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Editorial.

Duty on Foreign Rice. The report of the special officer appointed last year to enquire into the rice production and trade in Madras has recently been published.

Among other things the report lays emphasis on two aspects of the question which have received considerable attention from the public in recent times namely (1) The import of large quantities of foreign rice into Madras which was one of the main causes of the reduction of the price of the commodity in the Province, and (2) The prevailing high rates of railway freight which mitigated against the development of internal trade. Action on both these matters, rested with the Government of India who decided in March this year to impose a duty of 12 annas per maund (82 lb.) on imports of broken rice.

In many quarters, the duty of 12 annas on broken rice is considered inadequate to meet the needs of the situation and the recommendation of the crop planning conference which met in Simla last June lends support to this view. The Legislative Council, Madras, expressed its dissatisfaction on the inadequacy of the relief measure, and suggested that the duty on broken as well as whole rice should be raised to Re 1—8—0 per maund.

It was the contention of many of the members that quantities of paddy, and rice raw and parboiled, were being imported into Madras in

addition to broken rice, and unless all kinds and grades were included in the levy no benefit would accrue to the cultivator. It must be remembered in this connection, that broken rice is a by-product of the rice milling industry of the exporting countries, which send out their graded produce to more fastidious countries but depend on India almost entirely for the disposal of their broken rice. Hence this commodity could afford to stand a good deal of competition with regard to prices, and a levy of duty on this may not have the desired effect of restricting its import and raising the level of the price of paddy. On the other hand, other members contended that the imposition of a duty on a staple food product would adversely affect the consumers, and especially the urban labouring classes. The famine conditions prevailing at the time, and the low output of food grains in 1934—35 due to adverse seasonal conditions, in a way justified their point of view. We would like to point out, however, that there is a fallacy attached to this argument regarding the supposed conflict of interests between the labouring and the cultivating classes. This conflict is largely illusory, since under Indian conditions the prosperity of the one is closely linked with the other, and the purchasing power of the rice cultivator, is the mainstay of the industrial labourer, and any measure which will help the former must perforce have a beneficial effect on the latter.

It is too early to consider the effect of the imposed duty on paddy prices. The major portion of the produce in the province comes to the market during the period January to March, and the percentage of rice growers who can afford to wait and take their produce to the market later in the season is relatively small; and hence any benefit which the imposition of the duty affords, is more likely to help the trader and middleman rather than the cultivator during this season. But there are signs of improvement in the price of rice and the present trend is likely to continue till the next harvest in October.

We hope that the Government of India will reopen the question before then and consider the advisability of increasing the duty and extending it to imported paddy and whole rice.

New Crops and Old. This is the heading given to the leader in the Madras Mail on 30th April. It arose out of an interview given by Mr. S. V. Ramamurthy, Director of Agriculture, Madras to the special correspondent of the paper indicating the natural advantages which Madras possessed for growing special crops like sugarcane and fruits. The Director's view that Madras should take early action to extend its sugar manufacture rapidly up to the extent of at least of supplying its needs has been criticised as 'bad economics'. We hardly agree with this criticism. If Madras were to rest content with getting its sugar needs from outside, it is obvious that there must be some

product which she can produce and profitably exchange it with sugar. But as things stand she has not got such a commodity. The question is therefore mainly one as to what she can produce more economically than other Provinces with the existing resources. As pointed out by Mr. Ramamurthy in a later communication, Madras can manufacture sugar cheaper than North India by growing Coimbatore canes like Co. 213. Recent work in sugarcane breeding has also shown that Co. 213 can be replaced by certain varieties of thick canes suitable to Madras for irrigated conditions. With the introduction of these types into general cultivation the necessity to grow thin canes chiefly to economise in cost of cultivation should disappear.

We believe Mr. Ramamurthy was right in his statement that Madras failed to take advantage of the favourable conditions early enough. A considerable time has probably been wasted in trying to evolve a particular type of sugar mill suitable to the small producer and in improving the methods of manufacturing jaggery. A number of sugar companies have been floated recently in Madras but very few of them have yet made any headway. On the other hand we hear of sugar companies in North India which have been able to realise half their capital outlay in two years after start.

More than the competition from the north, Madras has a serious rival in the adjacent State of Mysore. Here thick canes are grown under irrigated conditions as in Madras and the factory started in Mandya two years ago is already producing more sugar than what could be consumed within the State and it is increasing the output from this June.

Even if Madras does not produce sugar to the extent of competing with North India or Mysore, the growing of sugarcane in place of other crops that are less paying should be welcomed in places where facilities exist. Such possibilities appear to exist to the greatest extent in the central districts of Chittoor, North and South Arcots, Salem and Trichinopoly. The area under sugarcane in these districts has increased from 19,956 acres in 1928—29 to 54,129 acres in 1932–33 and this is a happy augury.

There is however one important consideration in the manufacture of sugar, the neglect of which is likely to hinder further development i. e., the existence of a healthy co-operation between the grower and the miller. While the grower should undertake to supply the mills with his canes, the price offered by the miller should allow a reasonable margin of profit to the grower to encourage him to grow canes in preference to other crops. Co-operative undertaking in which the grower has some interest will probably be the best way of meeting the problem. We do hope that this will be kept in view when new factories are brought into existence.

ANTHESIS AND POLLINATION IN BENGAL GRAM (*CICER ARIETINUM*)

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A study of the time of flower opening and anther dehiscence is a necessary pre-requisite in any scheme of plant breeding where artificial hybridisation is contemplated. As the mechanism controlling these phases of floral development are influenced by latitude and season, it is essential that separate data are collected on this aspect at each place of investigation. In Bengal gram (*Cicer arietinum*) Howards and Khan (1915) have recorded their observations under the conditions obtaining at Pusa. Since no information under South Indian conditions was available, detailed studies were undertaken at Coimbatore during 1931—32.

Bengal gram is usually sown in the Coimbatore District about the middle of November, and is in flowers between the second week of January and the first week of February. A pattern of its flowering curve is given in Chart I. It may be mentioned here that this crop belongs to the category of plants, the flowers of which open and close for two successive days.

Anthesis. Groups of flower buds were marked a day prior to their opening on 4 days in 1931, and 3 days in 1932 in a bulk rainfed crop grown on the black soil during the cold weather, and the time of their opening and closing were observed carefully every half an hour on two consecutive days during each period except on 9—1—1931 when the second opening and closing was not observed. Apart from these, two sets of flower buds were studied at hourly intervals in a crop raised for another purpose on red loamy soil under irrigated conditions during the summer of 1932. The data obtained on all these days are tabulated into hourly class intervals and given in Table I·(a) and (b).

When the figures relating to the time of opening of flowers are examined it is seen that:—

1. Some of the buds under observation did not open at all (even for the first time) and the proportion of such (cleistogamous) flowers was greater in summer crop. For instance in January 1932 the percentage of cleistogamous flowers ranged from 8 to 12, while it was between 32 to 42 in June and July.

2. Among the buds that bloomed on the first day some did not open on the second day. The ratio of such flowers increased with the

Table I.(a). Flower opening and closing in B. Gram in 1931.

Hours.	First opening and closing.								Second opening and closing.					
	9—1—1931		15—1—1931		31—1—1931		27—2—1931		16—1—1931		1—2—1931		28—2—1931	
	Percentage of flowers Opened	Closed.	Percentage of flowers Opened	Closed.	Percentage of flowers Opened	Closed	Percentage of flowers Opened	Closed	Percentage of flowers Opened	Closed	Percentage of flowers Opened	Closed	Percentage of flowers Opened	Closed
9 A. M.	...	...	...	...	...	...	...	...	16	...	4	...	2	...
10 „	22	...	42	...	27	...	24	...	6	...	1	...	...	...
11 „	36	...	22	...	31	...	22	...	...	2	...	...	...	1
12 Noon.	8	...	7	...	9	...	15	...	...	9	...	2	...	0
1 P. M.	5	...	3	...	9	...	7	...	...	5	...	0	...	0
2 „	6	...	5	...	8	...	14	...	...	5	...	3	...	1
3 „	...	...	...	...	...	...	...	...	...	1	...	...	...	...
4 „	...	...	...	...	...	40	...	38	...	...	...	...	...	...
5 „	...	64	...	29	...	18	...	27	...	...	...	...	...	...
6 „	...	12	...	49	...	25	...	13	...	...	...	...	...	...
7 „	...	...	...	1	...	1	...	4	...	...	...	...	...	...
Total.	77	76*	79	79	84	84	82	82	22	22	5	5	2	2
Percentage of Cleistogamous flowers.	23		21		16		18							

* One damaged.

Table I-(b). Flower Opening and Closing in B. Gram 1932.

Hours.	First opening and closing.										Second opening and closing.									
	4-1-1932		11-1-1932		22-1-1932		23-6-1932		2-7-1932		5-1-1932		12-1-1932		23-1-1932		24-6-1932		3-7-1932	
	Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers		Percentage of flowers	
	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed
9 A.M.	...	...	...	...	64	...	4	...	4	...	12	...	4	...	6	...	2	...	...	...
10 „	38	...	40	...	18	...	4	...	6	...	8	...	2	...	...	...	...	...	...	...
11 „	25	...	32	...	6	...	4	...	8	...	4	...	1	...	...	...	...	...	...	...
12 Noon	15	...	13	...	2	...	10	...	8	...	3	...	...	...	...	...	...	...	...	...
1 P.M.	7	...	1	...	2	6	18	4	6	2	...	3	...	6	...	2	...	...	...	...
2 „	2	...	3	1	...	10	24	8	24	8	...	9	...	...	...	4	...	2	...	...
3 „	1	2	1	5	...	8	4	14	2	12	...	9	...	...	...	...	...	...	...	...
4 „	...	24	...	39	...	34	...	30	...	12	...	4	...	...	...	...	...	...	...	...
5 „	...	28	...	14	...	10	...	10	...	20	...	2	...	1	...	...	...	...	...	...
6 „	...	31	...	16	...	14	...	0	...	4	...	...	...	...	...	...	...	...	...	...
7 „	...	2	...	15	...	6	...	2	...	...	...	...	...	...	...	...	...	...	...	...
Total.	88	87*	90	90	92	88**	68	68	58	58	27	27	7	7	6	6	2	2	...	...
Percentage of Cleistogamous flowers.	12	...	10	...	8	...	32	...	42											

* One damaged. ** 4 damaged.

advance in season. In 1931 the percentage of flowers that did not open for the second time on the 16th January, on the 1st February and on the 28th February were 72, 94, 97 respectively.

