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ERI SILKWORM REARING AS A COTTAGE INDUSTRY IN S. INDIA. Part I.

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Introduction: In these days of increasing unemployment, comparatively low wages and appreciable budget reductions every where, it behoves those who find it hard to make both ends meet to think of ways and means to supplement their feeble earnings by engaging themselves in some of the many cottage industries as spare time hobbies. Of the various such activities which offer promising openings, especially to the middle classes and the poorer folk in the rural areas, the rearing of silkworms may be found to be a very suitable and practical proposition. As a home industry sericulture is second none either in the interest it creates for the work by the ease with which it can be done or in the returns the industry would bring.

The Two domesticated Silkworms: Among the different kinds of silkworms found in India there are only two varieties which can be easily utilised for domestic breeding. One is the well-known mulberry silkworm (*Bombyx mori*) the silkworm *par excellance* (fig 1.) which is reared all over the world and which produces the great bulk of the world's commercial silk. In S. India this worm is reared on a fairly large scale as a cottage industry chiefly in the Mysore plateau—including the Mysore state, the Kollegal taluk in Coimbatore and the small Zamindari tract of Berigai in the Salem district. For a brief account of the different aspects of mulberry worm culture in these tracts

reference may be made to a paper * published by the writer in 1916 as a result of some work done by him in that direction. The other silkworm is the one known as the *Eri* or castor silkworm (*Attacus ricini*, Boisd). (fig. 2) It is a native of the sub-montane tracts along the south eastern Himalayas and the rearing of the worm was till lately confined to the different parts of the province of Assam; the silk produced by this worm is also known on that account as 'Assam Silk'.

Though in their general life history the two silk worms are more or less similar, in certain structural features, in food habits and in the production and quality of the silk, there are marked differences between the two. The most important of these consist in (1) the mulberry worm and its parent moth are smaller in size and of a uniform pale whitish color and the worm has a smooth body; the eri worm and its moth are on the other hand much bigger; the worm is pale yellowish and fringed with short fleshy tubercles and the moth has a wide wing expanse and its color is dark brown with numerous pale white markings, (2) the mulberry worm feeds on the leaves of the mulberry plant while the eri worm feeds on castor leaves, (3) the mulberry worm spins its cocoon by means of a single continuous reelable thread of silk, but the cocoon of the eri worm is not made of one unbroken strand and the silk is not reeled. In the former case the cocoons have to be stifled and the insect inside the cocoon killed; else the insects will emerge out by cutting the cocoon and making the silk unreelable. In the case of the eri worm, however, the insects can be allowed to emerge and need not be killed, (4) the silk got from the mulberry worm is certainly finer and superior in quality as compared with eri silk; but the latter, though carded and spun like cotton, is far stronger, finer and more durable than cotton, and (5) the mulberry worm thrives well in a cool and dry atmosphere while the eri worm can thrive in damp and warm climates and with some attention in any place; the former is a delicate creature and easily susceptible to silkworm diseases, while the latter is hardy and less susceptible to diseases. Looking at these important differences between the two, it may be found that the eri worm possesses some special qualities which would readily appeal to the Indian farmers and induce them to take to the rearing of the eri worm in preference to the mulberry insect. The most important of these, especially that one which would be telling in the eyes of the great majority of Indians who are very averse to the killing of animals, is, that no life is killed in the production of silk from the eri worm as in the case of the mulberry insect. This feature in this creature also makes it possible to utilise all the cocoons for silk production and enables one to get plenty of '*seeds*' for one's future use and distribution as a result of allowing all moths to emerge and breed. These considerations alone, apart from others, may be sufficient to induce

* "Sericulture in S. India" by T. V. Ramakrishna Ayyar, "Tropical Agriculurist". Vol. of 1916.

our rural population to take to this work as a home industry. Another factor is, that castor, the food of the worm, is grown everywhere and is one which can be grown both for oil seeds and as food for the worm.

In view of the numerous enquiries recently received by the writer on the subject of eri worm rearing, it is intended in this paper to briefly describe the salient characteristics of the eri insect and add brief suggestions regarding its culture, etc., so that it may be of some help to those who contemplate taking up this work. As early as 1910, the writer tried rearing this worm at the suggestion of the then Director of Agriculture (Mr. M. E. Couchman, I. C. S.) and as a demonstration, was not only able to successfully breed out fifteen generations of the worm between September 1910 and August 1912, but also managed to introduce the industry into some parts of * S. Canara and other places where several families took up this work and continued the same for a long time. Some of the facts and figures added in the following paragraphs are taken from the results of these early trials of the writer at Coimbatore.

Name, Systematic position & General features: This silk insect (*Attacus ricini, B.*) and the silk it produces are so called from the food plant of the insect which is the castor plant and which in Assamese language is known as *Eri*—perhaps a corrupt and colloquial form of the Sanskrit name of the plant *viz.*, '*Erandi*'. The silk is also known as '*Endi*' or Assam silk. The worm is the young one (caterpillar) of a moth belonging to the lepidopterous family *Saturniidae* which includes some of the largest moths known, such as the Atlas, the Tassar and the Moon moths. The eri moth is a large sized species with a wing expanse of 4½ to 5 inches in an average female. The general color of the insect is pale brown with whitish bands on the abdomen; the wings have pale white and olive bands and patterns over the ground colour. Though provided with large wings the moth does not generally fly about but flutters occasionally, and as such there is no need to guard against these insects disappearing by flight. It has no mouth parts and does not feed. The female moth is somewhat bigger and stouter than the male, but the latter has the pectinae of the feelers more pronounced. Similar to all moths and butterflies the mother insect lays a number of eggs and these hatch out into small worms called caterpillars. These grow in size by feeding on the food plant and in course of time stop feeding, spin the silken cocoons and pupate inside the same; from the cocoon the adult moth emerges after the pupation period. There is thus a regular metamorphosis in the life history of the insect possessing all the four distinct stages found in all insects of the group Lepidoptera, *viz.* egg, caterpillar, pupa and adult.

* The Depressed Classes Mission, S. Canara, the Criminal Settlement at Kalichedu in Nellore and some families in Mangalore took up this work with enthusiasm. Eggs were also sent to Tanjore, Shajahanpore, etc.

The Life history and different stages of the Insect. The female eri moth lays from 125 to as many as 250 eggs in clusters of hundred or more. Each egg is a small and oval object with a greenish yellow color. In about seven to ten days, which varies with the weather conditions, each egg gives rise to a small active worm-like creature which is the *first stage* of the silk caterpillar. In this stage it measures about one fifth of an inch in length, is cylindrical in shape and shows the distinct regions of the body, (the head, thorax and abdomen) with the legs and prolegs as in all caterpillars. It is pale greenish yellow in colour with the head and the region just behind it dark. The whole length of the body shows rings of dark tubercles each giving rise to a hair. This creature grows by feeding on the tender leaves of castor for about three or four days. At the end of this period it stops feeding and remains inactive for a day or a day and a half and it is during this time that it moults (throws away its old skin) and gets a new coat at the same time increasing in size and changing slightly in coloration. Soon after the moult the worm starts feeding again as before and in this way at intervals of 3 or 4 days it moults 4 times. At each moult the insect grows bigger and stouter and after the fourth moult it begins to feed on the food plant rather voraciously for a week or more until it is full fed and ready for spinning its cocoon. At this stage the worm measures about four inches in length, is stout, cylindrical and more or less narrowed towards the head end. It has a pale greenish or yellowish white coloration with numerous small fleshy tubercles on the body surface; in some cases the body shows rows of black spots also. The full-fed worm, before it starts spinning the cocoon, passes a large mass of solid excrement followed by some liquid evacuation and this is the sign of preparation for cocoon spinning. Such worms wander away from the food stuff and seek hidden corners and crevices which afford them facilities for starting the spinning and get the future cocoon properly fixed up. In two to three days the worms cover themselves with the pale white silken cocoon and disappear from our view. The cocoon is elongate oval and measures in the case of a fairly healthy one 1½" from pole to pole. The eri cocoon is rather loose in texture compared to that of the mulberry worm. In about a fortnight to thirty days according to seasonal variations the moths begin to emerge out of the cocoons. Within twenty four hours after emergence the sexes begin to mate and the female soon starts laying the eggs for the next generation. The moths do not generally live for more than four or five days after emergence.

Each life cycle of the insect from egg-laying to the next generation of eggs takes a period which varies from as many as 35 to such a long period as even 100 days. The following are the records of the 15 broods reared at Coimbatore by the writer during 1910—1912, and

the period of one life cycle in S. India may be roughly taken as six to seven weeks.

Brood No.	Dates.	No. of days.
1.	20th September to 3rd November 1910.	44
2.	4th November „ 22nd December „	48
3.	23rd December „ 9th February 1911.	48
4.	10th February „ 31st March „	49
5.	1st April „ 14th May „	44
6.	2nd May „ 16th June „	45
7.	16th June „ 1st August „	46
8.	2nd August „ 18th September „	47
9.	19th September „ 2nd November „	44
10.	3rd November „ 21st December „	48
11.	22nd December „ 17th February 1912.	56
12.	(18th February the lot got diseased).	
13.	21st March „ 8th May „	47
14.	9th May „ 22nd June „	45
15.	22nd June „ 9th August „	47

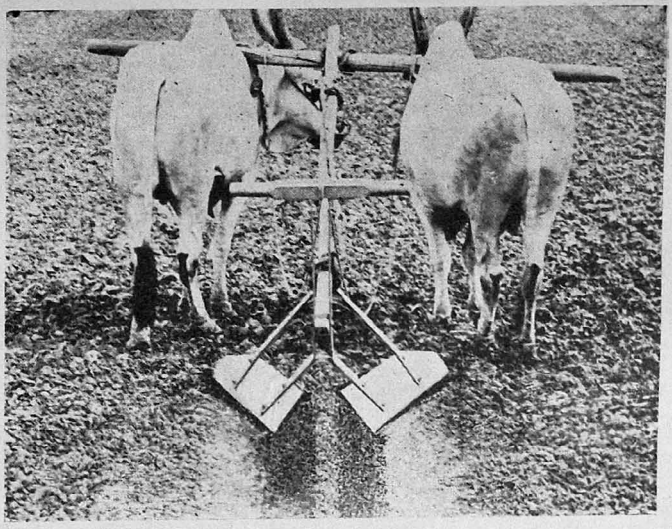
Factors influencing vigorous growth of worms. The healthy and successful growth of eri worms in any locality depends upon a few important factors which should be borne in mind by any one contemplating rearing the insect. The most important one is that of climatic and weather conditions. As stated once before, this insect thrives well in warm damp weather and cannot stand hot season with high temperatures and dry winds. The optimum temperature for healthy growth ranges between 70° and 90°F. though by artificial help the worms may be made to thrive when it is a little over 90 or slightly below 60. In the Madras Presidency the worms can be reared in the Coastal tracts, especially of the West Coast almost all through the year except, say for a month or two, between March and June when the heat may be severe though saturated with moisture. In the central interior districts, especially in the Ceded Districts and the Carnatic tracts, it is better to suspend rearing from April on to middle of June when the weather will usually be warm and very dry, and when the temperature often goes above 100° in some places in these areas. There is no fear of the worms suffering in any way during the so called winter season in S. India, since, except in the hills where the temperature falls below 50°F., we have practically no cold weather so to speak, as in N. India where, when the temperature goes down below 55° or 50°F. the worms become unable to spin cocoons and the moths do not breed. In Coimbatore, during the period of the past trials, the daily temperature on the Coimbatore farm ranged between a maximum of 100° and a minimum of 55°F. The following temperature statement for some of the important places in S. India might guide rearers in judging which are the best months for rearing the worms.

