed to the duty in Ceylon and to the development of the local industry in Burma.

The nett available supply of eggs in this province is as detailed below:—

Marketable production	4,816·32	lakhs.
Imports	142·75	,,
	4,959·07	,,
Deduct exports	49·36	,,
Nett supply for consumption	4,909·71	,,

The per capita consumption works out to 10 eggs per annum as against 152 in England. The rate of consumption in urban areas is estimated at 18. Trichinopoly city ranks first with its per capita consumption of 26 eggs followed closely by the city of Madras (24). Corresponding figures for Coimbatore and Madura towns are only 11 and 10 respectively.

The largest demand for eggs is in the city of Madras which draws a daily supply of about 45,000 eggs from Travancore, Cochin and various places of the Presidency such as Ongole, Olavakode, Ammanabrolu etc.

The price of eggs from 1932 to 1935 declined by 23 per cent, and since then it has been fairly steady. Duck eggs usually sell cheaper than hen eggs by about 20 per cent. The wholesale prices per 1000 eggs now ruling in Madras city are Rs. 22 to Rs. 24 for hen eggs and Rs. 16 to Rs. 18 for duck eggs. In retail a dozen is sold at annas six and five respectively. Eggs sell cheaper in summer than in winter although one would expect the contrary, in view of the low production in the dry season. This is attributable to the fact that all the dealers are anxious to dispose of their stock at as early a date as possible since in hot weather eggs keep badly. This undue haste on the part of the wholesalers and retailers has the effect of reducing the price level. The producer gets about half the price which the consumer pays for eggs.

Packing of eggs as at present executed is far from satisfactory, and accounts for a wastage of 3 to 4 per cent as a result of eggs being cracked. The container in most common use is the bamboo basket which holds about 500 hen eggs or 300 duck eggs. Eggs intended for Rangoon undergo rather an elaborate packing in earthen jars after being coated with slaked lime. There is the provision of a pad of straw for the jar to rest on. A jar would hold about 2,500 duck eggs for which there is a special demand in Burma. Earthen jar is said to keep the eggs cool and thereby preserve them long. A better system of packing in dealwood cases is in evidence at Mangalore when eggs are sent by steamer to Bombay.

Grading is a preliminary essential in the marketing improvement of most agricultural commodities and this is particularly so with eggs. Graded eggs are regularly sold at the poultry farms, Katpadi, Ramanathapuram and Hosur. The grades usually adopted are *A* weighing 24 oz. or more to a dozen eggs, *B* 22 to 23 oz. to a dozen, *C* 20 to 21 oz and *D* 19 oz. and below. Recently Madras city is

also being supplied with graded eggs arriving from Chenganoor (Travancore) where, at the instance of the Marketing Section, an egg grading station has been in operation. The grading machine can be worked by hand or by power. Eggs are placed on a circular feeder disc and when the machine is worked they are taken off the disc one after the other by a series of mechanical clasps and dropped on weighted platforms. Eggs are graded into four grades of (1) over 2 oz. (2) 1¾ to 2 oz., (3) 1½ to 1¾ oz., and (4) 1¼ to 1½ oz. At present 1 and 2 are classed as *A*, 3 as *B* and 4 as *D*. Eggs weighing less than 1¼ oz. are rejected. The machine at Chenganoor costs Rs. 350/- and it can grade 1,500 eggs per hour. After the eggs are graded they are candled to test the quality by holding them against strong light and observing the air space. Old, unsound and cracked eggs are rejected. In the consignments of ungraded eggs about 10 per cent are found to be stale, cracked or otherwise unfit for the market. Experience has shown that if unfit ones are eliminated the remaining ninety per cent fetch much better prices, apart from the fact that railway freight has been saved on the rest.

Eggs should be delicately handled in packing and transport and should be available for consumption in as fresh a state as possible. There are a few simple tests to find out the freshness or otherwise of eggs, which can be easily carried out by observing them against strong light and by floating them in saline water.

Egg being a very concentrated food, laying birds should be provided with a rich feed containing protein and starch in the proportion of 1:5. At present the birds have mostly to find their own food in dust heaps and dirt, and their full capacity for laying is never tapped. The fact that the maximum production takes place during harvest of crops which provide the birds plenty of grains is significant. Better feeding of birds and eradication of diseases among them seem to be some of the lines on which improvements in poultry industry could be effected. A few infectious and virus diseases for which no remedial measures are available at present, act as a great hindrance to large scale poultry farming being taken up. Research on poultry diseases with a view to finding out remedial measures calls for immediate attention.