3. Though a few commenced opening on the first days at about 9 A. M., the time of most active blooming was between 9 to 10 A. M. The laggards however kept on till 3 P. M. The buds developing in summer under irrigated conditions started opening at the same time as in cold months, but the rate of opening in the course of the day was very much slower, reaching its peak at 2 P. M.

4. On the second day, the opening was much earlier and less drawn out in distribution. Anthesis started at 8 A. M. and by 11 A. M. it was complete.

When these observations were compared with those recorded at Pusa, it is noticed that no mention of cleistogamy is made at the latter place except a small note made in the body of the Table IV, on page 220-(4) to the effect that two flowers (out of the sixteen under observation) did not open. Very probably this feature is not very much pronounced there. The difference in behaviour if present, may be due to varietal differences. At Coimbatore most of the North Indian types dry up when they are in flowers, while the local types complete their life cycle rapidly.

The occurrence of higher percentage of cleistogamous flowers in the summer crop needs an explanation. Henslow (1838), and Coulter, Barnes, and Cowles (1932), mention that fall or rise of temperature and illumination, poor nutrition, changes in turgor pressure, and parasites may induce cleistogamy which might also involve changes in structure, form and setting. The data on the setting of pods show that it was as good as in chasmogamous group. (Table II).

Table II.

Percentages of setting.

Date of observation.	Open flowers.			Clestogamous flowers		
	No. observed.	No. set.	Percent of setting.	No. observed.	No. set.	Percent of setting.
9—1—1931	70	44	63	20	16	80
15—1—1931	70	50	71	19	13	68
27—2—1931	61	37	61	14	7	50
4—1—1932	80	69	86	11	9	82
Total.	281	200	71	64	45	70

A scrutiny of the hourly figures relating to temperature, humidity, number of hours of sunshine, and total atmometric evaporation on these days, point out that they bear no relation to the phenomenon observed, Table III.

Table III. *Air Temperature °F.*

Date.	Hours. 6 A.M.	7 A.M.	8 A.M.	9 A.M.	10 A.M.	11 A.M.	12 N.	1 P.M.	2 P.M.	3 P.M.	4 P.M.	5 P.M.	6 P.M.
9—1—1931	67	67	68	69	74	78	79	80	81	82	82	82	79
15—1—1931	71	71	71	72	73	75	76	77	78	80	80	80	80
31—1—1931	72	72	72	72	72	74	75	79	80	81	81	81	81
27—2—1931	69	69	70	76	80	83	85	87	87	88	88	88	88
4—1—1932	68	69	70	74	76	78	80	80	82	81	80	79	76
11—1—1932	62	68	70	74	77	80	81	82	83	83	82	80	78
22—1—1932	70	70	70	72	74	75	80	82	83	83	84	83	82
23—6—1932	73	76	79	81	83	84	84	84	84	84	80	78	77
2—7—1932	68	72	74	78	80	83	85	87	87	87	83	80	77

Further if alterations in temperature are responsible for the higher percentage of cleistogamous flowers observed in the summer crop, one would expect a consistently higher or lower proportion in the latter part of the flowering period when the days get warmer. But a study of distribution of unopened flowers during the entire flowering period (vide chart I) shows that it is not so. The peaks noted on the 7th, 13th, 16th, 17th, 20th and 23rd January are not associated with any rise or fall in atmospheric temperature prevailing on these days. The only possible explanation left is the difference in the nutrition between the two crops studied. The soil on which the off-seasonal crop was grown and the water used for irrigation were slightly alkaline, while the seasonal crop was raised on more or less neutral soil under rainfed conditions. The summer crop was very much poorer in growth than that raised in the cold weather. The tardiness observed in the opening of the chasmagamous flowers produced in summer plots (Table I-b) tends to support this possibilty. It is stated by Coulter, Barnes and Cowles that want of available food in the embryonic regions might bring about alterations in the time of opening and closing of flowers in spite of favourable temperature and illumination.

If the figures of the closing of the flowers are compared, (Tables I-(a) and (b) it is seen that:—

1. The march of closing is more gradual and less rapid. Although flowers in 1932 commenced the first closing earlier than in 1931, largest number closed nearly at the same time in both years viz, between 4 and 5 P. M.

2. The second closing starts very much earlier than the first. In 1931 the latter did not begin before 4 P. M. while in the former flowers closed as early as 11 A. M.

3. The daily scheme of closing in the summer crop is however similar to that obtaining in the crop grown in the normal season. This feature forms a direct contrast with its behaviour during opening.

The data collected at Pusa on this point show that the closing occurs at about the same time on both the days.

The results of the duration of flowering point out (Table IV) that the flowers remain open for a shorter time during the hot months

and also on the second day, and that the duration of flowering on the second day is not influenced by its performance on the first day.

Table IV. *Duration of flower opening. Frequency distribution.*

Duration in hours.	First Opening.									Second Opening.							
	9—1—31	15—1—31	31—1—31	27—2—31	4—1—32	11—1—32	22—1—32	23—6—32	2—7—32	16—1—31	1—2—31	28—2—31	5—1—32	12—1—32	23—1—32	24—6—32	3—7—32
1	...	...	...	...	...	...	...	6	2	...	...	...	...	...	...	...	...
2	...	...	1	4	2	2	...	32	14	5	1	1	3	1	...	...	...
3	2	1	12	4	4	2	...	12	22	6	1	...	3	1	...	...	...
4	7	6	5	4	6	7	4	8	6	5	...	...	4	4	...	...	...
5	7	2	7	13	13	9	12	6	6	5	2	...	5	...	6	2	...
6	27	11	28	27	16	31	12	4	8	1	1	1	7	...	...	...	...
7	28	36	14	10	21	19	26	...	...	...	...	...	3	...	...	...	...
8	6	23	16	11	19	11	20	...	...	...	...	...	2	...	...	...	...
9	...	...	...	...	6	8	8	...	...	...	...	...	...	1	...	...	...
10	...	...	...	...	...	1	6	...	...	...	...	...	...	...	...	...	...
Average hours.	6·2	6·8	5 9	5·8	6·4	6·4	7·1	2·8	3·5	3·6	4·2	4·0	5·0	4·3	5·0	5·0	...

Anther dehiscence and pollination. It has been observed that on the day of flower opening the pollination is complete by the time flowers unfurl their petals. Examinations of buds one day previous to the anthesis have shown that the process had already started by 8 A.M. A large number of buds due to open two days hence were then labelled and examined in lots of fifteen or more, at intervals of two hours from 2 P. M. onwards, on the 20th January 1931 for anther dehiscence, and on the 4th, 13th, and 23rd January 1932 for both anther dehiscence and for pollination. The data obtained are furnished in Table V.

Table V. *Dehiscence of anthers in Bengal Gram.*

Hours of observation.	20-1-1931	4—1—1932		13—1—1932		23—1—1932	
	% of buds with dehisced anthers.	% of buds with dehisced anthers.	% of buds with pollinated stigma.	% of buds with dehisced anthers	% of buds with pollinated stigma.	% of buds with dehisced anthers.	% of buds with pollinated stigma.
4 P.M.	8	...	...	...	...	...	...
6 ,,	23	...	...	...	...	4	...
8 ,,	31	13	...	8	...	25	...
10 ,,	36	28	...	25	...	38	10
12 ,,	45	39	4	32	12	65	12
2 A.M.	48	42	4	34	14	86	13
4 ,,	80	42	4	40	23	91	20
6 ,,	100	46	21	61	44	92	32
8 ,,	100	69	35	65	52	98	42
10 ,,	...	84	43	72	70	100	52
12 Noon	...	100	76	100	92	100	67
2 P.M.	...	100	96	100	100	...	100
4 ,,	...	...	100	...	...	...	...

It is seen that the anthers commenced to dehisce more than 40 hours prior to the flower opening. In 1931, they started at 4 P. M. and by 6 A. M. on the next day all had liberated their pollen, while in 1932 the first anther opened between 4 and 6 P. M. only, and the last did not do so till 12 noon of the next day. The active period of opening was between 2 A. M. and 12 noon according to the variations in the phenological conditions.

The stigma, however, got pollinated for the first time at 12 P. M. in the night but the majority showed abundance of pollen grains between 8 A. M. and 2 P. M. on the succeeding day (i. e.) a day previous to the opening of the flower. It may be mentioned here that Pusa types 6 and 8 dehisced their anthers 12 hours later than the local varieties, while Type 1 showed very low percentage of dehisced anthers.

It is reported at Pusa that bees visit flowers in large numbers and a certain percentage of cross pollination occurs in nature. As far as the observations made at Coimbatore go, self pollination seems to be the invariable rule. Few insects are found visiting the flowers. Besides, no hybrid plant has ever been found so far in the several populations raised. The small number of aberrant plants found in them proved to be mutants. These indicate definitely that cross pollination is practically absent at Coimbatore. A few experiments conducted on this aspect fully confirmed the above inference. In one case 50 flowers were emasculated and left unpollinated. No pods resulted from any of these. In another set, 46 flowers were emasculated two days previously and pollinated on the day of flowering with the pollen secured from flowers opening on that day. Only one pod developed. This result might point out that conditions were not favourable for natural cross pollination on the day of flower opening. It could not be said that the pollen grains used in the second experiments would have lost their viability as they were more than 24 hours old by the time the anthesis occurred. For, germination tests made in vitro in culture media made up of 2% agar and 20% of cane sugar showed that on the first day of flower opening 96% of pollen grains were yet viable (Table VI) and it was only at the time of second day opening, the germination capacity fell down to 13%.

Table VI. *Pollen Germination. Average of 6 counts in plates.*

Date of observation.	First day flowers.			Second day flowers.			Remarks.
	Total grains.	No. of grains germinated.	% of germination.	Total grains.	No. of grains germinated.	% of germination.	
23—7—1932	66	63	95	71	10	14	
24—7—1932	73	68	93	81	9	11	
25—7—1932	83	79	95	78	11	14	
26—7—1932	85	83	98	51	6	12*	
30—7—1932	96	94	98	75	9	12	* 4 readings only.
Total.	403	387	96	356	45	13	

It is clear from the foregoing data that in Bengal gram the flowers are protandrous in nature and the pollination is complete in bud stage itself.