Temperatures of important places in South India in °F.

Place	'Mean average'	Maximum	Minimum
Berhampore	80	84	79
Vizagapatam	81	92	67
Cocanada	82	99	66
Masulipatam	83	99·7	65·8
Nellore	84	104·6	67·1
Cuddappah	85	105·9	65·2
Anantapur	83	104	61
Bellary	82·2	103·6	61·5
Kurnool	82	104·6	60·1
Madras	83	99	67·8
Chittoor	85	104	74
Vellore	82	101·8	64·2
Cuddalore	82·6	98·7	68·3
Negapatam	83	97·7	72
Trichinopoly	84·3	101·6	85·4
Madura	84	100	69·1
Kodaikanal—8000 ft.	58	70	46·9
Pamban (Ramnad Dt.)	82	91·4	74·3
Tinnevelly	82	100	71·0
Coimbatore	79·8	97·3	64·3
Ootacamund—7000 ft.	57·5	71·7	43
Salem	82	100·8	64·5
Mangalore	80	91·8	69·9
Calicut	80·5	90·8	70·5

In most of the S. Indian tracts the hottest months are either April or May and in a few the maximum temperature is recorded in June. As such it may be found somewhat difficult to rear the worms successfully during these 3 hot months especially in places where the thermometer registers 100° F.

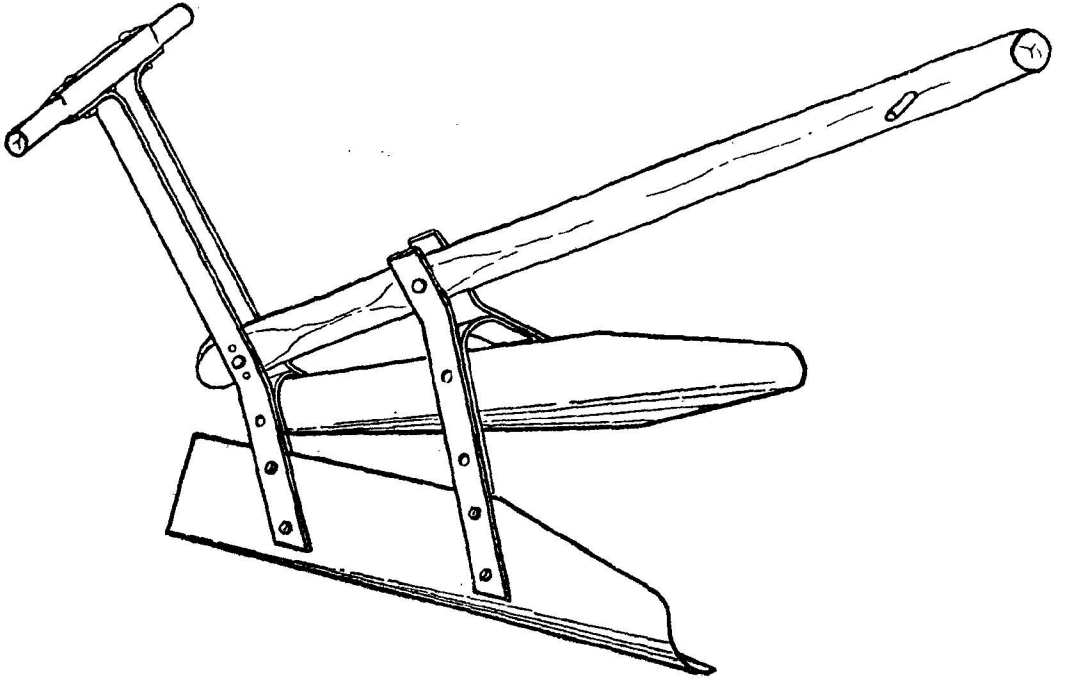
Next to the climatic factor may be considered some of the diseases which the worms become occasionally subject to. These are mainly attributable to unsatisfactory conditions of food, feeding, housing, handling and seed selection ; these conditions are referred to below under suggestions for rearing. Though not so easily susceptible to diseases as the mulberry insect, the eri worm occasionally suffers from maladies which may be compared in many respects to the well-known silkworm diseases such as Pebrine, Flatcherie Muscardine, etc. But these diseases of the eri worm have not yet been sufficiently investigated for any definite confirmation of such a view. In addition to these diseases there are a few enemies of the worm which occasionally cause some appreciable damage and loss. Rats, some birds, lizards, frogs, ants etc., occasionally attack the worms ; these can be checked by proper housing and with the use of traps, baits, ant pans, etc. in the rearing houses. There is an important fly enemy, a *Tachinid* parasite (*Trycolyga bombycis*, B.) which lays eggs



Bund former in operation showing compact and neatly shaped bund produced. Quality of work depends on soil tilth.

Typical bunds and channels made with the bund former in preparation for planting and irrigation of ragi.

THE BUND FORMER



in the worm and the maggots coming out of these eggs kill it. Fortunately this fly has been so far found confined only to Assam and East Bengal and has not been noted in other parts of India. To prevent this fly getting into other places the best thing is to get the seeds only in the form of eggs and never as live cocoons which might carry the parasitic fly pupa. Further details as to how healthy worms can be bred out free from the attacks of diseases and enemies are given below.

(To be continued)

A BUND FORMING IMPLEMENT.

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In the preparation of garden lands for irrigation, bunds or ridges are constructed across the fields dividing them into a number of small beds or squares after the fashion of a chessboard. At intervals across the fields feeder channels are also constructed which serve to lead the irrigation water from the headland channels and supply it to the beds throughout the field. In this way, the supply of water may be controlled by men in the field and the desired amount of water fed to each every bed thereby securing a uniform irrigation. This bunding or forming of the field into beds is a task which has hitherto been done entirely by manual labour and is a very labourious operation to say nothing of the cost. On larger acreages a considerable number of men are required particularly when the beds are constructed after the sowing of the crop and the work must be completed in quick time to avoid delay of the initial irrigation. In the present difficult times of little or no return from farming, it has become essential, as indeed with all other farm operations, to reduce the cost of such a process to the very utmost and with such an object in view a bund forming implement for bullock draught has now been produced by the Agricultural Department and is proving of considerable value for the purpose for which it has been devised. The implement has been designed by Mr. D. G. Munro, Deputy Director of Agriculture, Eighth Circle, Coimbatore, in collaboration with Mr. N. G. Charley, the Research Engineer.

As may be seen from the accompanying illustration the implement is a very simple one. It consists essentially of a pair of opposing mouldboards so arranged as to collect the surface layer of soil and throw it towards the centre to form a bund the size of which is regulated by the length and setting of the mouldboards and the opening between them at the rear. The mouldboards are of such a length and so disposed as to form a bund of average size under average conditions of soil tilth. The capacity of the implement and the size of the resultant bund may be somewhat reduced by disconnecting the mouldboards from their supporting members and refixing them in a similar

manner after drawing them a few inches towards the rear in which position the opening between them will be reduced. A second set of holes are provided in the mouldboards for this purpose. A means of adjustment is provided by which the pole may be raised or lowered to suit the height of animals. The implement complete with pole weighs about 70 lbs. It may be constructed by any blacksmith at a cost of about Rs. 8/-. Smaller or larger sizes might be specified to suit any particular requirements.

In practice, the bunds are constructed from end to end of the field at the desired spacing which is stepped out and marked by clods at the boundaries for the guidance of the driver. The beds are then completed by working across the field at right angles and afterwards filling up the gaps where the bunds intersect by hand labour. The feeder channels referred to are easily constructed by forming two bunds close together. No preliminary marking out of lines with the country plough is required, as is the custom with the ordinary method of bunding with *mammatties* by manual labour. The implement may be operated by the ryot with no more difficulty than his country plough and the draught is not too much even for the smallest cattle.

In addition to the preparation of fields for irrigation before or after sowing for all garden crops the implement may be used for ridging crops like cotton, tobacco, potatoes and chillies. It may also be employed for forming beds in dry farming areas for the purpose of preventing run off after rains and conserving moisture, and for forming bunds across gradients to prevent wash during heavy rains.

The value of such an implement is evidenced by the following remarks of Mr. Abboi Naidu, a leading ryot of Peelamedu, Coimbatore District:—

"The new bund forming implement you gave me this year was used by me for forming beds for Chitraicholam crop. I am able to appreciate the advantages enumerated below and wish to convey my sincere thanks to you and to the officer who invented the implement.

My engines irrigate daily 12 acres. This area has every day to be laid into beds soon after sowing. In this locality the ordinary dearth of men is very much more accentuated during this special sowing season as almost every garden is sown at the same time. The period is really a trying one to me as well as to all others and the availability of a bund former like the one you sent is a great boon to me and my difficulties were considerably reduced.

With two bund forming implements I was able to form beds over an area of 12 acres daily. To do this area by manual labour, 30 men will be needed. Even so it will be necessary first to mark lines with the country plough. The pair that will ordinarily be required for this has done the forming of beds. Deducting additional labour required for rectifying channels and corners of beds, the working of the bund former saves 24 men for the 12 acres or 2 men per acre equivalent in money valve to Re. 1. For the 80 acres of my Chitrai cholam this year I have been benefitted to the extent of Rs. 80."

Based on the above results and taking an average garden land field cropped at least twice a year, the saving per acre per year works out at Rs. 1- 8—0 to Rs. 2/- according to the rate of wages for men coolies in the locality. Even in a small holding of 10 acres the saving in one year on two crops will amount to more than Rs. 15/-, i. e., enough to defray the cost of the implement and provide a profit as well. And the implement with reasonable care should last for at least 7 years on a holding of 10 acres. Even when it becomes worn out it may be fully repaired by the fitting of a new pair of mouldboards at a cost of only a few rupees.

The use of such an implement is one of the ways in which the ryot may effect a considerable saving in his working costs and thereby enhance his returns in these days of low prices.

Note. Ryots desirous of obtaining the bund-forming implement should apply to the nearest Agricultural Demonstrator or the District Agricultural Officer of their district.

RURAL STUDIES IN SOME ORIYA VILLAGES OF CHATRAPUR TALUK OF THE GANJAM DISTRICT

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As the Oriya parts of the Ganjam District present certain peculiar aspects quite distinct from the rest of the Circars, we were persuaded to get into the details of the life of an Oriya cultivator and examine the various rural problems influencing him. The first part of this note is confined to the detailed economic enquiry of the Pattupur village, and in the second part attempts are made to draw certain conclusions from the data obtained for Pattupur. The tabulations in part 1 of the note had to be formulated to suit the subjects dealt with in part 2. Since the object of this note is to sketch the general economic condition of an Oriya ryot and indicate lines on

which his condition may be improved, all descriptive notes are curtailed to allow sufficient reference being made to some of the outstanding rural problems.