The egg industry is of sufficient magnitude to warrant a regular and systematic poultry census, as also statistics of intra—and inter-provincial trade. As the production of eggs is contributed largely by poultry of *desi* type, more study should be made of them. Regular collection of eggs can be done better by licensed collectors under distributed system of areas and villages. Such a method has worked successfully in Bombay both in the interest of producers and consumers. Grading of eggs as described already will certainly be a very useful improvement in the marketing of eggs. As in hot weather much damage occurs by staleness and prices are low, it is worthwhile investigating possibilities of cold storage. The devising of suitable packages for eggs to minimise loss in breakage, has already been undertaken by the Marketing Section and small trial boxes have yielded encouraging results in North India.

Crop and Trade Reports.

Cotton—1937-1938—Fifth or Final Report. The average of the areas under cotton in the Madras Presidency during the five years ending 1935-36 has represented 9·5 per cent. of the total area under cotton in India.

2. The area under cotton in the Madras Presidency in 1937-38 is estimated at 2,556,100 acres as against 2,578,400 acres for the corresponding period of last year and 2,512,000 acres according to the forecast issued in February. The present estimate for the Presidency represents an increase of 1·7 per cent. as compared with the finally recorded area of 2,512,194 acres in 1936-37. The final estimate of last year exceeded the actuals by 2·6 per cent.

3. Picking of cotton is in progress and may be finished within a month.

4. Normal yield is expected in Chittoor, North Arcot, Tanjore, Madura (irrigated Cambodia only), Malabar and South Kanara. A yield below normal is expected in the other districts. The estimated yield is lowest in Anantapur (57 per cent.); Bellary comes next with 60 per cent.

The seasonal factor for the Presidency works out to 96 per cent. of the average for irrigated and 80 per cent. for unirrigated cotton, the corresponding figures according to the Season and Crop report of last year being 94 per cent. and 86 per cent. respectively. On this basis the yield works out to 505,200 bales of 400 lb. lint as against 497,120 bales last year which represents an increase of 1·6 per cent. The yield in an average year is estimated at 506,570 bales. It is, however, too early to estimate the yield with accuracy as much will depend on future weather conditions and their effect on the second crop and on the amount of damage done by insect pests.

5. The estimated area and yield under the several varieties are given below:-

Variety.	*Area in hundreds of acres.*		*yield in hundreds of bales of 400 lb. lint.*	
	1937—38. Acs.	1936--37. Acs.	1937—38. Bales.	1936—37. Bales.
(1)	(2)	(3)	(4)	(5)
Irrigated Cambodia ...	264,8	244,9	159,9	140,1
Dry Cambodia ...	312,4	286,9	63,4	60,3
Total, Cambodia ...	577,2	531,8	223,3	200,4
Karunganni in Coimbatore ...	142,0	131,5	28,9	30,1
Uppam in the Central districts ...	34,9	37,7	5,2	6.1
Nadam and Bourbon ...	25,2	17,8	1,1	9
Total, Salems ...	202,1	187,0	35,2	37,1
Tinnevellies* ...	547,5	625,5	134,0	155,0
Northerns and Westerns ...	1,091,0	1,079,0	89,7	116,2
Cocanadas ...	131,3	149,6	22,2	25,3
Others ...	7;0	9,2	8	1,2
Presidency ...	2,556,1	2,578,4	505,2	535,2

* Includes Uppam, Karunganni and mixed country cotton in the South.

6. The table below gives final information so far as it is available on the crop of 1936-37 :—

(*Figures in hundreds of bales of 400 lb. lint i. e.*, 00 *being omitted.*)

Particulars.	South		Deccan Northerns and Westerns.	Rest of the Presidency Cocanadas and others.	Total.
	Tinnevellies and Salems.	Cambodia.			
(1)	(2)	(3)	(4)	(5)	(6)
(1) Pressed at presses and loose cotton received at mills in 1937-38.	140,9	245,7	103,5	30,3	520,4
(2) *Add* estimate of extra factory consumption.	6,0	Nil	6.0	4,0	16,0
(3) Total crop of 1936-37.	146,9	245,7	109,5	34,3	536,4
(4) Yield as estimated in April 1937.	192,1	200,4	116,2	26,5	535,2
(5) Yield as estimated in the Season and Crop Report.	172,9	196,6	103,2	24,4	497,1

Note:—(1) Item 1.—The entries mainly relate to the crop of 1936-37. The early sown crop in the Deccan, however, generally comes into the market from December in each year. The figures are taken from the weekly returns furnished by mills and presses.