Technique of Crossing. Artificial crossing in this crop has been found to be very difficult on account of the smallness of buds and their sensitivity to manipulation. In spite of the great care taken during the process as well as in the selection for fertile parents, only 15 to 19 % flowers managed to set (Table VII).

Table VII.

Percentage of setting in Crosses.

Date of crossing.	No of flowers crossed.	No of flowers set.	Percentage of setting.
30—12—1932 to 9—1—1933	570	108	19
10—1—1933 to 19—1—1933	435	84	19
20—1—1933 to 29—1—1933	242	37	15
30—1—1933 to 11—2—1933	283	48	17

The following method has been found to give very successful results at Coimbatore. Flower buds due to open two days later are selected and labelled. Such buds can be easily identified by their size after a little experience. In the evening between 2 and 6 P. M. the keel is gently pushed apart with a blunt needle and the anthers are carefully removed with a light upward jerk given at the point of attachment with filament, without pricking the anthers. A large number of flowers could be operated quite easily in this manner when one gets familiar with the work. It may, however, be pointed out that care has to be taken to see that the pedicels are handled least, and a few of the tagged flowers are left undisturbed for use as pollen parent later on. On the next morning pollen grains from these buds are removed and dusted between 9 and 11 A.M. on the stigmas of the buds emasculated on the previous evening. It has been found that emasculated buds left exposed overnight without any covering kept fresh on the next day. As insects are seldom found visiting the flowers, there is hardly any risk of cross pollination. Freshness of the pedicel on the subsequent days will indicate the success of crossing. Pods will be seen from these 5 or 6 days hence.

The above method differs from the one described by Khan and Akhtar (1934) in the non-removal of petals and in dispensing with the muslin bags. In fact tissue bags were used at first to cover the emasculated flowers, but they were abandoned when they were found to accelerate shedding. It has been experienced that crossing is more

successful if the earlier formed buds are selected for crossing. They are also easier to manipulate on account of their size and capacity to keep fresh for a longer time.

Pusa types differ among themselves with regard to their sensitiveness to crossing. T-6 and T-8 stand handling better. Types 11 and 13 give higher percentage of setting if they are used as pollen parents. Shaw and Khan (1931), Khan and Akhtar (1934), experienced the same drawback at Pusa in the last two types.

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Summary. Observations made at Coimbatore on the time of opening and closing of flowers in Bengal gram (*Cicer arietinum*) disclosed that :—

(a) Cleistogamy was present and its proportion seemed to be altered by differences in nutritional conditions in the soil.
(b) All the flowers that opened on the first day did not open on the second day.
(c) The time of active blooming was between 9 and 10 A. M. on the first day. In a summer crop, most of the flowers opened at 2 P. M.
(d) The march of closing was more gradual and less rapid than that of opening.
(e) The petals opened and closed much earlier on the second day of their opening.
(f) The total period during which a flower remained open was less on the second day of opening and during hot months.

2. It was also found that the anther dehiscence and pollination occurred one day before the opening of the flowers, and there was hardly any cross pollination notwithstanding the fact that the pollen grains were viable at the time of flower opening.

3. The method of crossing that has been found successful is described.

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GERMINATION TESTS ON SORGHUM SEEDS PRESERVED IN EARHEAD

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To a plant breeder with whom seed material especially of single plants, accumulates rapidly, the whole of which cannot be worked off each succeeding year, the question of how long and in what way this seed could best be preserved with unimpaired viability is a matter of primary importance. In a previous article (Rangaswami Ayyangar and Vijayaraghavan)* the result of the germination tests of loose sorghum seed stored in tin screw top bottles has been reported, and it was recorded that the seeds retain full vitality for about 2½ years and when four years old deteriorated to a germination capacity of only about 10 per cent. It was also recorded that preserving the seed in naphthaline, which keeps the seed free from damage from pests of stored grain, does not affect its germination capacity.

In breeding work in sorghum the individual head is usually the seed unit and it has been the practice at the Millets Breeding Station to keep the seed material from single plant selections as earheads and to thresh them only just prior to sowing. As the earheads are compact and the seeds safely clipped up in the glumes, it has been found that it was enough to scissor off portions of the earhead for sowing purposes and have the rest of it as a sample for future reference, so that the general configuration of the earhead and the seeds on it is, in a measure, preserved for future use. Leaving the seeds in the glumes is an added advantage.

The sample heads thus preserved accumulated through years and in 1933, after ten years of seed accumulation, it was decided to discard superfluous earheads; and before they were rejected the seeds in them were tested for their viability. One to ten years old earheads of the same variety were used in these tests. Two to four heads in each of different important varieties representative of typical tracts were chosen, and 200 grains from each head were germinated. Germination tests were made by keeping the seeds on wet blotting paper or germination trays in an incubator.

The first indications of germination are usually observed from 12 hours onwards and in the case of fresh (½ to 1 year old) seeds germination will be completed in 3 days. In these tests the ungerminated seeds were retained up to a week, and then rejected as having

* Madras Agri. Dept. Year Book, 1926, p. 14.

no vitality. The results of the germination percentages obtained in the different varieties tested are given below.

Viability of Sorghum Seeds Preserved in the Earheads.

Local Name.	Botanical group.	Percentage of germination.							
		1 year old.	2 years old.	3 years old.	4 years old.	5 years old.	6 years old.	7 years old.	
1. Vellai Cholam	Sorghum Durra.	89	82	59	38	1	0	0	Irrigated (Dindigul).
2. Chinna Manjal Cholam	„	100	99	86	22	5	0	0	Irrigated (Coimbatore).
3. Peria Manjal Cholam	„	...	93	97	87	58	1	0	Rainfed (Coimbatore).
4. Patcha Jonna	„	...	...	...	92	16	4	0	Rainfed (Ceded Dts.)
5. Tella Jonna	Sorghum cernuum	...	...	...	95	18	0	0	„
6. Talai Virichan	Sorghum Roxburghii var. Hians.	...	94	90	69	21	2	0	Rainfed Gaping glumes.

It will be noted that in this naked grain, grains with their glumes on the earhead retain their viability longer than when kept as loose seed. So even when larger quantities of seed are to be preserved, picked earheads can be stored in closed metal bins or earthern pots with a few balls of naphthaline.

The rate of deterioration in viability is higher in the irrigated than in the rainfed sorghums. The percentage of germination decreases rapidly in the irrigated varieties after the second year, while in the rainfed varieties the seeds retain full vitality (about 90 per cent.) for three to four years and decreases to less than 50 per cent. after five years and even when six years old stray seeds (1 to 5 per cent.) germinate. In no case did seven years old seeds germinate.

SOME SOUTH INDIAN VILLAGE STUDIES *

(A Preparatory Study of " Villur ", Village No. 119, in Tirumangalam Taluq, Madura District, Madras Province.)

BY P. S. SESHADRI,

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Rainfall and Irrigation.

Nature of Rainfall. The rainfall is very uncertain and scanty even in the best of seasons. A study of the district during a number of years shows no indication of its being concentrated in the two short periods during which the monsoons blow. On the contrary, it appears that there is a continuous rainy season of 9 months' duration

* Continued from Page 148, April issue.

which brings more and more rain until November, when it rapidly declines. During a first rate season there will be rain in almost every month of the year, though the bulk of rainfall is received in October and November, every fall will be of some use to one or another of the many crops that are grown, provided it be not too heavy and protracted. Usually there is nothing like regularity in their occurrence or amount. During some years rain falls in desirable abundance but either too early or too late in the season. This state of affairs naturally confuses and misleads the ordinary cultivator. Often his anticipation fails and he meets with disappointment.

(b) *Tanks.* The tanks of this village fall under the IV class, i. e., those which supply water for 3 months or under. There are two big tanks irrigating 175 and 250 acres each, a dozen small tanks irrigating under 50 acres each, and 6 private ones irrigating 54 acres in all. All the private tanks and six of the smaller ones are purely rain-fed. One big tank and four smaller ones are partly rain-fed but partly supplied by the surplus from tanks which themselves are rain-fed. The other big tank and the remaining 2 small tanks are purely surplus-fed. Not unexpectedly, therefore, some of these tanks often get exhausted in the last stages of the crops and the only hope left is in subsoil or underground water.

(c) *Wells.* When the Revenue Department started issuing agricultural loans about 30 years ago many of the cultivators took the advantage, for the purpose of digging wells. This however did not prove so beneficial as was expected. Springs are generally found at a depth of 15 to 20 feet in hard rocky strata. Good springs are hard to get and there are instances where more than Rs. 1000 has been spent for a well which could not supply enough water for one acre a day in summer. Though well-digging still remains a gamble in these parts, yet every year we find stray attempts at improving old wells or digging new ones. No scientific method is yet known. The loose soil is dug out by the country implements and when rocky strata are met they are drilled and blasted. Silting is not very rapid as the underground is mostly rocky but a parapet wall on the top is necessary to prevent the surface drains flowing into the well in rainy season. Nearly 500 wells have been dug, out of which about 300 are in working condition. About 60 are in wet lands and serve as additional sources of water for paddy and for raising a second crop in summer. The rest are in dry lands and help to grow garden crops.

The water obtained from these wells varies according to the soils through which it passes, but is in no case equal in fertilising value to rain water or tank water. On account of the saline ingredients in the soil, good water is rarely obtained. However none of the wells in the fields is unused, though those within the house-compounds are

neglected. Some people even prefer the alkaline water for irrigating certain crops like chillies.

No water pump has ever been brought to this village, though there are said to be at least 4 or 5 wells, which with slight improvement, can each engage an engine of 5 h. p. and a pump 3″ diameter.

(d) *Methods of irrigation.* (i) *Flood irrigation.* Mostly in wet lands. For this the land must be level and where it is not naturally so, it is corrected by the plough.

(ii) *Furrow irrigation*, in garden lands. Furrows 4-8 feet apart are made in the fields with a gentle slope from the supply. The land is divided into small squares or rectangles, bordered on one side by a furrow. Water is turned into the plots from the furrows.