Part I.

Pattupur is a hamlet of Belagam, in the Chatrapur Taluk of Ganjam District, being a small colony of tenants of M. R. Ry. Rai Bahadur Tadepalli Venkatakrishnayya Pantulu Garu to whom the hamlet belongs. This land-lord, it is gratifying to note, has been giving his active co-operation to the Agricultural Department for the last 3 years in carrying out the various agricultural improvements and has shown what land-lords could do to their tenants and to themselves by giving effect to the various recommendations of the Agricultural Department. The total number of ryots cultivating land at Pattupur is 56. The total areas cultivated are as per details below.

	Total for the 56 ryots.		*Average per ryot.*
Broadcast paddy area.....	331·8 acres.	...	5·93 acres
Transplanted paddy area...	117·7 „	...	2·11 „
Dry land	21·44 „	...	0·38 „
Garden land...	3·00 „	...	0·05 „

In broadcast paddy areas, paddy is sown broadcast and is followed by a pulse crop, sown in a standing crop of paddy. In transplanted areas, Ragi (*Eleusine coracana*) may either precede or succeed a paddy crop in a limited area. But the usual practice is to plough the fields after the harvest of paddy and raise a crop of green gram wherever the soil conditions permit. In garden lands, south west monsoon ragi is transplanted and after its harvest, the fields are prepared to grow a chilly crop. In dry lands certain areas are set apart for groundnut to be repeated year after year, unless timely rains are received for the sowing of horsegram as a second crop, after the harvest of the groundnut. Sweet potato is raised on ridges and is treated as a rainfed crop, but is usually preceded by ragi.

The following statement gives the details regarding the various crops grown and their contribution to the maintenance of the cultivators.

S. No.	Crops.	Total area under the crop in the Village.	Yield in lbs. per acre.	Value of crop per acre in Rupees.	Estimated Expenditure per acre. Rs. A. P.	Cash Expenditure per acre. Rs. A. P.	Estimated value of the Crop produced in Rs.	Deduct Expenses including leases in Rs.	Net income of the Village in Rs.
	1	2	3	4	5	6	7	8	9
1.	Broadcast Paddy.	332 acres.	750 Lbs.	20	11 3 0	2 3 0	6,640	4,046	2,594
2.	Transplanted Paddy.	118 „	1,500 „	45	22 14 0	6 4 0	5,310	3,657	1,653
3.	*Punasa* Ragi.	18 „	1,440 „	58	35 10 0	5 10 0	870	101	769
4.	Groundnut.	16 „	1,000 „	60	34 12 0	20 0 0	960	560	400
5.	Sweet Potato.	5½ „	8,000 „	112	56 0 0	37 0 0	616	286	330
6.	Chilly.	3 „	1,500 „	240	136 0 0	35 0 0	720	217	503
7.	Black Gram.	200 „	200 „	8	2 2 2	Nil.	1,600	800	800
8.	Green Gram.	5 „	300 „	15	6 4 0	...	75	37	38
9.	*Pyru* Ragi.	10 „	1,000 „	40	36 4 0	15 0 0	400	156	244
	Total ...	697½ „	15,690 „	598	341 1 2	111 1 0	17,191	9,860	7.331

Note:— The prices noted are for the year 1929 which represents a normal year in the predepression period.

Particulars of population and live stock :—

	Total for the 56 ryots.	*Average per ryot*
Adults	205	4·5 in terms of adults taking 2 children as equivalent to 1 adult.
Children	90	
Working pairs. ...	89	1·6
Cows and she buffaloes	36	·6

A working pair can manage 8 acres of broadcast paddy area, 4 acres of transplanted paddy area, and one acre of dry land. And these areas are considered sufficient to provide comfortable living for an average family of 4 adults and 2 children as per details noted below.

Cropping and income from the economic holding.

	Extent in acres.	Cash expenditure	Yield in lbs.	Quantity consumed including payment of rent.	Quantity sold	Value in Rs.
Broadcast paddy... ...	8·00	17—8—0	6000			
Transplanted paddy ...	4·00	25—0—0	6000	8300	3700	104—0—0
Punasa Ragi	1·50	4—2—0	2250	2250	...	...
Groundnut	0·80	16—0—0	800	100	700	14—0—0
Sweet potato	0·20	7—6—0	1600	...	1600	7—8—0
Black gram	6·00	...	1200	800	400	16—0—0
Green gram	2·00	...	600	200	400	20—0—0
		70—0—0				161—8—0
				By sale of straw ...		40—0—0
					Total...	201—8—0

Expenditure.

Expenditure on crops	Rs.	70—0—0
Condiments, kerosene	„	20—0—0
Vegetables, fish etc.	„	6—0—0
Tobacco	„	4—0—0
Clothes	„	25—0—0
House repairs	„	10—0—0
Implements, repairs to cart etc.	„	5—0—0
Concentrated food for cattle ...	„	5—0—0
Marriage etc.	„	50—0—0
		195—0—0

In the case of land-owning cultivators half the above areas would be enough. The general standard of cultivation is low with consequent poor returns and necessitates the maintenance of large holding for supporting an average family. In spite of the existence of copious subterranean water supply, no serious attempt is made to make use of it for any intensive cropping.

From the averages obtained per ryot at Pattupur it is clear that the land available is not enough to meet the requirements of the tenants and that the various kinds of lands available are not in the economic proportion indicated above with the result that the number of working pairs kept in the village far exceeds the required number and there is the unequal distribution of work for many of the ryots. Out of the total number of 56 ryots there are only 4 whose holdings approach the economic unit. Many ryots have to supplement their income from land by taking recourse to other occupations

The following are the statements of receipts and charges for the 56 ryots of Pattupur.

Income :—

	Income from crops.	Income from cattle (cart-hire excluded)	Income from subsidiary occupations.	Contributions from emigrants to Rangoon.
Total for ryots families in Rs.	10,430	940	3050	400
Average per head in Rs.	42	3½	12	2

Note :— The following earnings are grouped under subsidiary earnings—cart-hire earned Rs. 2000, cooly Rs. 300, salaries and remunerations Rs. 400, pounding paddy Rs. 150, profits earned by leasing gardens etc. Rs. 200.

Expenditure :—

	Towards food grains.	Other expenses for food.	Other necessities of life, clothing, housing lighting.	Cultivation expenses.	Luxuries.	Marriages and ceremonies.
Total for all families in Rs.	6400	3460	1450	2040	790	400
Average per head in Rs.	26	14	6	8	3	2
Percentages to the total expenditure.	44	24	10	14	5	3

With this low standard of living and in a normal year the village as a whole may be said to be above ordinary wants even under the present conditions, and this is rendered possible on account of the subsidiary occupations they resort to. On account of the road laid by the late M. R. Ry. Tadepalli Sivaramayya Pantulu Garu, the founder of the village, connecting Pattupur with the Purshothapur road, the village forms a gateway to the betel-leaf produced in the interior tract, wherefrom it is brought in head loads to the village to the Jagannadnapur railway station. The villagers earn as much as Rs. 2000— per year as cart hire in carting betel leaf. Besides this, the landlord disburses a considerable amount in the village for the various supplies and services he gets from his tenants.

Part II.

With the details we have for Pattupur, if we consider the economic condition of agriculturists in other villages we find that it is not at all different from what it is at Pattupur, excepting that the chances for subsidiary occupations are far fewer, with the consequent struggle for living, which in its train brings rural indebtedness.

The following statement gives the approximate average holdings in some of the villages of the tract for land owning cultivators and tenants.

Village.	*Broadcast paddy area.*	*Transplanted paddy area.*	*Dry land*
Tenants.			
1. Ramachandrapur.....	5·2 acres	0·7 acre	0·02 acre
2. Mohanapalli. ...	2·4 „	2·4 „	nil
3. Daribhadra. ...	2·1 „	2·1 „	1·5 „
4. Sappuvapalli. ...	3·9 „	3·9 „	3·0 „
5. Saradapuram. ...	0·5 „	5·2 „	1·0 „
Land owning cultivators.			
1. Saru. ...	4·6 acres	2·6 acres	0·8 acre
2. Ankurada. ...	0·5 „	2·4 „	2·4 „
3. Hinjili. ...	2·0 „	1·3 „	1·0 „
4. Sasana Ambugam. ...	2·1 „	1·2 „	0.8 „
5. Nimmigam. ...	3·00 „	2·00 „	2·5 „

We find that the majority of the holdings are such as not to provide enough for an average family. Even in cases where the average holding of a village approaches the desired figure on account of the existence of some big land lords, a detailed scrutiny shows that the majority of the cultivators suffer heavily on account of the inadequacy of their holdings. Fortunately the existence of absentee land lords in some of the villages appears to relieve some pressure on land.

From the statements of expenditure and income for Pattupur, we find that the agricultural income obtained from crops and domestic animals hardly meets the bare necessities of life including the cultivation expenses. Under such circumstances a ryot will have to go in for loans, not only for expenses, involving capital outlay but even for working expenses if he has no other source of income. If the previous crop happens to be particularly poor after unfavourable seasons, the ryot has sometimes to borrow for his household or agricultural expenses. Luxuries and ceremonies account only for 8 per cent of the total expenditure. And this is low enough with an ordinary ryot to be beyond any possibility of any economy being suggested. However, ryots generally borrow for such items as marriages and other religious ceremonies, and these are partly responsible for rural indebtedness. Even in the case of ryots who could save some small amount it is spent away on luxuries or on

account of the increased standard of living with the result that no reserve is built up to meet lump-sum expenses on marriages and other ceremonies.

It now remains to be considered what attempts are made by the villagers with inadequate holdings to overcome the difficulties they face, and how we can assist them in improving their lot. Some of the ryots are no doubt struggling to supplement their agricultural income by working as labourers, hiring out carts, rearing calves, mat-making etc. In their anxiety to supplement their agricultural income ryots sometimes take the risk of going to Central Provinces across the Agency tract with a cart laden with salt and returning with some produce from there just to earn something towards cart hire. Whenever relief cannot be secured through subsidiary occupations emigration to Rangoon is common even with the middle class ryot.

It has been estimated that even an economic holding does not engage the working pair for more than 121 days and the cultivator for more than 211 days. The rest of the five months will have to be wasted by the cultivator, except when he cuts some green grass for his cattle. The organisation of more cottage industries is therefore one remedy for the idleness of the cultivator. For an industry to be introduced in any village with the desired results, the raw products should be available locally, and be of such a nature as to be capable of being handled by a good number of villagers during the off hours. The finished product must lend itself to easy packing and transmission, from place to place, and there should be a good demand for it. Spinning and weaving no doubt answers all these requirements, but as cotton cultivation is not in vogue at present, the raw material is not available. Cuscus mat making, plate leaves making, palmyra and screwpine industries, eri silk industry and bee keeping for which facilities exist in some places may be found useful to a certain extent.