(2) Item 2.—The figures are approximate.

(3) Figures carry over of crop are not available nor are figures of arrivals and despatches by road of the different varieties available.

7. The average wholesale price of cotton lint per imperial maund of 82 2/7 lb. as reported from important markets on the 4th April 1938 was Rs. 15—2—0 for Cocanadas, Rs. 15—13—0 for White Northerns, Rs. 15—10—0 for Red Northerns, Rs. 13—0—0 for Westerns (early crop), Rs. 15—8—0 for Westerns (late crop), Rs. 21—15—0 for Cambodia, Rs. 23—7—0 for Coimbatore Karunganni. Rs. 18—9—0 for Tinnevelly Karunganni, Rs. 17—2—0 for Tinnevellies, and Rs. 17—1—0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 7th February 1938 these prices reveal a fall of about 9 per cent in the case of White Northerns and Tinnevellies, 8 per cent in the case of Cocanadas and Nadam cotton, 6 per cent in the case of Coimbatore Karunganni, 5 per cent in the case of Westerns (Jowari or late crop) and Red Northerns, 4 per cent in the case of Tinnevelly Karungannni, and 2 per cent in the case of Westerns (early crop), the price of Combodia remaining almost stationary. (*Director of Industries, Madras.*)

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1938 to 13th May 1938 amounted to 154,271 bales of 400 lb. lint as against an estimate of 488,600 bales of the total crop of 1937—38. The receipts in the corresponding period of the previous year were 190,864 bales. 145,536 bales mainly of pressed cotton were received at spinning mills and 14,411 bales were exported by sea while 44,621 bales were imported by sea mainly from Karachi and Bombay. (*Director of Agriculture, Madras.*)

College News & Notes.

Students' corner. The University examinations for the B. Sc. degree in Agriculture came to a close by the beginning of the month. The results of the examinations are published elsewhere in this number.

Personal. We understand that Mr. K. Krishnamurthi Rao, Assistant Sugarcane Expert, Imperial Cane Breeding Station, Coimbatore, is availing of leave from 1st June 1938, preparatory to retirement. The staff of the Cane Breeding Station, entertained him at a grand Tea and Dinner party on the 15th May. The Managing Committee of the Agricultural College Public Servants Co-operative Credit Society Ltd., Lawley Road P. O., of which he was the President entertained him at a Tea Party in view of his retirement from the Presidentship of the Society.

We are glad to record that Dr. J. Muliyil, Lecturer in Agricultural Zoology has been appointed as Sugarcane Parasitologist under the Imperial Council of Agricultural Research, New Delhi, and Mr. S. Kuppuswami Ayyar, Lecturer in Animal Hygiene as Veterinary Investigation Officer, Bihar and Orissa.

Agricultural College P. S. C. C. Society. Mr. V. Ramanatha Ayyar, has been elected as the President of the Society.

Visitors. As examiners for the University examinations for the B. Sc. degree in Agriculture the following gentlemen visited the Estate:— Mr. K. R. Narayana Iyer, Director of Agriculture, Travancore, Mr. Appathurai Mudaliar, Industrial Engineer, Mysore, Mr. G. Krishnaswami Mudaliar, Retired Veterinary Assistant Surgeon and Lecturer in Animal Hygiene, Mr. Saadat-ul-lah Khan, Deputy Director of Agriculture, St. Thomas Mount, Madras, and Mr. S. Narayanaiah, Assistant Director of Agriculture, Nellore.

Mr. P. H. Rama Reddy, Director of Agriculture, Madras, arrived at the Estate on 17th May and left for Ootacamund on the 20th. He is expected back at Coimbatore on the 31st.