(iii) *Basin irrigation.* This is practised only for trees and creeper vegetables. A wide circular furrow or basin is excavated around each trunk and water is run from a furrow laid along the rows. Similar basins are made in case of creeper vegetables and watered by hand till they take root.

Generally the tillage operations are not planned in such manner that water may be admitted with ease and held without difficulty during the whole time the land is idle or at rest. Irrigation by underground pipes is unknown. Due to the ignorance as to the requirements of the crops in respect of water, frequent and excessive irrigation also occurs. This brings about the shallowness of rooting and other evils.

Manuring.

The practice of manuring is widely prevalent and various substances are used as manures. Major portion of these is not purchased but made by the cultivators themselves. Sheep penning, oil cakes, farmyard manure and green manure have to be paid for. Farmyard manure or household refuse is generally used for wet lands. Despite the fact that the villagers always try to find other material for fuel than dung cakes, the available farmyard manure is far from sufficient to meet the requirements even of the wet lands. The careless manner in which it is handled shows an utter lack of knowledge about the manurial elements of the different substances. Manurepits are rare and all sorts of refuse are thrown in a heap in the back yard of houses or vacant sites. This not only causes damage to the manure by exposure but it is also a great breeding place for the disease-bearing flies and insects. Though generally very inadequate quantities are applied, cases have occurred where its excess had led to purely vegetative growth. Cattle urine is totally neglected. Green manure is used in plenty ; in fact this is the most largely used manure at present for wet lands. *Avarm*, *virale* and *kolingi* (*Sesbania aculeata*) are the crops usually employed. If the soil is alkaline (*soudu*) more leaves and tank silt are used. The first plant rarely grows wild in this locality. All the three

are mostly grown for this purpose. Sometimes horsegram or redgram is sown on wet lands after the harvests to be ploughed in as green manure for the next paddy crop. Leaves of trees such as *neem*, are also freely used. The fields are well ploughed and irrigated before green manure is spread and trodden. Oil cakes, e. g. castor, gingelly and groundnut are commonly used for wet lands though in very small proportion. They are ground to powder and applied just before flowering of the crop. Sheep penning is done for all kinds of lands as often as possible. Chemical manures are being introduced. Depots are now established within a distance of 4 miles and their use is increasing in surrounding places.

Crops.

(a) *Crop seasons.* The two cultivating seasons prevalent are *kalam* (winter) and *kodai* (summer). On wet lands only the *kalam* crop is raised, for the tanks can hardly supply enough water for anything else. In years of unusually good rains when the tanks get refilled, a second crop is obtained. Where there are wells in wet lands, cereals such as *cholam* (Sorghum) or *ragi* (Eleusine coracana) are grown in summer as a second crop. Dry lands without wells grow only the *kalam* crop while garden lands raise two and sometimes three. The following table gives the details of crops cultivated in the year of resettlement (1920). Since that time groundnut cultivation has nearly doubled and *tenai* and *kudiravali* have gone out of cultivation. Other crops grown are practically the same.

Table V. *Extent of crops cultivated.*

Cereals	Paddy	594 acres.	Industrial crops	Cotton	1740 acres.
	Cholam	225 ,,		Gingelly	53 ,,
	Cambu	92 ,,		Castor	2 ,,
	Ragi	152 ,,		Groundnut	193 ,,
	Tenai	3 ,,		Others	19 ,,
	Samai	101 ,,		Betel	12 ,,
	Varagu	35 ,,			
	Kudiravali	40 ,,	Vegetables	Chillies	61 ,,
	Others	383 ,,		Plantain	6 ,,
				Others	12 ,,
Pulses	Horsegran	13 ,,	Double crop area		155 ,,
	Blackgram	1 ,,			
	Redgram				
	Others	1			

(b) *Extent and nature of crops grown.* The village is hardly self-sufficient in its food crops; in fact it is so in all the essential crops. There are more than 1000 acres under cereals other than paddy. This area however produces, under the best of existing conditions, not more than a fourth of the annual requirements of the village. Less than another quarter is met by paddy, while more than half has to be purchased from outside in the form of imported rice. The same is the case as regards pulses and vegetables, though the requirements of

the latter shrink according to circumstances. Redgram and blackgram are hardly grown at all, while gingelly cultivation requires extension to meet the needs of the place. Cotton, groundnut, chillies and *pan* (betel) are the chief money crops. Though the price of cotton has gone down and the demand for groundnut is not so much as before, yet there seems to be no sign of any diminution in the extent of their cultivation. On the whole, the cotton area, though only 471·26 acres is best suited for the crop, no other equally valuable crop could be found for the rest of the lands. Groundnut oil is being increasingly consumed locally. Chillies are not successfully cultivated, and considering the importance of the crop, there is great prospect for its extension. The crop seems to be subject to many diseases and blights which have not been understood well. Selection of seed and the best methods of cultivation are not known. Betel is a crop raised almost exclusively by the Vellalas; its cultivation is generally well done. The leaves are consumed largely in the surrounding villages and so it has got a fair market. Plantain does not occupy the place it ought to, as admittedly it gives good returns. The reasons are fear of theft, the high initial expense and the costly method of water-lifting.

(c) *Rotation of crops.* All wet-lands without wells grow only paddy and receive no benefit of rotation. In cases where there are wells, the land is occasionally let out for pan cultivation: or a second crop cereal such as *cholam* or *ragi* or a vegetable like brinjal is grown; and rarely a green manure crop. In dry lands *cholam* and *varagu* are never sown twice running on the same land; they are usually followed by *samai* or horsegram. The advantage of rotation is also gained by the system of mixed crops with cotton or groundnut as the main crop. This practice is most common. As regards garden lands the inferior cereals, vegetables, chillies or some pulse, are raised in a system of rotation; root crops like sweet potatoes are rarely grown. Both in dry and garden lands inter-tillage is common. Catch crops are also frequently raised in the place of regular staple crops.

Methods of cultivation.

(a) *Renting lands.* Large scale cultivation has never been attempted in this locality, though there are 47 holdings possessing between 10 to 50 acres each. It is only 2 or 3 farmers among them who keep a labourer permanently. More than one pair of bullocks is very rarely seen with a farmer. The usual practice of a cultivator is to keep as much land as he can himself cultivate with his pair of bullocks and to rent out the rest. This seems to be the reason why no labour-saving machinery has ever been brought into this place. The chief method of renting lands is the system of *varam* by which the tenant bears all the expenses of cultivation with or without tax, and shares equally the produce with the land-lord, the whole of the straw being taken by the tenant. Slight variations in this system exist, when the landlord

undertakes some of the expenses as manure, or tax, for a larger share in the produce. The contract system by which the tenant agrees to pay a fixed amount (which is considerably less than half the produce in this locality) each year, himself enjoying the full produce and bearing all expenses, is rarely found. Farm servants are engaged as whole-time paid servants, or they get their food and clothing and a share of the produce. or simply a share in the produce.

(b) *Soils and cultivation methods.* The black soil requires a thorough soaking before it will raise a crop and thereafter needs no further rain; whereas the red does not retain moisture well and so wants frequent showers. Consquently on the black soils the sowing season may be deferred as late as October, when the land has received the heavy showers of the north-east rains, whereas on the red soils it must be begun in July or August, so that the crops may receive the benefit of all rains. Ploughing involves more labour in the black soil than in the red.

(c) *Wet cultivation.* Of the total cultivable area only 600 acres (16 per cent) are under wet cultivation. Paddy is the chief crop. Both transplanting and broadcasting are done. Often much time is wasted by putting off the preparation of the seedbeds and leaving the fields to soak before beginning to plough. A great deal of neglect is found, particularly in manuring. Fields at a distance from the village get practically no manure at all. Those nearer at hand are given village sweepings and farmyard manure, and sheep and goats are penned upon them once in 2 or 3 years. Only the fields next to the habitations are manured every year. After manuring, the land is flooded and the manure turned in. Then green manure is trodden in. Finally the surface of the field is levelled by *parambu*. The seedlings are then transplanted. Seed is usually soaked before being sown. The seed-bed is sown thin and seedlings are planted out by twos or threes, but not in large bunches. Formerly, sometimes the young plants raised in a nursery were transplanted into a second nursery and afterwards retransplanted singly into the field. In this case the crops are good and the yield largest. Broadcasting is also done in two different ways. Here the expenses are light but the produce is not very remunerative. Fearing the failure of the rains the cultivators, of late, have more and more restricted themselves to broadcasting and stick to the 3 months' variety which suits this purpose best.

(d) *Garden lands.* The farmers having garden lands generally devote great care and attention to their cultivation. Water is available from the wells throughout the year and two or three crops can be raised. The outturn depends more on the cultivator's efforts. His main difficulties are the costliness of pumping water by the existing methods and the low output of the springs in hot weather. The chief

crops cultivated in the gardens are cereals other than paddy, and vegetables like chillies, brinjals and sweet potatoes.

(e) *Dry cultivation.* The method of cultivating dry crops seems unenterprising. First the stubble of the last crop is ploughed in. Then such manure as is available is spread, after which the land is ploughed 3 or 4 times with the usual wooden plough, which is somewhat bigger than that employed on wet-land. Lands away from the village are not manured but, now and again, left fallow to recuperate. As soon as sufficient rain has fallen, the seed is broadcast and the field again ploughed to cover the seed. Mixed crops are common. The pulses and castor are mixed and sown where groundnut, gingelly, cotton or one of the cereals is the main crop. The larger grains such as dhal, castor and beans, are dropped separately one by one in a furrow made by the plough and then. When the crop is about a foot high it is weeded by hand, a small hoe being used. Cholam and cumbu are first thinned with the plough. Neither process is carefully carried out and the fields are often choked with weeds.

Yields.

(a) *Wet lands.* The outturn of paddy, varies from 400 to 1000 Madras measures per acre in the different soils of the district. Almost all of the wet lands of this village are assessed at Rs. 5—10—0 or above per acre (only 2½ per cent. are assessed at Rs. 4—6—0) which shows their fertility is above average (see table III). The produce per acre therefore must be at least 630 Madras measures. In practice this is hardly reached except in small plots of half an acre or less in the better soils. In most of the rented lands it goes as low as 400 measures per acre and in owner-cultivated lands rarely above 600. This was not so 20 years back. Such high rates as 900 measures were, it is said, quite common, the highest limit attained being 1800 measures or more than double the 'grain value'.