We shall now consider how far the economic condition of the villagers can be improved, by improving the agricultural practices of the ryot apart from introducing cottage industries. We feel, that as far as the Oriya tracts in Ganjam District are concerned, improvement of the general standard of cultivation and promotion of intensity and diversity of agriculture go a long way in solving our problem. Agriculture in this tract is at a very low standard, and though there is no doubt that the discouraging local conditions are partly responsible for it, there is considerable scope for improving production, if only the necessary bias can be created. At Pattupuram which formed one of the centres for agricultural demonstration some degree of success has already been achieved in the demonstration of the past three years. In the year 1931 the District Agricultural Officer estimated an additional income of Rs 3000 for the whole village as the result of the various agricultural improvements carried out there, including

the paddy grass hopper control work, which claims the lions' share in the profits. The following statement shows that the ryot of Pattupur can further improve his income by about 25 per cent. by adopting improved method of agriculture on the lines indicated in the statement.

	Area available in acres.	Increase in production in bags per acre.	Total increase for the village in bags.	Estimated value of the increased yield in Rs.
Agricultural Improvements :—				
Paddy—				
1. Proper preparation of seed beds, thin sowing and proper planting.	118	2	236	1000
2. Green manuring in transplanted paddy fields.	118	2	236	1000
3. Bund ploughing work in broad-cast areas for controlling the grass-hopper pest....	200	2	400	1500
Other items :—				
4. Plantain cultivation in paddy fields. ...	1	...	...	200
5. Chilly and vegetable cultivation after the harvest of paddy. ...	4	...	...	200
6. Removing superfluous bunds, and thinning broad bunds in paddy areas. ...	Lump sum	...	...	150
7 Improving the quantity and quality of cattle manure. ...	...	...	...	150
			Total.	4200

Note :— Besides the above, there are other items, e. g. the introduction of sugarcane and other garden crops, dairying etc.

To make up the defeciency in income of certain individuals we can suggest the growing of such money-fetching crops like sugarcane plantain, chilly and vegetables after paddy etc., not for reasons of big profits, but for providing work to the cultivator during the off season, and get him some additional income. The area a ryot has to tackle

under these crops will have to be settled with special reference to the working members of his family, and the cropping he does. The following statement furnishes details regarding the area a ryot has to tackle with the money-fetching crops, the cash and the estimated expenditure, and the additional income that can be expected.

Crop.	Area in cents for an average ryot.	Cash expenditure.	Estimated expenditure.	Estimated value.	Profit.
		Rs.	Rs.	Rs.	Rs.
Sugarcane	40	68	100	150	82
Plantain	40	40	100	180	140
Charakanda *	30	24	75	87	63
Chilly	25	8½	21	40	31½
Vegetables including onions	50	8	21	40	32

* This is not cultivated by others than Saru brahmins.

Note: The last three crops can be grown in the cold weather season after the harvest of paddy without displacing it.

In this connection it may be mentioned that at Saru, another central village, where J. 247 sugarcane was introduced some five years back, in an area of 40 cents, the area has spread to 30 acres; and more than half the number of cultivators having taken up its cultivation. The villagers who were taking the risk of going to the Central Provinces across the agency tract for earning cart hire in their struggle to find some subsidiary occupation have given it up, and have become whole-hearted dependents on agriculture, having learnt to grow money-fetching crops.

Out of the 56 ryots at Pattupur as many as 29 do not possess cattle other than working pairs, and this is peculiar to rural life. Milk and its products are not generally used by the Oriyas, and are considered luxuries. The poor performance of the local breed at the pail, and the low cost the calves fetch, appear to be responsible for an Oriya ryot not paying sufficient attention to cattle or to rearing of calves. Ganjam District imports large quantities of ghee from other areas. If milk does not command any sale locally, there is no reason why good milch buffaloes should not be maintained by the villagers to earn something by the sale of ghee. For maintaining health butter milk is sufficient, and if this is consumed, and the ghee sold, the ryot gets an additional income and supplies himself with an important article of diet.

It may appear surprising as to why the villagers are slow in taking to the various agricultural improvements when we are thus in possession of the means of ameliorating their economic condition. The

state of the villager appears to be that of a chronic patient who loses all faith in medicines, and is reluctant to take up any suggestion that may be offered to him to ameliorate his condition. The perpetual struggle to eke out the bare necessities of life, from year to year, makes him despondent. The worse the adverse conditions he has to get through, the lesser the chances for him to be in a mood or condition to launch on any enterprise, and it is only persistent and patient work with selected individuals that can create confidence in others to take up our advice. Under such circumstances, progress cannot but be slow. The fall in the prices of agricultural products has further complicated the problem of rural uplift and renders the work of the Department much more difficult. With the concentration of work in some central villages and the co-operation of Revenue, Public works, Sanitary, Co-operative, and Industries departments some measure of success may be achieved.

Acknowledgements. In conclusion, we wish to thank M. R. Ry. G. Jogiraju Pantulu Garu, District Agricultural Officer, Vizagapatam, for his kind direction in the enquiries at Pattupur.

OBSERVATIONS ON FLOWERING IN THE COMMON GOURDS

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A study of some of the common gourds cultivated in Malabar was taken up in the Agricultural Research Station, Pattambi, (South Malabar) and this note describes the observations made about the flowering phases of two of the varieties, snake gourd (*Trichosanthes anguina*) and bitter gourd (*Momordica charantia*).

Snake gourd (*Trichosanthes anguina*).

This variety started flowering about a month and a half after sowing. The earliest among the plants examined took 42 days, while the late ones started flowering in 48 days.

Flowering was observed to start from the 8th to 11th nodes. In every leaf axil a raceme consisting mainly of staminate flowers 10 to 20 in number starts, and by the side of the inflorescence, an odd flower, which is either male or female develops. These earliest formed odd flowers are generally male but those formed later are females. Once the female flowers begin to appear, all the succeeding flowers in that particular branch are females only. This behaviour is observed to be characteristic of this species in all the plants examined. The female flowers are always solitary in the axils of leaves. The axis of inflorescence when observed at the growing tip of a branch, is only about 0·5 cm.; but this grows to about 25 cm. when the first flower of the inflorescence opens. At the time of opening, the pedicels of individual

flowers of inflorescence, measure about 4 to 5 cm. and the flower proper (calyx tube and corolla) about 2·5 cm. The pedicels of the odd solitary male flowers, occurring by the side of the inflorescence in the beginning, are much longer than those of the male flowers on the inflorescence. The whole length of the pistillate flower when very young is only about 1 cm. Within 5 or 6 days however, it grows to about 6½ cm. when the flower opening takes place.

Table No. I. gives the percentage of male and female flowers produced and the number that comes to full bloom, during the periods noted against each plant. A large percentage of male flowers are found to open even after 20 days, whereas in the case of pistillate flowers a large number wither away without developing fruits. It is also observed (Table I) that the average percentage of pistillate flowers varies between 8 to 9 % in a majority of the plants examined.

The actual blooming of the flowers, starts at about 7-45 p. m. in the case of the male flowers and about half an hour later in the case of the female flowers. The petals which are rolled up and closely attached together, gradually separate and unfurl, and after a period of about 45 minutes the flowers are normally and fully open. Just at the commencement of opening of the flowers, the anthers were observed to have dehisced ; insects were also observed to be visiting all the open flowers. Since the staminate flowers open a little earlier than the pistillate flowers, the insects which must necessarily visit the former first, get besmeared with pollen ; and so, when they in turn visit the female flowers, the chances of pollination are great. In the female flower the stigma is sunken in the calyx tube at the time of flower opening and the calyx tube itself is filled with nectar, thus serving as a sort of attraction for the insects. Since these flowers open so late in the day, at about 7-45 p. m., the question of the period of receptivity of the stigma will have to be examined if any artificial crossings are to be undertaken between this and any other gourd with a different flowering time.

Changing weather conditions such as rainy weather followed by bright sun do not seem to have any appreciable effect on the flower opening. The flowers remain open throughout the night, and begin to close the next day at about 11 a. m. Most of the male flowers get detached at the bottom of the calyx tube and drop down late in the evening and this is greatly accelerated by heavy rains. In the pistillate flowers the petals roll up and remain there in the dried up condition for a few days.

Bitter Gourd. (*Momordica charantia*)

The flowering commences in this variety about a month after sowing. The flowering duration recorded in the different plants examined ranges from 34 to 47 days.

The flowering generally starts at the 8th or 9th node. The flowers are generally solitary in the axes of leaves. The flowers of this variety have long thin stalks which grow up to 7 or 9 cm. at the time of opening of the flowers. The peduncles have leaf-like cup-shaped bracts at the middle or at the base. The pistillate flower when first traced at the growing point is about 1 cm. in length while in the fully matured flower, the length of the pedicel alone varies from 4 to 8 cm. and the ovary portion ranges from 3 to 4 cm. It takes about 10 to 12 days for a young flower bud noticed at the growing point to come to blooming, but sometimes the time taken is less than a week. This probably depends on the rate of growth of the plants.

From Table No. II it will be seen that a large number of male flowers are usually produced, and percentage of females produced (which varies between 1·6% to 4·2%) is comparatively small; but one among the plants examined, showed quite the reverse tendency —that of producing a large percentage of females. It may be observed from the table that about 38% of the females produced in this particular plant, shrivelled up without coming to full bloom. It may be interesting to follow whether the tendency to produce any particular sex predominantly is a heritable character.

The actual blooming of the flowers in this variety takes place between 4 and 5·30 a. m. for both male and female flowers. The flower opening consists in the loosening of the petals from the twist. Just as in the case of Snake gourd, rainy or dry weather at the time of flower opening does not appreciably affect the flower opening. Generally in the evenings, most of the opened staminate flowers get detached from the pedicel and fall down. The anthers dehisce at the time of flower opening and the insect agencies begin their work of pollination.

Table No. I. Flowering observations recorded in the Snake gourd (*Trichosanthes anguina*).