Weather Review—APRIL 1938.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	0·4	−0·4	1·5	South	Negapatam	1·1	+0·5	13·0
	Calingapatam	0·0	−0·9	1·3		Aduthurai *	0·2	−0·7	6·3
	Vizagapatam	0·0	−0·7	2·1		Madura	2·0	−0·1	6·5
	Anakapalli*	0·1	−1·3	1·4		Pamban	1·4	−0·2	11·1
	Samalkota*	...	...	0·0		Koilpatti*	5·9	+2·8	12·0
	Maruteru*	...	−0·7	0·0		Palamkottah	4·5	+2·0	13·3
	Cocanada	0·0	−0·6	0·7					
	Masulipatam	...	−0·6	0·0					
	Guntur*	...	−0·8	0·0	West Coast	Trivandrum	8·4	+3·9	14·4
						Cochin	3·5	−1·2	5·2
Ceded Dists.	Kurnool	0·3	−0·3	0·9		Calicut	10·3	+7·0	10·4
	Nandyal*	0·0	0·0	0·0		Pattambi *	7·2	+4·1	9·2
	Hagari *	0·4	−0·6	1·2		Taliparamba *	6·1	+3·5	0·3
	Bellary	0·2	−0·6	1·3		Kasargode *	3·9	+1·5	3·9
	Anantapur	0·0	−0·5	0·3		Nileshwar*	4·6	+3·0	4·7
	Rentachintala	0·0	0·0	0·5		Mangalore	3·9	+2·6	4·3
	Cuddapah	0·0	−0·5	0·0					
	Anantharaju-pet *	0·0	−4·2	0·1	Mysore and Coorg	Chitaldrug	1·7	0·0	2·0
						Bangalore	0·6	−0·7	0·9
Carnatic	Nellore	0·0	−0·4	0·1		Mysore	2·0	−0·3	2·4
	Madras	0·0	−0·5	2·0		Mercara	4·0	+1·4	7·5
	Palur *	1·7	+0·4	6·8					
	Tindivanam *	0·0	−1·0	3·7					
	Cuddalore	0·9	+0·3	6·2	Hills	Kodaikanal	3·1	−1·2	8·3
Central	Vellore	0·0	−1·0	0·4		Coonoor	0·0	...	0·0
	Salem	1·5	−0·3	2·5		Ootacamund *	5·1	+1·3	7·0
	Hosur*	...	...	...		Nanjanad *	2·4	−0·9	4·8
	Coimbatore	2·2	+0·8	2·8					
	Coimbatore A. C. & R. I.*	2·2	−0·5	2·6					
	Trichinopoly	0·5	−1·2	2·2					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 published in the Fort St. George Gazette.

A trough of low pressure which formed on 18th in the Bay of Bengal caused thunder weather over the area between Pegu and Ceylon and became less marked on 21st.

Scattered and widespread thunder showers occurred on almost all days of the month in parts of Hyderabad, Mysore, Malabar and South East Madras. Rains local as well as general also occurred throughout the Presidency during the month.

Rainfall was in large defect in the Circars, Ceded districts and parts of Central and Carnatic districts, while excess in other parts of the Presidency.

Weather Report for Agricultural College and Research Institute.

Report No. 4/38.

Absolute maximum	...	...	98·0°F.
Absolute minimum	...	...	69·5°F.
Mean maximum	...	...	95·0°F.

Departure from normal	...	-0·2°F.
Mean minimum	...	73·5°F.
Departure from normal	...	+0·4°F.
Total rainfall	...	2·17"
Departure from normal	...	-0·53"
Heaviest fall in 24 hours	...	0·56" on 22nd.
Total No of rainy days	...	6 days.
Mean daily wind velocity	...	1·1 M. P. H.
Mean humidity at 8 hours	...	72·4%
Departure from normal	...	-0·2%

Summary. Fine dry weather prevailed. The thunder storms began to appear by the middle of the first week and thunder rains occurred during the first two weeks and the last week of the month. The rainfall totalled 2·17" and the heaviest fall of 0·56" was recorded on 22nd. Day temperature continued to be the same though the mean minimum and humidity were higher than the previous month. Lightning and storms of line squall and dust storm types were recorded on most of the days. P. V. R. & P. G.

Departmental Notifications.

Transfers.