(b) *Dry lands.* Cholam and cumbu, have been taken as the standard grains for dry lands, their outturn being 100 to 275 Madras measures per acre for the different soils of the district. These yields compared with those of wet lands are better. The reason is that dry cultivation is comparatively easy and there are no difficulties about irrigation, etc.

(c) *Garden lands.* No special rates are charged for lands converted into gardens and there is no standard available for purposes of comparison. When the same crops are grown in both garden and dry lands, the yield is naturally higher in the former on account of irrigation from wells. However, it is specially for such valuable crops as chillies, tobacco, onions, etc., that garden lands are prized and successful garden cultivation is still a rarity in the village.

Agricultural implements. The implements for tillage, cultivation and harvesting are the same as elsewhere and are obtained from Virudhunagar. Some are made by the local carpenters and blacksmiths and all others are mended or repaired locally. The wood of the Babul (*Acacia arabica*) tree is generally used for these implements. No special wood is bought from outside. There were 161 carts and 188 ploughs in 1920.

Fencing. The pan fields as a rule are always well fenced as the crop stands for three years and as the leaves are likely to be eaten away by stray sheep and cattle. Otherwise, with the exception of a few garden lands which are fenced with a line of thorny trees (*Pithecolobium dulce* Benth) or other bushes, no permanent fencing is found. Whenever necessary low mud walls were raised or thorny branches of the karuvel tree were fixed on the borders of pathways and nullahs easily accessible. Even this temporary fencing is not common at the present time. Considerable damage is done for want of fencing when second crops are raised in isolation.

Storing. After the grains are brought from the fields they are temporarily stocked in a corner to be dried in the sun on the roofs or house-fronts and winnowed later with the help of winds. Circular bins made of cumbu chaff called 'kulukkai' are generally used for storing small quantities. They are quite suited for the domestic requirements of a small family. Larger quantities are stored in overhead cellars. Every house possesses at least one such cellar. These are very dark, ill-ventilated and damp. Paddy and groundn ts often get spoiled by damp. Cotton is always kept in gunny bags in which rats and vermin do considerable havoc. Chillies are never accumulated in large quantities; they are disposed of at every collection. The pulses rarely require special storing arrangements. They are usually kept in covered earthen vessels, but small weevils develop in them and eat away the pulses if they are not periodically sun-dried.

Prices. Though prices have varied greatly since the time when the assessment was made, the standard food grains have never gone below the commutation rate. Cotton is not so paying as before, while the price of groundnut is so low that its cultivation is hardly worth the trouble. Chillies maintain good prices. The pulses and other vegetables vary in price within the usual narrow limits. Land in this village is usually selling at a higher price than its worth, on account of the Chettis competing to buy as much as possible. During the years that followed the war when agricultural produce was selling at high prices, wet lands were sold at Rs. 1500 and dry lands at Rs. 500 per acre. In the majority of cases the net income is slightly more than the assessment; often it is less. Incomes equalling the interest on the value of the land (capital) are very rare indeed. The tendency on the

part of the cultivators when high prices prevailed for agricultural produce was to increase the area of cultivation. The quality of cultivation never improved and no advance was gained in improved agricultural methods. On the other hand, neglect and deterioration are more rapid with low prices.

Holdings. The following table gives details of the holdings which are obviously far too high in a place where irrigation facilities are scanty, the rainfall so uncertain, and the soil not always the best. Most of these are made up of wet, garden or dry land, in the different soils. It is thus very rare that a holding is in one block. The bigger few under the last three items are not so fragmented.

Table VI. Holdings. (Fasli) (1328).

Pattas paying.	Number. Single.	Joint.	Total.	Extent. Acres.	Cents.
1. Rupee 1 and less	60	66	126	40	05
2. Between Rs. 10 and 1	482	235	717	1487	51
3. „ 30 „ 10	127	57	184	1216	28
4. „ 50 „ 30	25	9	34	427	04
5. „ 100 „ 50	4	4	8	243	11
6. „ 250 „ 100	2	3	5	263	37
Total.	700	374	1074	3677	36

Only 47 holdings (4 per cent.) are above 10 acres each (items 4, 5 and 6). Holdings of 2 to 8 acres form roughly 62 per cent. (items 2 'single' and 3), and their extent is more than half of the total cultivable area. Most of these happen to be dry land alone, in which the produce is precarious. To make out a living for 3 or 4 members under conditions like these is most trying and bordering on despair. About 34 per cent. of the holdings (items 1 and 2 'joint') are below 2 acres each and belong to the class of owner-labourers.

Economic holding for the locality. The daily wages per head in this locality is 4 Madras measures of paddy, i. e., one day's subsistence. On this basis the annual requirement for a family of 4 members is 5160 measures, i e., roughly the produce from 8 acres of good land. Dry lands without wells work out to a larger extent, but where there is a well 5 or 6 acres is the limit. In case of mixed holdings, more than 8 acres in all is necessary. As regards working capacity of the people, if all the members of this family work in the field, they are generally able to do optimum cultivation in about 10 acres of dry land without a well, provided it is not too fragmented. If there is a well, or in case of wet lands, 7 or 8 acres is the maximum. Such holdings do not form even 15 per cent. of the total.

(To be continued)

A NOTE ON PRECAUTIONS TO BE TAKEN IN THE CURING AND STORING OF TOBACCO.

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Tobacco in its curing and storing stages is subject to being damaged by attacks of fungi and bacteria which if not controlled properly at the right time will result in serious loss to the producer as well as to the manufacturer. The diseases are peculiar in themselves and occur sporadically due to the negligence on the part of the curer and storer. The nature of the diseases and the possible remedial measures are enumerated below for the benefit of the producer and manufacturer of tobacco.

White veins. In hot places like Guntur, continuous spell of dry weather causes the appearance of white-veins in the barn. The white veins are due to the outer cells of tobacco leaf getting killed soon, by the rapid drying of the leaf. Such leaves allow the admission of air under the epidermis and appear to be devoid of the colouring matter (chlorophyll) in leaf. This condition reduces the value of the leaves for wrappers but seldom for any other purpose. The keeping of the air in the barn slightly humid in dry weather by sprinkling water on the floor may be tried as a preventive measure.

Pole-burn. This is also known as pole-sweat or house-burn. This is due to excess of humidity in the barn in prolonged warm weather and is first noted by the appearance of small dark spots near the base and mid-rib of the leaf. The spots rapidly increase in size and number, and in a short time become confluent. Within the course of 48 hours all the leaves in the curing barn may be affected and destroyed. As a result, the tobacco becomes dark in colour and thoroughly decayed. The decay is due to the presence of a bacterium that gains access to the leaf through wounds on the surface or through the openings made by fungus growths. A reduction of humidity and rise of temperature to 110° F. can put an end to its action. Hence this can be controlled by the judicious regulation of temperature and humidity of the room, with the aid of heating apparatus and ventillators.

Saltpetre. At times while curing and in the process of fermentation a saline efflorescence, caused by the presence in the leaf of large quantities of salts such as potassium, sodium, calcium, and magnesium tends to make the tobacco appear as if attacked by mould. The best way of overcoming the difficulty is to brush the surface of the leaf and spray on it a 4% solution of acetic acid. This removes the deposit.

Moulds and Rots in cured tobacco. The presence of moisture in the cured leaf at the time of storage favours the growth of rots and moulds. The storage room must be kept clean and warm.

In the case of black rot, the affected tobacco leaf has to be subjected to the forced sweating to kill the fungus and drive away the musty odour. There are special air tight rooms constructed and steam is let in it through a metal tubing with a big nozzle attached. Thus the tobacco is subjected to hot air and steam whereby the fungus as well as the spores are killed. The duration of heating depends on the nature of the attack and the quantity of the stuff handled. The tobacco treated for a long time deteriorates to a certain extent. There is a room of this type at Cheerala in the tobacco factory of Messrs. India Leaf Tobacco Development Coy. The trouble, though it may not appear to be serious, causes a good deal of loss in big godowns, if proper care is not taken at the outset.

Research Notes.

Male Sterility in Rice.

During the season of 1932–33, a sterile plant was spotted out in the seed multiplication block of the pure line G. E. B., 24, characterised by a protracted growing habit, with non-emergent panicles bearing spikelets which failed to open and contained considerably reduced and non-dehiscent anthers. The pollen when examined was all aborted, there being no normal grains. The plant, however, set a dozen seeds, which in the succeeding season gave rise to normal individuals with perfect pollen and good seed-setting. When the dozen plants were cultured the following year, segregation of normal and sterile plants was noted in the progenies, the original mutant type coming out as a simple recessive, as shown by the figures in the table.

	Normal	Male-sterile	
Total in 10 segregating families	838	287	
Calculated 3 : 1	844	281	$\frac{\text{Dev}}{\text{S. E}}$ 0·97

The sterile mutant is designated as 'Male-sterile' on an analogy with similar recessive mutants recorded in maize (Eyster 1921). These are easily distinguished in the field from the normals by their characteristic appearance there being no intermediate types. Each plant sets about 10–15 seeds, due to cross-fertilisation by fertile pollen from contiguous normal plants, which gave rise to heterozygous individuals resembling the normals.

Cytological examination of pollen meiosis carried out to ascertain the cause of sterility revealed no apparent irregularities at reduction division, but the spores degenerated following a fairly normal sporogenesis. It may be stated here that this mutant closely resembles another 'the asynaptic mutant' (Unpub) isolated in another strain where the sterility affects both the pollen and ovule and is the result of irregularities of chromosome behaviour at meiosis brought about by lack of pairing of choromosomes at meiosis.

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* Eyster L. A. 1921. *Heritable characters of maize* VII, Male-Sterile—*Jour. Heredity* 12: 138–141.

ABSTRACT.

Ammonium in the nutrition of higher green plants—Jose—H Pardo—*Quarterly Review of Biology*, Vol. 10 No. 1. pp. 1—31.