Number of the plant.	No. of days after commencement of flowering.	Total number of male flowers produced.	Percentage of male flowers opened.	Total number of female flowers produced.	Percentage of female flowers opened.	Percentage of shrivelled female flowers.	Percentage of females to the total male and female produced.
1	8	266	9·8%	23	13·0%	34·8%	8·0%
2	7	205	5·4%	27	22·2%	33·3%	11·6%
3	9	400	9·0%	34	...	73·5%	7·8%
4	3	300	4·7%	27	...	51·9%	8·3%
5	9	500	4·0%	48	8·3%	37·5%	8·8%
6	6	396	9·3%	37	5·4%	67·6%	8·5%

Table No. II. Flowering observations in Bitter gourd. (*Momordica charantia*)

No. of the plant.	No. of days after commencement of flowering.	Total male flowers produced.	Percentage of male flowers opened.	Total female flowers produced.	Percentage of opened female flowers.	Percentage of shrivelled female flowers.	Percentage of female flowers to the total male and female produced.
2	14	210	62·4	4	5)	...	1·9
4	14	275	54·2	12	66·7	...	4·2
6	19	301	50·2	5	40	...	1.6
8	20	3	...	183	8·2	38·3	98·4

ABSTRACTS

The Relation of Nitrogen, Phosphorus and Potassium to the Fruiting of Cotton:— Nelson, M. and Ware, J. O. (*Arkansas Agrl. Expt. Stn, Bull.* No. 273, 1932). The paper reports field studies of the effects of nitrogen, phosphorus and potassium upon the fruiting of cotton, carried out on fine sandy loam soil in Arkansas State, for a period of five years. It was found that lighter applications of nitrogen, increased the setting of squares materially, while the heavier applications did not cause further increases in the rate of development or in numbers. Similar increases occured in the blooming stage, the greatest increases per unit of nitrogen, resulting from the lighter applications of nitrogen. However, the heaviest applications of nitrogen succeeded in producing the largest number of blooms during the season. The numbers of bolls set tended to increase each season from no treatment to the highest application of nitrogen ; so also yields of seed cotton. The average percentages of earliness did not increase with larger applications of nitrogen, although the amount of early cotton usually was larger from the heaviest application of nitrogen. The size of bolls was increased decidedly by the first or lightest application after which there was no further increase.

Phosphorus, in the first or lowest applications increased the percentage of earliness, but further additions were ineffective. The size of boll and the lint per 100 bolls were increased slightly by phosphorus, but the weight of seed, the staple lengths, the lint index and the percentage of lint were not increased even by the heavier applications of phosphorus. Potassium, as indicated by the five year averages, appeared to increase very slightly the numbers of squares, the numbers of blooms, the numbers of bolls, yield and percentage of earliness. Potassium had no effect upon the size of bolls and no positive effect upon the lint in 100 bolls. Apparently, potassium had a very slightly reducing effect, if any, upon the weight of seed and upon the lint index, but it had no appreciable effect upon the percentage of lint or upon the length of staple.

Potassium and nitrogen without phosphorus increased the setting of squares and the number of blooms and bolls set and also the yield substantially. The

authors report that the addition of phosphorus to nitrogen and potassium in the above cases showed no appreciable improvement; but it is to be noted that they fail to furnish in their paper figures for analysis of the soil they have experimented, so that it is not possible to state whether the inefficacy of additions of phosphorus in the authors' experiments is due to the physiological non-responsiveness of the cotton plant to phosphorus or to the abundance of phosphorus present already in the soil. The authors' experiments also show that the percentage of shedding is proportional to the total numbers of blooms that developed; and that the manurial ingredients by themselves did not affect the proportion.

(C. N.)

Variation in the Composition of Milk:—(*Bullatin No. 16 of the Ministry of Agriculture and Fisheries, London*). This publication, formerly Miscellaneous Publication No. 65 of the Ministry of Agriculture, and since been published in Bulletin form, deals with the different factors which control the composition of milk, the Food and Drugs (Adulteration) Act of England 1928, provides that a sampleof milk that contains less than 3% of fat or less than 8·5% of other solids should be presumed not to be genuine until the contrary is proved; but a large number of cases were forthcoming where "genuine" milk contained less than the above proportion of fat and solids not fat. The present publication is the outcome of a conference of officials and Dairy experts held in 1927 to consider the factors bringing about the above exceptional cases and summarise our present knowledge regarding "the circumstances known to be associated with variations in the composition of milk". Among such controlling factors examined by the writers are (1) Individuality of cows; this factor may not prejudicially affect herd averages. (2) Intervals between successive milkings: this has a more decisive influence on fat content than others; the longer the interval the less the percentage of fat; usually the evening milk is richer in fat than the morning milk. The solids not fat are not generally affected. (3) Age of cows; the percentage of fat tends to fall down with age, especially after 7 or 8 years. (4) Breed; the Jersey breed for instance shows 5·43% fat and 9·30% solids not fat, while the British Fresian gives only 3·67% fat and 8·78% solids not fat. (5) Period of Lactation; the percentage of fat (3·78%) and that of solids not fat (8·95%) tend to increase with advance in the period of lactation (up to 4·70% and 9·49% respectively). (6) Influence of food; despite popular opinion, numerous experiments show that the influence of food, provided it is wholesome and sufficient, is very slight and temporary; the yield of milk no doubt considerably varies (up to 50% even) with increased nutrient provided to the cow, but the composition of the milk shows a remarkable uniformity. (7) Abnormal conditions; unusual surroundings and disturbing influences, for example, being milked by inexpert milkers or strangers, considerably reduces the fat percentage of milk. (8) Sexual excitement in the cow shows a preliminary depressing effect, followed by high values for fat, which may vary as much as 300 to 400% of the intial values. (9) Variations in the composition of milk during a single milking; the first drawn milk from the udder is the poorest in fat (1·3%) and the strippings are richest (5·9%). The solids not fat also showed considerable variation. (10) Day to day variations; the evidence shows that there may be considerable variations even within short periods. In the case of individual cows, variations of fat percentage from 3·1% the previous eveningto 6·6% the succeeding evening have been known; the mixed milk of a herd of 24 cows varied in fat by 0·6% and solids not fat by 0·87% between one milkingand the next corresponding milking. The pamphlet ends with a number ofinteresting graphs showing the variations in the composition of milk over different periods.

(C. N)

Cheese-making:—(*Bulletin No. 43 of the Ministry of Agriculture and Fisheries London March 1932*). This new addition to the useful series of bulletins issued by

the Ministry of Agr. & Fish. in England, gives full details regarding the various kinds of hard pressed, blue-veined and soft cheeses, their history, general characteristics and manufacture. A preliminary chapter is devoted to general instructions for cheese-makers with particular reference to control of acidity, use of starters, colouring and renneting. The pamphlet will prove a useful handbook to all those interested in cheese-making.

(C. N.]

Gleanings.

World Agricultural Policy. The general assembly of the International Commission of Agriculture, which met at Lausanne on July 21—22, was attended by delegates from sixteen countries and thirty-five national agricultural organisations, and a statement has been issued on world agricultural policy. It was emphasised that the world agricultural crisis is due to the fact that production and increased means of securing production have outstripped both present consumption possibilities and population increases, while purchasing power has meanwhile declined. The commission therefore considers that a judicious organisation of production and exchange will constitute one of the most effective means for fighting the agricultural crisis and establishing the prosperity of nations on a new basis. The first step would be to substitute orderly marketing, through the agency of associated bodies or by means of systematic State-controlled quota import arrangements for the present unregulated offers of large quantities of commodities on world markets. Simultaneously, all means of stimulating consumption in general will have to be considered. Efforts will have to be made to improve and regularise quality and to cheapen retail sale. An appropriate wages policy will have to be adopted which, while allowing of a decrease in the number of the unemployed, will take account of national purchasing power. The question of new markets should also be studied, and, for the time being, also that of the export of existing surpluses to countries where the populations are suffering from underfeeding or famine. Further, an increased consumption of products of animal origin would absorb a larger portion of the surplus of vegetable products, which would be transformed into milk and meat. Finally, building should be encouraged by all suitable means. The International Commission of Agriculture recommends agriculturists to support the work of international collaboration, to associate themselves with efforts which aim at the maintenance of peace, at guaranteeing the security of property, and at drawing closer the bond which unites economic groups and nations in a common interest.

(*Nature*, Aug. 6, 1932.)

Milking Machines. It was felt desirable to ascertain the present position of mechanical milking among members of the Milk-Recording Societies in England and Wales, and an enquiry was carried out during the summer of 1931, by means of a questionnaire, submitted through the Ministry's Life Stock Officers working in conjunction with local societies Information was obtained regarding the type of machine, the size of herd, time taken to milk the herd, the number of milkers, the technical procedure followed, and the general efficiency, economy and hygiene of the machine.

The general enquiry has served a useful purpose in providing useful details of milking-machines on a large number of farms, and in confirming the general impression that mechanical milking can be generally efficient and on many farms a definite economy. The Scottish enquiry indicated that little economy could be

effected in herds below 40 cows, where wages were relatively high, or in herds below 60 cows with a comparatively low wage rate. The lower average figure in England and Wales points to the general utility of a machine, quite apart from a purely cash economy, and shows that it is useful where local labour is limited or of doubtful efficiency, where the farm is run as a family unit and where general farm work, special contracts and regular delivery are important considerations. (*Jour. Minis. Agri.* July 1932.)

Empire Fibres for Rope Manufacture. For many years past the ropes used by sea-going vessels have been made largely of the fibre known as Manila hemp, some 50,000 tons of which, of an approximate value of £ 1,500,000 are imported annually into the United Kingdom for this purpose. Much of this fibre could be replaced by the Empire-grown fibres such as Sisal hemp and New Zealand hemp, if these should prove suitable for use in this way.

During recent years the production of Sisal hemp has undergone great development in British countries, especially in Kenya and the Mandated Territory of Tanganiyaka, and its employment for marine ropes would provide an outlet for the large quantities produced.

Some years ago when the question of the utilisation of the fibre for this purpose was under consideration at the Imperial Institute, it was found that there was an impression prevalent that Sisal hemp was unable to withstand the action of sea water but rapidly suffered a loss of strength. A series of trials have, therefore, been carried out by the Imperial Institute during the last six years in order to study the durability of Sisal hemp and New Zealand hemp in comparison with Manila hemp.

A number of ropes of Manila hemp, Sisal hemp and New Zealand hemp respectively were made according to the same specification and were exposed to the action of sea water, under precisely the same conditions, by placing them in wooden crates fixed to Southend pier in such a position that during each tide they were completely submerged for a period and completely uncovered for a period. The strength of the ropes was determined before immersion and after definite periods of exposure to sea-water.

The Imperial Institute has now completed the fourth series of tests carried out on these lines and the results are recorded in a report published in the "Bulletin of the Imperial Institute" (No. 2 of 1932). They corroborate those of the earlier series in demonstrating that ropes composed of Sisal hemp or New Zealand hemp resemble Manila hemp ropes in their resistance to sea-water and are capable of maintaining their strength to a similar extent The establishment of these facts has encouraged the Admiralty and certain shipping companies to carry out practical tests on sea going vessels with ropes made from British-grown Sisal and New Zealand hemp, and the results are awaited with great interest.

The above mentioned report (Price 6d. post free 7d.) can be obtained from the Director, Imperial Institute, South Kensington S. W. 7. (*Journal of the Royal Society of Arts*, vol. LXXX, No. 4160. August 12, 1932).

Field Control of Mosaic Disease in Hawaii. At the present time mosaic disease in Hawaii is a problem only in a few localized areas and as regards a limited number of highly susceptible cane varieties. The methods used in the field for controlling the disease are outlined as follows:

(1) Rigid selection of healthy cuttings only for seed material. Labourers can be trained to differentiate between healthy and diseased plants, and where such a system of selection is in effect it is possible to have a newly planted field almost entirely free from the disease. It is now known that the mosaic virus can be transmitted by cane knives, hence these implements should be disinfected frequently.