Name of officers	From	To
Mr. M. R. Balakrishnan	Asst., Chemistry Section	Asst. in Chemistry, A. R. S., Siruguppa.
„ N. Srinivasa Rao	A. D. (On leave)	A. D., Krishnagiri.
„ C. S. Sankaranarayana Ayyar	A. D., Krishnagiri	A. D., Hosur.
„ N. S. Rajagopala Ayyar	A. D. (On leave)	A. D., Salem.
„ N. Raghava Rao	F. M. A. R. S., Anakapalli	A. D., Narasannapeta.
„ M. Lakshmikantam	A. D., Narasannapeta	A. R. S., Anakapalli.
„ V. S. Rangacharyalu	A. D. F. R. S., Kodur	A. D., Cuddapah.
„ C. Bhujanga Rao	F. M. F. R. S., Kodur	A. D., Anantapur.
„ C. Krishnamurthi	F. M. D. F. S., Hagari	A. D., Bellary.
„ A. B. Adisesha Reddi	A. D., Tadpatri	A. D, Atmakur.
„ K. Sitarama Ayyar	A. D., Pattukottai	F. M. A. R. S., Pattukottai
„ S. Venkatarama Ayyar	A. F. M., Pattukottai	A. D., Mannargudi.
„ D. C. Hanumantha Rao	A. D. (On leave)	A. D., Bezwada.
„ G. Krishnamurthi	F. M. A. R. S., Nandyal	A. D., Kurnool.
„ A. Raghavan	F. M. A. R. S., Nandyal	A. D., Rajampet.
„ S. Venkataramanappa	F. M. D. F. S., Hagari	A. D., Cuddapah.
„ S. Kanakaraj David	A. D., Nandyal	F. M. D. F. S., Hagari.
„ S. Ramachandran	A. D., Omalur	A. D., Tinnevelly.
„ C. Vadamalai	A. D., Anantapur	A. D., Hindupur.
„ G. Satyanarayana Rao	A. D., Guntakal	A. D., Penukonda.
„ Ali Hyder	A. D., Bellary	A. D., Kudligi.
„ K. Ramaswami Ayyar	Asst. L. A., Coimbatore	A. D., VIII Circle, Coimbatore.
„ A. Muhamad Ali	A. D.. Puthur	A. D., Tirukoilur.
„ K. Ambikacharan	A. D., Tirukoilur	A. D., Puthur.
„ K. Varadachari	A. D., Chingleput	A. D., Villupuram.
„ T. V. Srinivasa Charlu	A. D., Villupuram	A. D., Chingleput.

Leave.

Name of officers.	Period of leave.
Mr. M. B. V. Narasinga Rao, Assistant, A. R. S., Maruteru	Extension of l. a. p. for one month from 28—4—38.
„ K. Kunhikannan Nambiar, Assistant, A. R. S , Pattambi	L. a. p. for 1 month from 6—5—38.
„ K. K. Subramania Iyer, A. D., Srivaikuntam	L. a. p. for 2 months from 16—5—38.
„ B. Shiva Rao, A. D., Vizagapatam	Extension of l. a. p. for 1 month from 1—5—38.
„ K. K Raghavan, A. D. (on leave)	Extension of l. a. p. for 2 months from 15—4—38.
„ R. Vasudeva Rao, F. M. A. R. S., Samalkota	L. a. p. for 1 month from 5—5—38.
„ J. S. C. Antony, A. D. (on leave)	Extension of l. a. p. for 2 months from 21—4—38.
„ S. Ramaswami Ayyar, Botany Asst., A. R. S., Gudiyatam	L. a. p. for 4 months from the date of relief.
„ K. V. Seshagiri Rao, A. D., Kurnool	L. a. p. for 4 months from 5—5—38.
„ S. M. Kalyanarama Ayyar, Asst. in Cotton (on leave)	Extension of l. a. p. for 1 month from 13—5—38.
„ N. S. Rajagopalan, A. D. (on leave)	Extension of l. a. p. for 1 month from 14—5—38.
„ G. Venkataramana, A. D., Gurazaa	L. a. p. for 1 month from 4—4—38.
„ P. Narayana Nayar, A. D., Kugalur	L. a. p. for 2 months from 2—5—38.
„ A. B. Adisesha Reddy, A. D., Tadpatri	L. a. p. for 1 month from 1—5—38.
„ C. S. Rajaratna Mudaliar, A. D. in Mycology, Coimbatore	Extension of l. a. p. for 1 month from 13—4—38.
„ G. Sakharama Rao, A. D., Udipi	L. a. p. for 20 days from 24—4—38.
„ M. R. Balakrishnan, Asst. in Chemistry Section	L. a. p. for 1 month from 2—5—38.
„ L. Neelakantan, Cotton Asst., A. R. S., Nandyal	L. a. p. for 1 month from 20—5—38.
„ G. K. Subramania Ayyar, A. A. D. (on leave)	Extension of l. a. p. for 4 months from 15—5—38.
„ K. Suryanarayana, A. D., Chipurupalli	L. a. p. for 21 days from date of relief.