A detailed review of the salient features of the work so far done in the absorption and assimilation of nitrogen in the form of nitrate or ammonium in the nutrition of higher green plants is succintly given in the above article with 106 references. This was gathered by the author in connection with a series of solution culture experiments carried out by him on NH_4 assimilation by sugarcane. Though the review presented in the publication is representative of the technique and trend of investigation in this field of study, no definite and satisfactory conclusions could be reached at on the basis of the results reported. What could be gathered in a general way is this that: the NO_3 ion is a suitable source of nitrogen for higher green plants in general but many forms have been found to thrive with NH_4 ion as a sole nitrogen source while in some cases these two ions, when supplied separately, showed almost the same degree of effectiveness, in some other cases NO_3 was superior to NH_4 although the latter was nutritionally effective to a considerable extent. In a few cases NH_4 was found to be definitely superior to NO_3 and a good many tests indicated that NH_4NO_3 was equal or superior to either of those two ions supplied separately.

This review presents generally the results of experiments conducted in solution cultures (including sand cultures to which solutions are added) as practical field tests which have been carried out in great numbers by many workers involving a larger group of unknown influences or conditions that can be considered only when physiological cultures are employed. Even in this field of work different experimenters have in many instances obtained very different results with the same kind of plant. It seems clear that such disagreement must be related to experimental influences or conditions that have not been adequately reckoned with. Amongst the number that may possibly be involved are mentioned as those due to (1) employment of varieties or strains of same species. (2) Preliminary treatment of seed and the developmental stages. (3) differences in the employment of criterion to judge growth and development. (4) Want of proper elimination of Concomitant factors position of the media as H. ion concentration (5) Alterations in the nutrient solutions and (6) Physical environment of experimental cultures. In section III the author has presented briefly the summary of experiments arranged with reference to plant families—amongst which graminae occupies an important position because of their economic importance—It appears that all the graminae tested were capable of deriving at least a portion of their new N. from NH_4 as well as from NO_3 but that the use of NH_4 as the only source of N has sometimes apparently resulted in secondry conditions that were more or less injurious to the plants, notably high H-ion concentration of the medium. Different plant forms appear to differ in regard to their capacity to thrive with (NH_4) as the only source of N and different varieties of the same species as well as different developmental phases of the same form have shown marked differences in this regard. Definite conclusions as to the relative capacities or nitrogen preferences of these different plant forms are not yet permissable but it may be said with certainty that rice has greatly surpassed the other graminae tested with regard to its tolerences of such injurious or retarding influences as may have resulted from the employment of NH_4 as the sole nitrogen source. Under the various conditions of the experiments that have been carried out rice has generally seemed to prefer ammonical N to nitrate N but it has grown better with NH_4 NO_3 than with NH_4 alone as a source of N.

Maize and wheat appear to have grown about as well with NH_4 as with NO_3 under suitable conditions but different experimental conditions seem to have swung the apparent nitrogen preferences to one or other of these two sources. Sorghum appears to have prefered NO_3 to NH_4 although the latter gave fair growth in some tests and good growth resulted from the use of NH_4 NO_3 . Sugarcane seems to have prefered NO_3 to NH_4 in early phases of development while NH_4 or NH_4 and NO_3 together were superior to NO_3 alone in more nearly mature phases, Barley has given good growth with NH_4 NO_3 as double source of N. The use of this double source led in some tests to better growth than was given by either NH_4 or NO_3 alone, for rice, maize and the more and more advanced phases of sugarcame.

PLACE OF ENTOMOLOGICAL COLLECTIONS IN ENTOMOLOGICAL RESEARCH

Use in Research : What is the value in scientific research of insect collections? The first evident purpose of a scientific collection is perhaps as a referecce in order;to secure positive identification of insects requiring study and this may account for the building up of reference collections at museums, experiment stations, colleges and in the hands of private collectors.

Of fundamental importance is the place the collection holds in taxonomic studies. In all such work it is vitally important to know what the earlier systematists had in hand when describing the species which were accumulated from the various regions of the earth and in many cases described in such brief and inadequate manner as to leave their identity from description in question. This is especially true of cases where later discovery of related forms has brought to light many species any one of which would meet the specifications given in the early description where perhaps only one species of a genus was known to the describer,

It is an easy matter to criticise and decry the unsatisfactory work of the entomologists of a century or even a half century past but if we stop to consider the difficulty of writing descriptions of a species when only one or a few of what becomes a large genus are known we can feel more respect and sympathy for the pioneer.

Much as it may be ignored or treated with contempt by some groups of biologists it must be recognized that correct identification of species is essential to accurate biologic work and many instances of gross inaccuracy could be cited to show that these have resulted from neglect to determine with certainty the specific standing of the organism treated.

We may even have instances where questions of enormous practical concern are involved where in cases of recognition of introduced pests from other faunal regions or the occurrence of destructive species in objects entering into commerce or affecting public health or sanitation.

Beyond this however a little study will disclose that the collection is a tool for the attack upon many biological problems. Comparisons of specimens from different regions or from different ecologic environments are necessary to the solution of many puzzling questions that arise to confront the student. It is hardly necessary to detail the essential nature of extensive collections in any faunistic study involving the classification of any group of insects So much of the earth's surface has now been explored at least superficially that scarcely any region can be studied without recourse to previous publications or collections. The necessity is perhaps even greater when an

attempt is made to secure a comprehensive ecologic survey of any particular ecologic unit. There should be much larger demand and greater opportunities for trained taxonomists in charge of national and institutional collections.

We all recognize I believe that the problems awaiting solution in Entomology are of very various characters and there may be differences in appreciation of their relative urgency. We need not overlook the pressing nature of problems in other branches when we argue for a greater attention to those taxonomic problems which are really fundamental to permanent advances in our science and in such problems we must certainly recognize the insect collection as a most essential tool. [T. V. R.]

Gleanings.

Fertilising Elements in Fowl Manure. Fowl excreta is comparatively rich in manurial constituents, but naturally varies to some extent in actual composition.

Mr. E. Griffiths gives the following analysis of average fresh fowl manure :—

Nitrogen	1·6 per cent.
Phosphoric acid (P_2O_5) ...	1·7 „ „
Potash (K_2O)	0 8 „ „
Lime (CaO)	2 8 „ „

Fowl manure enriches the soil in all manurial elements, and is particularly rich in available nitrogen and phosphoric acid. (*The Agricultural Gazette of New South Wales*, October 1, 1934).

Dehydration of Bananas or Banana "Figs". To produce the best quality banana "figs" the fruit should be just approaching the ripe stage, but should still be firm.

The skin is removed from the fruit, should this process prove somewhat difficult it can be facilitated by immersing the fruit in boiling water for a few seconds. The fruit is cut into halves lengthwise and placed on wooden trays. It is then submitted to sulphur fumes, the concentration of sulphur fumes being from 1 to 1·6 per cent., which is equal to burning approximately 1½ to 2½ oz., of sulphur for each 100 cubic feet of air space contained in the sulphur hood or sulphur house. The length of exposure to the sulphur fumes will vary slightly but 15 minutes will usually prove satisfactory.

From the fumigating chamber fruit is dried either by placing it out in the sun or in dehydrators. Dehydration is much more satisfactory than sun drying. The fruit can be dried sufficiently in 18 hours in the dehydrator with temperatures ranging from 120 to 125 deg. Fahr. On removal from the dehydrator the fruit is placed in the boxes and allowed to sweat for one to two weeks. It is then packed in attractive ½ lb. and 1 lb. packets.

This product should prove of great value in outlying districts where it is difficult to obtain fresh bananas. The banana "fig" forms a delicious sweetmeat when crystallised.

The loss of weight in the manufacture of banana "figs" from fresh fruit is about 75 to 80 per cent., which means that it will take from 4 to 5 lb. of fresh fruit to manufacture 1 lb. of figs. (*The Agricultural Gazette of N. S. Wales*, April 1, 1935.)

Banana "Coffee". The process followed in the manufacture of banana coffee is as follows :—

The skin is removed from the fruit. Should this prove somewhat difficult it can be facilitated by dipping the fruit in boiling water for a few seconds.

With stainless steel knives the fruit is quartered lengthwise and cut into pieces approximately 2 inches long. It is then placed on wooden trays, which are placed in the dehydrator for 9 hours at an approximate temperature of 120 degrees Fahr., and then the temperature is raised to 130 deg. Fahr., and the process is continued for another 9 hours.

At the end of the 18-hour period the fruit is ready for roasting, and this is carried out in an ordinary coffee roaster. Care must be exercised during roasting to see that the fruit does not stick to the sides of the machine.

Definite information cannot be given as to the exact temperatures and the time that the product will take to roast satisfactorily. These will vary, of course, with the condition of the fruit when received from the dehydrator, and also with the colour the manufacturer desires.

When the product is bone dry it is ground in an ordinary coffee mill. The loss of weight from the fresh stage to the ground product is about 80 per cent.

In many instances banana "coffee" is used pure, but other products have now been made by blending it with ordinary commercial coffee.

This method of using the "coffee" will vary according to individual taste, but the following procedure will give satisfactory results:—To make a pint of beverage, take 2 heaped teaspoons of the coffee and boil in a half-pint of water for 10 minutes. Then strain and to the liquid add half a pint of hot milk and sugar to taste.

Banana "coffee" is also being used as a flavour for chocolates. (*The Agricultural Gazette of New South Wales*, April 1, 1935).

Efficient Rat Trap. An effective rat trap can be made from a kerosene tin. Cut the top away, and have about 6 inches of water in the bottom. Float chaff on the surface of the water so that the rats do not see it, and on the chaff rest the bait--something rather strong such as a piece of old meat. Lean a plank against the side of the tin so that the rats can climb up to the top of the tin. One drowned rat does not prevent others from jumping in. It is possible to catch quite a number of rats in this way. (*Queensland Agricultural Journal*).

Review.

Lalgudi Sivagnanam Co-operative Society. The 9th Annual Report of the Lalgudi Sivagnanam Co-operative Agricultural Society for the year 1933-34 records another year of usefulness. Improved methods of cultivation of paddy in wetlands and of Ragi and Cotton in dry lands were demonstrated. The manufacture of white sugar with small centrifuges and of cream jaggery was on show in a member's holding at Peruvalavanallur. Sales of manures were effected to the tune of nearly a lakh of rupees. Green manure seeds and improved strains of paddy were distributed to members.