(2) Substitution of resistant for susceptible commercial varieties. This is the most effective of all means of controlling mosaic; an example is the substitution of D. 1135 in place of Striped Top.

(3) Systematic roguing of fields at frequent intervals in order to remove all diseased plants as soon as possible.

(4) Clean field cultivation. Weed control is of paramount importance in any field. Grasses, even though not affected by the mosaic disease, may harbour the corn aphis.

(5) It is recommended that host plants of the corn aphis such as corn, sorghum etc., should not be grown near corn fields. (*Facts about Sugar*, vol. 27. Number 8. August 1932).

Thunder does not sour milk.— "Contrary to popular belief, thunder does not have anything to do with the souring of milk," says the United States Department of Agriculture. Just before a thunderstorm, the atmosphere is unusually warm or even uncomfortably hot. This warm condition is ideal for bacteria and the sour milk is a result. The heat and bacteria do the trick not the thunder. More attention to cooling the milk is suggested to prevent souring at these times."— *Scientific American*, September, 1932.

Irrigation in India.— "The progress of irrigation and the use of the available water are surveyed in the 'Triennial Review of Irrigation in India 1927–30' (Simla, Government Press, 2sh. 6d.). It would appear that the monsoon of 1927 was almost normal in its time and rainfall except for a slight deficit. In 1928 there was a marked deficiency in the northwest, and in 1929 the principal departure from the average was an excess of 100% in the rainfall of the North-West Province and Sind. During the three years under review, the average area irrigated by Government works in British India was 29, 954,000 acres, an advance of more than 2 million acres on the corresponding figure for the previous triennium. The chief increase was in the Punjab valley, owing to the development on the Sutlej valley canals. It is noticeable that, of the total sown area, 12.7% was irrigated. Among the most important projects now in hand are the Sukkur Barrage and canals in Sind, the Sarda Canal and a Hydro-electric power scheme on the Ganges canal in the United Provinces and the Sutlej valley project in the Punjab. The problems of water supply in Baluchistan are being considered in the hope of improving the very poor irrigation facilities." — *Nature*, August 27, 1932

Notes and Comments.

The Unemployment Problem. In his recent address before the Mysore University Union, Sir M. Visveswarayya has discussed this problem in a thorough manner and his remarks are indeed worth noting. He traces the main causes of the present critical condition which has arisen not only in India but in most other countries of the world to two or three main reasons. In his opinion the first appears to be the mal-distribution of the world's gold supplies, failure to meet war debts, uneven production and high tariff and a second one, he says, is the rapid growth of population in India and the defects and disabilities

which our country has been labouring under for years past. After discussing these causes in some detail he suggests some remedies and lays considerable stress on the importance of devoting more attention to scientific research in various ways. As emergency measures he has put in three very sound propositions (1) rapid industrialisation by multiplying factories and industrial establishments, (2) rural reconstruction by increasing production from Agriculture and from cottage and home industries in rural areas by the co-operative effort of the people and (3) establishment of practical training institutions to provide the last stages of precise knowledge needed for the practice of callings connected with Agriculture and Industry for educated youths and adult businessmen. These three propositions are nicely elaborated. The whole address is very instructive, thought-provoking and full of very practical suggestions.

Wood Preservation. The question of preserving timber and keeping different kinds of wood work used in various structures from deteriorating and giving way has been engaging the forest, railway and public works departments for years. Various methods of preservation have been suggested by experts from time to time and tried by the authorities who have to utilise the products of our forests; but so far no very satisfactory methods appear to have been evolved to keep wood in a satisfactory condition for a fairly long time. We are gratified to find that a new process of preserving timber and wood work has been discovered by Mr. S. Kamesam, Wood Preservation Expert of the Forest Research Institute, Dehra Dun. In an interesting lecture he recently delivered at the Engineering College, Madras, Mr. Kamesam explained the new Fahl-Ramesam process which was discovered by him while carrying on research under Dr. Fahl in Germany. The process appears to be the injection of arsenic in a certain definite proportion into the wood before use and costs only one anna per c. ft. It would appear that wood work treated in this manner would keep in sound condition for over 21 years without any attention. This would mean considerable saving. We congratulate Professor Kamesam on this extremely useful discovery, the application of which will add to the economic wealth of India in the future.

Sugar Technology Training. We are glad to note that two of our agricultural graduates Messrs. T. R. Subbaroyan and P. G. Lakshmanan have been selected by the Director of Industries and offered Government scholarships of rupees sixty per mensem for a two years' course in sugar technology at the Harcourt Butler Technological Institute at Cawnpore. We have no doubt that these two young men who have been selected for this very useful work will do their best in this work and return with honour both to themselves and to the Agricultural College, Coimbatore, their *alma mater*. We wish that it may be possible for even private capitalists to depute

more young men for similar courses of training in the various industries to institutes both in and out of India.

A bequest for scientific research. Most of our readers are perhaps aware of the fact that Rao Bahadur D. Lakshminarayan of Kamptee in the Central Provinces has set apart as his gift a sum of forty lakhs of rupees for scientific research. A committee was appointed to draft a scheme for the proper utilisation of this very valuable endowment and this committee consisting of Sir P. C. Ray, Sir C. V. Raman, Dr. H. K. Sen and Dr. Gilbert Fowler has now recommended the establishment of a Lakshminarayan Laboratory for research in industrial chemistry with special preference to such industries as could be developed in the Central Provinces. The Nagpur University has been asked to establish a demonstration factory on a commercial scale. The details of the scheme are being worked out by the Nagpur University. It is needless to add that our country is in need of many such endowed institutions which will not only afford facilities for our young unemployed but would enable the country to find ways and means through the results of such research work to utilise its natural resources and add to its material wealth and prosperity.

The Viceroy on Agriculture. We invite the attention of our readers to the fact that in his inaugural address to the Legislative Assembly early last month H. E. The Viceroy has given prominence to Agricultural Research in India and has given expression to its great importance and further need. His Excellency has commended the work of the Imperial Council of Agricultural Research and in His Excellency's own words "though its activities have been affected to some extent by the prevalent financial stringency which reluctantly compelled the Government to suspend for the year 1931—33, its annual grant of five lakhs of rupees." His Excellency has also made the assurance that "this purely temporary suspension of the grant, however, does not in any way mean that the Government have changed their previous opinion in regard to the importance of Agricultural Research to this country in general and to the fact that the need for a central institution to co-ordinate and direct research remains as great as ever." This is doubtless a happy augury for agricultural progress in this country.

Prospects of Agricultural Graduates. Graduates of the Agricultural College have been for sometime past under some doubts as to their eligibility for employment in other departments and for further training for higher studies. The following note we have recently received from the Director of Public Instruction makes the matter clear as regards the eligibility of agricultural graduates in the Educational Department.

"Under Rule 13 of the Madras Educational Rules the Headmaster in a Secondary School and at least as many teachers as there are

sections in Forms IV, V and VI should ordinarily hold collegiate trained teachers' certificates. Where, however, teachers with such certificates are not available for these forms untrained teachers who are graduates in Arts, Science or Agriculture may be employed by the managements. As for the admission of B. Scs in Agriculture into the training colleges the selection is made under rule 114 of the Madras Educational Rules by the heads of the respective institutions with the assistance of selection committees. There is no rule which would debar the admission of graduates in agriculture who may be considered as regards admission as on a par with graduates in Arts or Science."

Reviews.

Nagpur Agricultural College Magazine :— We are glad to note that with the opening of the new volume for the current year, the Nagpur Agricultural College Magazine has come out in an improved form both in regard to its matter and get up. As noted in the editorial, the sponsers aim at "making the magazine a publication of some use to students of agriculture which they can read and study and preserve for future use." The August 1932 number contains several interesting original articles, besides new features such as extracts, gleanings, abstracts of current research, agricultural notes, crop forecasts, etc. We have no doubt that these improvements steadily maintained would serve to increase the popularity and usefulness of the journal and we wish it a long and prosperous career.

(C. N.)

The marketing of fruits and vegetables in Bombay, by Dr. Cheema, Horticulturist to the Government of Bombay. Dr. Cheema of the Bombay Agricultural Department has had an opportunity to study the organisation of the famous Covent Garden market, London, and the Paris market and thus has prepared a very useful and thought-provoking pamphlet on the subject.

The starting of big industries in towns and the consequent movement of the rural population to towns brings in complications in the supply of fruits and vegetables which form an important portion of the diet of the people. He finds that at present on account of the rise in the prices of these goods they are becoming luxuries while at the same time the producer does not get any more for his labour commensurate with or proportional to the abnormal rise in prices. It is estimated that on an average the retail buyers in Bombay pay up to 250 to 500 % more than the farm price on certain fruits like mango, guava and oranges, making them prohibitive for the middle and labouring classes. The incredibly low consumption of fruit and vegetables in Bombay, namely, half an ounce per head per day, is attributed to (a) the uncertainties under which the producer is working now, (b) the very large number of links between the producer and the final consumer and (c) an inadequate city organisation for controlling the provisioning of these articles.

There is also a big import of foreign fruit amounting to nearly a crore of rupees per annum contributing to affect the local fruit industry. This big import is found to be facilitated by the encouragement given to the importers by the foreign agents in Bombay, low freight charges of ships, and the direct distribution

of the fruit to the city stores without their being handled by the local agents who control the supply of local fruit. He thinks that while the foreign fruit is firmly establishing itself in Bombay markets the chances of the Indian fruit finding a home in other countries are very meagre. The very excessive freight charges demanded by the Steam ship companies, both coastal and otherwise are illustrated by the following examples. Palestine pays only Rs. 2 per case of 75 lbs. up to Bombay while Rs. 5 is demanded to carry one dozen mangoes from Bombay to Marseilles. A charge of Rs. 56 is levied to transport one ton of mangoes from Ratnagiri to Bombay while oranges can be brought from Rhodesia to this country at Rs. 40- per ton. To remedy this state of affairs, Dr. Cheema recommends the levy of a cess on foreign fruits and utilise the amount realised in improving the market system, the better feeding and provisioning of the city. The transport facilities offered by the railways are also so extremely defective that it is impossible to move fruits and vegetables to great distances within the country. Dr. Cheema has some useful suggestions to make regarding the wholesale disposal of fruits in Bombay, separation of the wholesale from the retail market, publication of prices. registration of commission agents, agency charges, etc. He proposes the setting up of a Marketing Board to displace the present organisation which should be declared unsatisfactory when we find (information supplied by the Bombay Presidency Fruit Growers' Association) that 71% of the retail price of fruit is taken by the middle men, 18% is absorbed in freight and only 11% goes into the pocket of the grower.

Dr. Cheema also gives some useful tips to the growers about grading and packing of the farm produce. He also suggests licensing of the seed stores and nurseries to prevent any possible deliberate cheating practised by the seedsmen.

The conditions described by Dr. Cheema as applying to Bombay probably applies equally well to every other big industrialised city of the country and it is none too early that public attention is drawn to the seriousness of the situation. (K. R.)