The Society has to be congratulated on the marketing programme of paddy of its members on a co-operative basis that has been inaugurated during the year. With the zeal and enthusiasm that the society has been evincing in all its activities and with the loyalty and co-operation of all its members, this new venture should succeed.

The Society has purchased during the year a building for Rs. 4750 from out of its building fund. That during the brief existence of 9 years, the society has put by Rs. 5060 towards the building fund, contributing to the reserve and common good funds at the same time, speaks highly of the management; and we wish the society success in all its endeavours.

The Permanent Committee of the International Institute of Agriculture. The Permanent Committee of the International Institute of Agriculture, assembled for the first time under the Presidency of Professor Baron Giacomo Acerbo, has now terminated its March meeting after holding six sessions. After the discussion of certain questions of finance and internal administration, the Committee proceeded to consider the question of the special studies to be undertaken by the Bureau in carrying out the resolutions adopted by the General Assembly at its reunion in October last, and adopted the recommendations of the Secretary General that special attention should be paid to cotton and to the international market for meat of all kinds.

In addition, the Committee unanimously accepted the recommendations of a special Commission, appointed to give effect to a resolution of the recent Assembly, arising out of a report presented by Mr. F. L. McDougall, Delegate of Australia, and referring to the scientific work of the Institution. This commission consisted of Sir John Russell, Director of the Rothamsted Experimental Station (England), Senator Strampolli, the Italian wheat geneticist and Professor Jonescu Sisesti, Director of the Agricultural Experiment Station of Bucarest, together with certain members of the Permanent Committee and of the Staff of the Institute. The report recommended that the Institute should concentrate its scientific work rather upon the practical and international side of the results of scientific developments than upon recording the progress of the more purely scientific aspects.

The Committee next approved the method proposed for the regular publication in convenient form of the collected measures notified by the Governments of the various countries, relating to prices, tariffs, premiums on exports and monopolies in so far as they relate to agriculture.

In dealing with the preparations now in force for collaboration between the Institute and the other great International Organizations, the Committee *inter alia*, approved the agenda proposed for the meeting of the Joint Agricultural Advisory Committee (the liaison organ between the Rome Institute and the International Labour Office), to be held in Geneva on 28th May, and established the general lines of the co-operation of the Institute with the Economic Committee of the League of Nations in the matter of the sanitary inspection of the imports and exports of plants and of other vegetable products, a question referred by the Monetary and Economic Conference of London to the International Institute of Agriculture and to the Economic Committee of the League of Nations.

The Committee in addition signified its approval of the provisions made for collaboration between the International Institute of Agriculture and the International Federation of Olive Growers recently established in Rome. Definite instructions were also given regarding the future conduct of the Institute's statistical work, founded on the data supplied by Farm Accountancy offices.

It was further arranged that the date of 4th June 1935 should be fixed for the meeting in Rome of the International Diplomatic Conference for the standardization of the methods adopted for the analysis of wines intended for international trade, while the date of 15th October 1935 was arranged for the other proposed International Diplomatic Conference on the question of the standardization of the systems for the keeping and uses of cattle herdbooks. Lastly the Committee nominated its own representatives at the various Conferences, etc., for the consideration of questions relating to agriculture, which will be held during the current year.

International Year-book of Agricultural Statistics 1933—1934. This Year-book has been published recently by the International Institute of Agriculture, Rome

and provides an extensive, complete and exact summary of statistical information for agriculture of a quite unique kind. Every agricultural product reaching international markets is included. e. g, wheat, wool, cotton, tobacco, sugar, tea, oilseeds and many others. For the reference library, the economist, financier, merchant, manufacturer and farmer, these concise and exhaustive tables are of the highest value. Agricultural Engineers, implement makers and persons engaged in the fertilizer trade will also be particularly interested.

Annuaire International De Legislation Agricole, Vol. XXIII, 1933. This annual publication contains the most important legislative measures of the year, with, in addition, an analytical introduction. For the less important laws the title only is given, in the original language and in French. The Yearbook has two indexes, one a chronological index by countries, the other an alphabetical index by subjects. This Yearbook is of great interest to all who, as legislators or economists, are interested in agriculture, as well as to agricultural associations and persons engaged in the trade in agricultural products or in the allied industrial processes.

News and Notes.

College Day and Conference. We are glad to announce that the 24th College Day and Conference will be held by the middle of August; the exact dates will be notified later. The Hon. Mr. C. A. Souter, C. S. I., I. C. S., first member, Board of Revenue has kindly consented to preside. We extend our invitations to all members of the Union, and our subscribers and well wishers to attend the College Day and Conference, to contribute papers on Agriculture and allied subjects for the conference and thus make the function a success. It is requested that those who contribute papers would kindly send in their papers with an abstract to the Union Secretary sufficiently early to facilitate their inclusion in the agenda.

The Silver Jubilee, was celebrated with great eclat at the College. The Research Institute was tastefully illuminated and there was a large monster procession with the pictures of their Majesties the King and Queen round the estate. The coolies of the Central Farm and the Millet Station provided rural dance and music. Poor feeding was done by Mr. M. Ratnavelu, Assistant Farm Manager, Central Farm, at the Central Farm premises.

We are glad to note that the following officers of the Madras Agricultural Department have been awarded the Silver Jubilee medal. Messrs 1. S. V. Ramamurthy, Director of Agriculture, 2. Rao Bahadur D. Ananda Rao, 3. R. C. Broadfoot, 4. K. Ramiah, 5. N. S. Kulandaiswami Pillai, 6. Sitarama Patrudu, 7. Jogi Raju, 8. P. Subrahmaniam, 9. K. Cherian Jacob and 10. C. S. Gangadara Iyer; also Rao Bahadurs T. S. Vankataraman and B. Viswanath of the Imperial Department of Agriculture.

The University Examinations which started last month came to a close by 2nd May and the following students have been declared successful:—

First Examination:— Anantanarayanan T.M., Chalamiah Sastry V., Dharmarajan K.D., Ganeshasundar Rao H., Gopalakrishna Kamath M., Hariharan S.V., Adiseshayya H.A., Khadder Razak S., Krishna kumar B., Krishanada Sastry S., Kulandaisami S., Lakshmana Babu P., Lakshminarayana S., Mahadeva Iyer S., Parthasarathy A.V., Pitchumani A.V., Ragothama Reddi J., Rajagopalan D.V. Sattanadhan R.S., Sayeed P.K, Srinivasamurthy G., Tobias K.I., Venkayya N. Sundararaman S., Brahmayya G.V., and Lakshmana Rao.

Second Examination:— Albuquerque M., Annaswami S., Arunachalam T., Coloco J., Gitachari R., Ityachan C.T., Jayaraman R, Kannayan K., Kelukutty

Menon M., Krishnan R.H., Krishnanunni Nayar, Lingiah M.K., Parasuraman N.A., Ragavan K., Rajabapaniya K., Rajaraman S., Ramandha Rao P., Ramanatha Rao H., Renganathachari M., Ali Hyder R., Sangameswara Sarma S., Shivasankar Rao G. Venkataramana G., Venkataramana Rao V.G., Murugesan Y., and Samuel Joshua.

Final Examination:— Arunachalam S., Balakrishna Nayar M., Bhujanga Rao C., Govinda Rao P., Kameswara Rao G., Kanakaraj Kasiviswanatham M,. Kesavan C.P., Krishna Marar N.M.. Kutti Mudali S., Lakshmanan K., Mariekolandai A., Narasinga Rao U., Narayana Pillai V., Ragava Rao M., Ramakrishnan T.S., Sadasiva Iyer V., Satyanarayanamurthy S., Srinivasan T., Sriraman K., Soundrarajan R., Suryanarayanamurthy B. and Venkata Rao N.

Old Regulations, Part II:— Azimuddin A., Muthusami N., Radhakrishna Rao K., Sundaresan K.R., Vadamalai, Veerayya and Reddi Nayudu K.V.

We understand that a few more students have got through the Second Examination—New Regulations, with references in one or two subjects, and their list will be published next month. We wish the successful students all success in after life as well.

Crop & Trade Reports.

Cotton (Madras)—1934-35. *Fifth or Final Report.* The average of the areas under cotton in the Madras Presidency during the five years ending 1932—33 has represented 9 per cent. of the total area under cotton in India.

2. The area under cotton in the Madras Presidency in 1934—35 is estimated at 2,271,800 acres as against 2,095,800 acres for the corresponding period of last year and 2,135,100 acres according to the February forecast of the current year. The present estimate for the Presidency represents an increase of 4·5 per cent. over the finally recorded area of 2,174,738 acres in 1933-34. Last year's estimate fell short of the actuals by 3·6 per cent.

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

4. A normal yield is expected in East Godavari, West Godavari, Kistna, South Arcot, Salem and Tanjore. A yield below normal is expected in the other districts. The yield is the lowest in Anantapur (37 per cent.)

The seasonal factor for the Presidency works out to 91 per cent. of the average for irrigated cotton and 81 per cent. for unirrigated cotton, the final figures according to the season and crop report of last year being 101 per cent. and 92 per cent. respectively. On this basis, the yield works out to 454,900 bales of 400 lb. lint as against 451,690 bales in the previous year, an increase of 0·7 per cent. and against an average yield of 466,430 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:-

(*Area in hundreds of acres*; *yield in hundreds of bales of 400 lb. lint.*)

Variety.	Area.		Corresponding yield.	
	1934—35. Acs.	1933—34. Acs.	1934—35. Bales.	1933—34. Bales.
(1)	(2)	(3)	(4)	(5)
Irrigated Cambodia	258,8	205,8	147,7	126,7
Dry Cambodia	238,1	140,9	48,0	29,8
Total Cambodia...	496,9	346,7	195,7	156,5

Karunganni in Coimbatore ...	125,0	135,3	25,7	31,4
Uppam in the Central districts	38,2	31,1	5,6	4,7
Nadam and Bourbon	22,7	31,5	1,0	1,6
Total, Salems...	185,9	197,9	32,3	37,7
Tinnevellies *	575,2	527,9	123,5	123,9
Northerns and Westerns ...	852,5	879,0	76,3	99,6
Cocanadas	149,2	130,8	25,6	22,5
Others	12,1	13,5	1,5	1,6
Presidency	2,271,8	2,095,8	454,9	441,8

* 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 1933—34.