A Study of Marketing Rice in Nueva Ecija, By Daniel F. Asuncion. Phillipine Agriculturist, vol. XXI, No. 3, p. 177. The above is an interesting thesis prepared by one of the students before graduation for the B. Sc. degree in Agriculture. The enquiry included in the thesis was intended to study the methods of marketing rice in a province which produces more rice than any other in the Islands. Nearly 620 landowners had been interviewed by the author besides merchants, transportation men and Government officials. Details are given as to how and what proportions of the produce pass through the middlemen, merchants and rice mills before it reaches the consumer. Summing up the costs under the different heads the author has come to the conclusion that the farmers of the province under enquiry received a little over 87% of the wholesale price obtaining in Manila, the chief cosuming market. The margin of middlemen was therefore 13% of which marketing costs was approximately 10% leaving 3% profits. The author states that the Chinese merchants who are the principal middlemen of the area are performing the essential marketing services at a fairly low cost and that any other system of marketing as co-operative marketing among farmers, to justify existence, must be able to render these services at equal or lower costs.

The rice market in Madras town gets a big supply of raw rice from parts of Kistna and Guntur and it should form quite an interesting study to determine what proportion of the wholesale Madras prices is actually being received by the rice growers of the tract. It is expected that in these days of trade depression the rice growers would stand to gain by organising for themselves co-operative marketing societies. Surveys of the type described in the thesis should be extremely useful for such organisations before they are brought into existence. (K. R.)

Industries in Madras. 'The Report on the Administration of the Madras Presidency for the year 1930—31 bears testimony to the depressed condition of the more important industries in it. The price of cotton was unremunerative though output was well maintained and the price of jute also declined. Two of the twenty large hosiery factories suspended operations during the year. The others were fairly well employed but experienced severe competition from cheap and inferior Japanese goods. The prices obtained were low. Owing to the fall in exports of Madras handkerchiefs, weavers began producing inferior goods, which had a further adverse effect on this industry. Exports of tanned and dressed hides and skins fell by 13% in volume and 19% in value the American market being almost completely closed by the high tariff on imported leather. The price of cocoanut, ground-nut and other vegetable oils dropped to the lowest lev l recorded for many years with disastrous effect to the oil milling industry. The demand for tiles both from within the country and from outside fell considerably, and the prospects of this industry were far from bright. It was found very difficult to get steamers to take tiles to the Straits Settlements, while French tiles were imported there direct from Marseilles in large quantities. The timber industry had a bad year, exports dwindling practically to nothing and the internal trade also being very small. There was a steady fall in the prices of all grades of coir yarn, and the demand for coir for export fell considerably, with the result that manufacturing concerns reduced their output by 50%. Production at a lower cost was made possible by the fall in prices of raw materials. The position of the rubber industry was the most serious in its history. There was a marked falling off in consumption, while large quantities of rubber were shipped from the East, resulting in a large increase in the stocks in London. Tapping on the estates generally stopped in May 1930, and the estates in South India gradually began to close down. In spite of the scheme for the restriction of tea production, excessive stocks in London, which amounted to over 260 million lbs. at the end of 1930, precluded any hope of improvement in the industry. Very few estates at a low elevation were able to produce tea at a profit. The Indian Tea Cess Committee and other bodies tried to encourage in every way an increase in consumption of tea in India itself, which is the best hope for the industry. The condition of the coffee industry was not promising, though crops were fairly good. The prices of sugar and jaggery were very low, there being a general excess of production over consumption. On the recommendation of the Tariff Board, the Government raised the import duty on sugar Rs. 7—4—0 a cwt., with a view to protect the Indian sugar industry. The only industries which expanded somewhat during the year were the match and soap industries. Imports from abroad fell in both cases, though the match industry still suffered from competition. The soap industry was helped by the fall in the price of vegetable oils. Two fairly large factories were established during the year, making a total of 125 soap factories. There were several instances also of soap being made in a small way on a cottage industry basis.' ("*Mysore Economic Journal*", September 1932).

College News & Notes.

Students' Club: The College closed for the Michaelmas holidays on the 15th September and reopened on the 1st October. The final year students escorted by Messrs. P. S. Jivana Rao, S. Narayanaiyah, and V. T. Subbayya Mudaliar went on tour in Trichy and Tanjore districts and returned to Coimbatore on the 13th.

Officers' Club: The usual out-door and in-door tournaments in connection with the Club-day celebrations were in full swing throughout the early part of the month. The 'Club day' was celebrated as usual on a grand scale on the 22nd with a full programme for the whole day. The celebrations came to a close with a sumptuous dinner in the night followed by fire works and a variety entertainment.

Scout Day: The local scout troup celebrated The Scout Day on 1st October in the presence of a large number of ladies and gentlemen of the estate. There was a scout display which was very much appreciated. The celebrations included the planting of a tree in the compound by Mrs. T. Laxman Rao, opening of a lumber hut by Mr. C. Tadulingam and presentation of badges by Rao Bahadur B. Viswanath.

A Science Conference: Under the joint auspices of three scientific bodies, viz. The Association of Economic Biologists, Coimbatore, The Indian Chemical Society (Madras Branch) and The Society of Biological Chemists (India), there was a Conference on the 7th and 8th October at the Agricultural College and Research Institute. A number of scientists from Bangalore, Madras, Kumbakonam and Coimbatore attended the meetings of whom may be mentioned Dr. Gilbert J. Fowler, Dr. V. Subramanyam, Professor of Bio-chemistry, Indian Institute of Science, Bangalore, Messrs. K. C. Viraraghavayyar, Rao Bahadur M. R. Ramaswami Sivan, M. Sreenivasayya, Major Howard, Rao Bahadur K. R. Venkatramier, C. Dover, A. V. Varadaraja Ayyangar, G. Sambamoorthy, B. N. Sastri and others. On the 7th morning the visitors went round seeing the Institute and the Crop Breeding stations. In the afternoon there was a conference at which a Symposium on 'Utilisation of Waste Products, was read by several authors with Mr. S. V. Ramamoorthy in the chair. After the meeting the visitors and guests were entertained at tea by the local Association of Economic Biologists. In the evening Rao Bahadur B. Viswanath gave a lantern lecture on 'The Case for the Electro-chemical Fixation of Atmospheric Nitrogen' when Major H. G. Howard, Chief Engineer, Hydro-electric Development, presided. On the 8th morning Mr. M. Sreenivasayya of Bangalore gave an address on the 'Recent Status of the Problem of the Spike disease of Sandal', Rao Bahadur K. R. Venkatramier, Conservator of Forests, Coimbatore, presiding. In the afternoon, with Dr. Fowler as the president a number of scientific papers contributed by members of the three bodies were read and discussed*. The local members of the Indian Chemical Society were 'at home' to the visitors.

A Cricket match between the students of the College on one side and a combined eleven of local officers and visitors from Bangalore on the other was played on the 9th afternoon at which the College students won by a comfortable margin.

Visitors: Amongst the visitors to the College during the month may be mentioned Messrs. S. V. Ramamoorthy, Director of Agriculture, V. Ramakrishna, Director of Industries, A. Ranganatha Mudaliar of Bellary and Sahni, Director of Agriculture, Baroda.

Games. The College played a hockey match against the Forest College on the 13th inst. and despite the absence of several regular members of the team, belonging to the III year class, won the match by 3 goals to 1. On the 15th the College met the Forest College at cricket and won the match by 93 runs.

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* [The details of the proceedings of this joint meeting will appear in a subsequent issue] *Ed.*

Ayudha Puja Celebrations. The presence of the Director of Agriculture at Coimbatore was availed of by the Farm staff and the Principal, Agricultural College during the Annual *Ayudha Puja* Celebration at the Central Farm in requesting him to give away the annual presents to the permanent coolies of the Central Farm. After the *Puja* and some comic dances by the farm coolies, the Principal, in requesting the Director of Agriculture to give away the presents, said that this was the first occasion since the inception of the Central Farm in which the Director of Agriculture happened to be present on the occasion of the annual distribution of the presents to the coolies and that he was highly proud of the presence of the Director Mr. Ramamurti in distributing the presents spoke a few words in Telugu (as most of the coolies speak Telugu) pointing out that it is the results of their manual labour that is being demonstrated to the ryots throughout the Presidency and that if they were to be slack or indifferent to the instructions of the higher officers, the time and money spent on the experiments would be a waste. He also added that the pleasures of life and work, be it that of a poet, in composing a good poem, or a songster in singing a fine song, or a carpenter in making a beautiful piece of furniture or a farmer in taking a good bumper crop, are one and the same and so a ryot need not feel dejected on account of his manual labour. He requested them to be careful to the instructions and do their duty with a feeling of responsibility and with the idea that they are also responsible for the good or bad results of the work of the Department. Then the Manager of the Central Farm thanked the Director of Agriculture for kindly consenting to be present on the occasion in the midst of his multifarious duties and thus give an opportunity for the coolies to hear words of advice from t e Head of the Department which will be of much value and which will increase the enthusiasm and efficiency of the coolies. The function came to a close after three cheers proposed by Mr. R. Swami Rao, the Superintendent of the Central Farm.

Association of Economic Biologists.

There was a meeting of the Association on the 5th October when two papers were read and discussed. The first one was on 'Yield characters in coconuts' by T. Krishnamoorthy and J. S. Patel. The authors have analysed the yield records of 12 years at the Agricultural Research Station, Karasagod, and tried to establish a relationship between certain morphological characters and yield of nuts. They have found definite positive correlation between yield and total number of leaves, height of the trunk, number of female flowers, percentage of setting etc. in middle aged trees of 30—35 years. In a young plantation of 12 years they have found a significant negative correlation between the age at first flowering and total number of leaves and height of the trunk. According to the authors a tall tree with a large number of leaves not only yields more but also begins to bear early. From the results obtained it would seem possible to identify and reject at a very early stage some of the poor bearers in a young plantation.

The paper also discussed about certain preliminary observations on the catalase content in the leaf tissues, undertaken to evolve, if possible, a physiological test for the selection of seedlings in the nursery.

The second paper was by K. S. Subba Rao on "Chromosome Numbers in certain sugarcane varieties." The author had examined a number of varieties, viz. *Vellai*, *Shamshara*, *Poovan*, *Chittan* and *Purie*, and found the haploid chromosome number to be 40 in each.

The Coimbatore species of *Saccharum spontaneum* examined by the author was found to have 32 haploid chromosomes. One of the seedlings evolved at Coimbatore viz. Co. 205. a cross between *Vellai* and *S. spontaneum* was found to have 56 haploid chromores divided as $\frac{40+40+30.}{2}$

From the occurrence of 32 chromosome numbers in the Coimbatore farm of *S. spontaneum* the author suggests that 8 may be the basal number in at least certain forms of *Saccharum*. The paper was illustrated with a number of extremely good slides prepared from the Camera Lucida drawings of sections prepared by the author. (K. R.)