(*Figures in hundreds of bales of 400 lb. of lint.*)

Particulars.	South.		Deccan.	Rest of the Presidency.	Total.
	Tinnevellies and Salems.	Cambodia.	Northerns and westerns.	Cocanadas and others.	
(1)	(2)	(3)	(4)	(5)	(6)
	Bales.	Bales.	Bales.	Bales.	Bales.
1. Pressed at presses plus loose cotton received at mills in 1934—35.	186,7	242,2	137,8	32,8	599,5
2. Add estimate of extra factory consumption.	6,0	Nil	6,0	4,0	16,0
3. Total crop of 1933—34.	192,7	242,2	143,8	36,8	615,5
4. Yield as estimated in April 1934.	161,6	156,5	99,6	24,1	441,8
5. Yield as estimated in the season and crop report.	167,3	150,4	111,4	22,6	451,7

Note (1) *Item* 1.—The entries mainly relate to the crop of 1933—34. 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 of carry over of crop are not available nor are figures of arrivals and despatches of the different varieties available.

7. The wholesale price of cotton lint per imperial maund of 82-2/7 lb. as reported from important markets towards the close of March 1935 was Rs. 19-2-0 for Cocanadas, Rs. 21-6-0 for red Northerns, Rs. 23-13-0 for white Northerns Rs. 18-13-0 for (early crop) Westerns, Rs. 28-8-0 for Cambodia, Rs. 26-14-0 for Coimbatore Karunganni, Rs. 25-10-0 for Tinnevelly Karunganni, Rs. 24-10-0 for Tinnevellies, and Rs. 24-15-0 for Nadam. When compared with the prices reported towards the close of January 1935, these prices reveal a rise of about 1 per cent. in the case of red Northerns and 9 per cent. in the case of white Northerns and a fall ranging from 2 to 18 per cent. in the case of other varieties.

Crop Gingelly (Madras)—1934-35—*Fourth or Final Report.* The average of the areas under gingelly in the Madras Presidency during the five years ending 1932-33 has represented 12 per cent. of the total area under gingelly in India.

2. The area sown with gingelly up to the 25th March 1935 is estimated at 657,300 acres. When compared with the area of 848,500 acres estimated for the corresponding period of last year, it reveals a decrease of about 22·5 per cent. This year's estimate also reveals a decrease of about 21·4 per cent. as compared with the finally recorded area of 836,145 acres last year. Last year's estimate was in excess of the actual area by about 1·5 per cent.

3. 194,700 acres have been reported as sown since the previous forecast report was issued in January, as against 240,500 acres during the same period last year. These late sowings were mainly on wet lands in the Circars, Cuddapah, South Arcot, Trichinopoly and the South where gingelly was raised as a second crop after paddy.

4. As compared with the actual area sown last year, there has been a decrease in area in all the districts except Guntur, Cuddapah, Nellore, Chingleput, Chittoor, Salem and South Kanara.

5. The yield has been below normal except in Kistna, Cuddapah, Ramnad and South Kanara where it has been normal. The yield is markedly low in Anantapur (20 per cent) and Bellary (60 per cent). The condition of the late sown crop is generally fair.

The seasonal factor for the Presidency works out to 84 per cent of the average as against 93 per cent according to the season and crop report of last year. On this basis, the yield is estimated at 75,200 tons as against 105,690 tons in the previous year and an average yield of 105,660 tons.

Statistics—Crop—Forecast—Groundnut, 1935—*First Report.* The area sown with the summer or irrigated crop of groundnut during the three months of January to March 1935, is estimated at 39,100 acres, as against 41,800 acres for the corresponding period of last year, a decrease of about 6·5 per cent.

2. The whole-sale price of groundnut per imperial maund of 82-2/7 lb. as reported from important market centres towards the close of March 1935 was Rs. 5—15—0 in Vizagapatam, Rs. 5—13—0 in Cuddalore, Rs. 5—12—0 in Vizianagaram, Rs 5—7—0 in Salem, Rs. 5—5—0 in Guntur, Rs. 5—4—0 in Vellore, Rs. 5—3—0 in Cuddapah, Rs. 5—1—0 in Nandyal and Rs. 4—14—0 in Adoni. When compared with the prices in the corrresponding period of last year these prices reveal a rise of 144 per cent in Adoni, 138 per cent in Nandyal, 129 per cent in Salem 127 per cent in Vellore, 124 per cent in Cuddaph, 119 per cent in Vizianagram, 113 per cent in Guntur, 98 per cent in Vizagapatam and 94 per cent in Cuddalore.

Weather Review (APRIL 1935).

Summary of General Weather Conditions. Thunderstorm rain was general in the central parts of the country and in South East Madras for the first seven days of the month. Thereafter normal hot weather conditions prevailed

A depression formed in the South East of the Bay on the 26th associated with an advance of the monsoon, and caused widespread rains in Burma, and disappeared with the withdrawal of the monsoon from the bay. It failed to affect the weather in the peninsula.

Rainfall was General over the Presidency and in excess in parts of Deccan, in the Central and Southern districts, and parts of Circars.

The chief falls reported were: Kodaikanal 4·7″ (2nd), Pamban 3·2 (3rd), Coonoor 3·3″ and Negapatam 3·1″ (4th) and Palamkottah 2·7″ (5th).

Temperature was generally below normal, but rose about the middle of the month and was in excess in the Deccan and along the North Coromandel Coast. The highest maximum reported was 110° at Nellore on the 29th.

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	1·0	+0·2	1·6	South	Negapatam	4·5	+3·9	10·1
	Berhampore*	1·7	+0 9	2·9		Aduthurai *	0·1	−0·9	3 9
	Calingapatam	0·8	−0·1	1·1		Madura	2·4	+0·4	3·2
	Vizagapatam	0·1	−0·7	0·1		Pamban	6·4	+4·7	10·5
	Anakapalli*	0·4	−1·1	0 4		Koilpatti *	3·6	+0·5	4·4
	Samalkota*	2 5	+1·8	2·5		Palamkottah	4·8	+2·3	7·2
	Maruteru*	0·2	−0 3	0·2					
	Cocanada	1·1	+0·5	1·4					
	Masulipatam	1·3	+0·7	1·5	West	Trivandrum *	8·1	+3·6	11·5
	Guntur *	0·0	0·0	0 0	Coast	Cochin	2·2	−2·5	3·5
						Calicut	1·1	−2·2	1·7
Ceded Dists.	Kurnool	0·9	+0·3	1·1		Pattambi *	2·5	−0·9	2·5
	Nandyal*	1·6	+1·2	1·6		Taliparamba *	0 0	0·0	0·0
	Hagari*	1·4	+0·6	1·6		Kasargode *	3·4	+0·7	3·7
	Bellary	0·3	+0·4	0·5		Nileshwar*	2·0	+0·5	2 0
	Anantapur	1·3		1·3		Mangalore	0·3	−1·0	0·3
	Cuddapah	0·2	−0·3	0·3					
Carnatic	Nellore	0·0	−0·4	1·3	Mysore	Chitaldrug	1·3	+0·3	1·7
	Madras	0 0	−0·5	0·6	and	Bangalore	1·2	−0·1	1·3
	Palur*	0 0	0·0	0·0	Coorg	Mysore	2·7	+0·3	3·1
	Palakuppam *	0·1	−1·0	3·4		Mercara	2·6	0·0	3·4.
	Cuddalore	0 5	−0·1	3·4					
Central	Vellore	0·6	−0·3	2·1	Hills.	Kodaikanal	10·0	+5·7	14·0
	Hosur cattle farm *	0·0	0·0	0·0		Coonoor	12·3		15·8
	Salem	2·0	+0·2	2 9		Ootacamund *	3·6	+0·4	4·1
	Coimbatore	2·5	+1·1	3·0		Nanjanad *	4·8	+1·5	5·1
	Coimbatore Res. Inst.*	3·1	+0·9	3·5					
	Trichinopoly	4 9	+3 2	5·8					

*Meteorological Stations of the Agricultural Department.

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Absolute Maximum in shade	...	...	99°F.
Absolute Minimum in shade	...	...	68·2°F.
Mean Maximum in shade	...	...	95·5°F.
Departure from normal	...	...	0·4°F.
Mean minimum in shade	...	...	72·7°F.
Departure from normal	...	...	−0·2°F.
Total Rainfall	...	...	3.07″
Departure from normal	...	...	+0·91″
Heaviest fall in 24 hours	...	...	1·17″
Total number of rainy days	...	...	7
Mean daily wind velocity	...	...	2 3 m.p.h.
Mean humidity at 8 hours	...	...	72 2%

Departure from normal	...	...	+1·4%
Total hours of bright sunshine	...	...	255·2
Mean daily hours of bright sunshine		...	8·5

Summary :— Rainfall was above normal, heaviest fall in 24 hours being 1·2". Other climatic elements were about normal. Normal hot weather conditions prevailed.

P. V. R. & A. S.

Departmental Notifications.

Positings and Transfers.— Mr. S. Varadarajalu Naidu, A. D. on leave to be A. D. Royadrug; Mr. P. S. Narayanasamy Iyer, permanent upper subordinate Agricultural Section and officiating assistant in Entomology to be temporary assistant in Entomology in the Madras Pempheres Scheme; Mr. Muhammad Basheer, temporary Assistant in Entomology in the Madras Pempheres Scheme on relief by No. 1 to officiate as assistant in Entomology, *vice* Mr. M. Subbiah Pillai on other duty; Mr. N. M Bhukta to continue as A.A.D. Vizianagaram; and Mr. M. V. Kondala Rao, A. D. Vizagapatam to be A. D. Chodavaram and relieve Mr. M. Narasimham to join duty at Samalkota.

Leave.— Mr. V. K. Kunhunni Nambiar, F. M. Kasargod extension of l. a. p. on M. C. for 2 months from 25th April 1935; Mr. T. V. Srinivasacharlu, A. A. D., l. a. p. on M. C. for 2 months from 3—5—1935 in continuation of l. a. p. for 4 months granted already; Mr. T. S. Venkatarama Iyer, A. D. is granted leave on average pay for 2 months and 22 days from 24—4—35 preparatory to retirement; and Mr. M. Eggiasamy Iyer, A. D. Tindivanam is granted l. a. p. for 4 months from 24th April with permission to prefix the Easter holidays.