Weather Review (SEPTEMBER—1932)

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	6·4	−0·9	19·4	South	Negapatam	3·8	+0·1	16·7
	Berhampore *	5·5	−3·8	24·1		Aduthurai *	2·0	−1·3	15·8
	Calingapatam	4·2	−3·2	8·2		Madura	0·2	−4·6	13·2
	Vizagapatam	3·7	−3·1	15·1		Pamban	...	−1·2	4·3
	Anakapalli *	7·2	−0·6	25·4		Palamkottah	...	−1·1	12·8
	Samalkota *	4·3	−1·4	22·5		Koilpatti *	0·2	−2·0	21·0
	Cocanada	3·5	−2·6	22·2					
	Maruteru *	3·0	−3·8	27·9					
	Masulipatam	5·6	−0·7	25·5					
	Guntur *	5·5	−1·5	27·9	West Coast	Trivandrum	4·5	+0·4	50·8
						Cochin	9·9	+0·6	90·0
Ceded Dists.	Kurnool	4·4	−1·7	16·3		Pattambi *	12·3	+4·5	91·5
	Nandyal *	2·2	−4·4	16·4		Calicut	13·6	+5·3	121·9
	Bellary	4·6	−0·4	15·1		Taliparamba *	15·0	+5·3	129·0
	Hagari *	4·1	+2·3	15·9		Mangalore	16·0	+5·2	98·1
	Cuddapah	2·8	−4·0	11·6		Kasargode *	12·0	+1·4	100·3
						Nileshwar *	14·4	+3·3	135·8
Carnatic	Nellore	0·6	−3·7	12·0					
	Madras	4·4	−0·4	10·3					
	Cuddalore	6·0	+0·4	13·9	Mysore and Coorg	Bangalore	4·3	−2·5	25·3
	Palur *	5·8	+3·8	17·6		Chitaldrug	2·4	−3·5	21·0
	Palakuppam *	1·2	−3·1	14·2		Mysore	1·0	−3·5	23·2
						Mercara	20·4	+9·4	121·2
Central	Vellore	3·6	−3·4	16·9					
	Hosur Cattle Farm *	2·3	+2·1	24·4					
	Salem	4·1	−2·5	27·2	Hills.	Kodaikanal	3·9	−2·9	38·3
	Coimbatore Town	0·6	−0·4	16·9		Coonoor	1·2	−4·7	27·1
						Ootacamund *	2·4	−1·9	31·1
	Coimbatore Res. Inst. *	0·4	−1·6	16·9		Nanjanad *	4·0	−0·6	40·4
						Kallar *	1·8	−1·7	29·5
	Trichinopoly	3·1	−1·8	25·0					

* Meteorological Stations of the Agricultural Department.

General Weather Conditions : The weather was of an unusual type throughout the month with a pressure distribution of a south-west monsoon type, with fairly steep pressure gradients across the peninsula. The monsoon was active on the west coast till the 23rd of the month. Associated with the type of pressure distribution two depressions formed in the Bay. The first depression formed off the

Orissa-Ganjam coast on the 2nd and crossed near Puri on the 3rd morning and moving into the Central Provinces intensified and finally broke up in the Punjab hills on the 12th. The second depression formed in the Bay centred about 19°N 89°E on the 19th and developing into a storm crossed the coast at the north-west corner of the Bay on t e 21st and traversing the country in a north-westerly direction filled up near the Simla-Kumaon hills on the 26th. The two depressions gave rise to heavy rain along the tract they followed and associated with steep pressure gradients over the peninsula, winds had a decided southernly component, and weather was generally dry over the south. The rainfall was moderate in the Circars and was due to the two depressions. The pressure distribution changed over to one normal for the time of the year at the end of the month, and conditions became favourable for the incidence of thunderstorms, over the south and the monsoon gradually withdrew from about the 26th.

Rainfall was in moderate defect throughout the area outside of Malabar and Coorg.

Temperature was generally above the average owing to fine weather.

Weather Report for the Research Institute Observatory.

Report No. 9/32.

Absolute maximum in shade	...	92·8°
Absolute minimum in shade	...	67·5°
Mean maximum ...	...	88·9°
Mean minimum ...	...	70·8°
Total Rainfall ...	...	0·39″
Mean rainfall for month	...	1·97″
Departure from normal	...	-1·58″
Total number of rainy days	...	1
Mean daily wind velocity	...	4·5 m. p. h.
Mean 8 hrs. wind velocity	...	4·0 m. p. h.
Mean humidity at 8 hrs.	...	71·6 per cent.
Total hours of bright sunshine	...	229·6
Mean daily hours of bright sunshine.		7·7

Summary of weather conditions.

The weather during the month was dry and warm with southwest winds typical of August; at the end of the month thunderstorms appeared, but rainfall was very scanty and below normal. Temperature was generally high and above normal. Other climatic elements were not far from normal

P. V. R. & T. S. L.

Departmental Notifications.

I Circle:— M. Chinnaswamy Naidu, A. D. Peddapuram, l. a. p. for one month from 22—9—32. V. Thirumal Rao, Asst. to G. E. extention of l. a. p. for one month in continuation of leave already granted. B. P. Papiah, A. A. D. transferred to Yellamanchili to be in charge of the sub-circle. **II Circle:**— K. V. Seshagiri Rao, A. A. D. Vinukonda, l. a. p. for 21 days from 25—9—32. **III Circle:**— K. Hanumantha Rao, A. D. Siruguppa l. a. p. for 8 days and leave on half average pay for one year and eight months preparatory to retirement. P. Subramanian offg. A. D. A. Bellary to be A. D. Siruguppa. Bhagiratha Padhy, A. D. Nandyal, l. a. p. for two months from 23rd October or date of relief. K. T. Bhandary offg. A. D. A.

extension of l. a. p. for one week from 3—9—32. A demonstrator has been posted to Tadpatri taluk of Anantapur District from 24—9—32. **IV Circle:**— S. Rama Rao, A. D. Chittoor l. a. p. for one month from 26—9—32. S. Venkatarama Ayyar A. D. Chidambaram, l. a. p. for 18 days from 13—9—32. **Transfers:**— S. Kuppuswami Iyengar A. D. to be A. D. Vellore. K. Varadachari A. D. Vellore to Madras for training in ericulture. K. E. Viswam Iyer A. A. D. in charge of the motor van on completion of the tour to be A. A. D. Polur. S. Ramachandran A. D. Polur to be A. D. Tirupathur. M. Gopalamritham, A. D. St. Thomas Mount l. a. p. for 1 month from 12—9—32 and extension of l. a. p. for one month from 12—10—32. **V Circle:**— P. V. Samu Iyer, A. A. D. Kulitalai, extension of l. a. p. for 3 weeks from 6—9—32. C. S. Seshagiri Iyer F. M. Aduturai l. a. p. from 6-10-32 to 22-12-32 with permission to suffix Christmas and New year holidays **VI. Circle:**— T. K. Kannappa Pillai A. A. D. Nanguneri extension of l. a. p. on m. c. up to 4—9—32. **VII Circle:**—K.Soopi Haji l. a. p. for 7 days from 3rd Sep. **VIII Circl:**—B. Dasappa Malli A. D. Coonoor l. a. p. for 6 days from 24—9—32. K. Achuthan Nair, A. D. Salem l. a. p. on m. c. for two weeks from 26—9—32. **Cotton Section:**— G. J. Balaraj, A. F. M. Koilpatti l. a. p. on m. c. for one month from the date of examination of accounts. **Millets Section:**— V. Gomathinayagam Pillai, Assistant, extension of l. a. p. on m. c. for 3 months and one day in continuation of leave already granted. **Chemists Section:**—B. S. Narasimha Ayyar, assistant, l. a. p. for one month. from 9th September 1932. **Entomologists Section:**—J. A. Muliyil l. a. p. for 19 days from 27—9—32. **Live Stock Section:**—H. Narahari Rao, F. M. extension of l. a. p. for one week in continuation of leave already granted. **D. A's office orders:**—As there was not sufficient work for separate assistants in Mycology and Entomology in the VI Circle, M. S Subbiah, Assistant in Entomology re-transferred to the Entomology Section, Coimbatore. S. Rajaratnam A. A. D. in Mycology will continue to work in the VI Circle. **Transfers:**— M. Narayana Iyer,A. D. IVcircle to be A. D. Kurnool. K. T. Bhandary extension of l. a. p. for one week from 3-10-32. T. K. Mukundan F. M. Palur on probation declared temporary with reference to G. O. 810 Public dated 5—8—31, will be declared as. offg. upper subordinate Agricultural Section from 1—10—32 vice L. Sankarakumara Pillai and will continue to work in the IV Circle. V. Karunakaran Nair, F. M. Livestock transferred to VI Circle. C. V. Saravayya Chetty, Assistant, Paddy section (Maruteru), deputed to Pusa for higher studies in Agriculture for a period of 2 years from 1—11—32. The period of his absence from duty will be treated as leave as follows:— l. a. p. for 4 months from 4—10—32. l. h. p. for 8 months and 28 days in continuation thereof plus study leave for one year. R. Vasudeva Rao Naidu upper subordinate, Agricultural Section, temporarily transferred to the Science Section to officiate as Assistant, Agricultural Research Station, Maruteru, vice C. V. Saravayya Chetty.

Gazette Notifications:— R. C. Broadfoot extension of l. h. p. for 5 days from 27—8—32 and on return from leave posted to VI Circle. Transfers:—Consequent on the posting of Mr. R. C. Broadfoot as Deputy Director of Agriculture, Sixth Circle, Madura, the following transfers of officers in the Madras Agricultural Service are ordered:— (1) Mr. C. Narayana Aiyar, Deputy Director of Agriculture, Sixth Circle, on relief by Mr. R. C. Broadfoot to Second Circle, to be Deputy Director of Agriculture, Guntur. (2) Mr. T. Budhavidheya Rao Naidu, Assistant Director of Agriculture in charge, Second Circle, Guntur, on relief by No. (1), to be Assistant Director of Agriculture, Guntur. (3) Mr. C. Ramaswamy Naidu, Assistant Directer of Agriculture, Guntur on relief by No. (2), to Cuddalore, to be Assistant Director of Agriculture. Postings,—The following postings of officers in the Madras Agricultural Service are ordered:— (1) Mr. M. Kanti Raj Nayudu, Personal Assistant to the Director of Agriculture, Madras, on the expiry of his leave on 31st August 1932, to officiate as Assistant Director of

Agriculture, Vellore. (2) Mr. R. Swami Rao, Assistant Director of Agriculture, Vellore, on relief by No. (1), to be temporary Superintendent, Central Farm Coimbatore. Mr. Gopalakrishna Raju, District Agricultural Officer in charge, III Circle, Bellary, an extension of leave on average salary for twenty-eight days from 20th August 1932, with permission to affix the holidays on the 17th and 18th September 1932.

Mr. P. Subramaniam, Offg. D. A. O., Salem, to officiate as D. A. O. Bellary, vice Mr. K. T. Bhandary. Mr. R. Chockalingam Pillai, A. D. A. Tinnevelly l. a. p. for six weeks; Mr. M. U. Vellodi A. D. A. on return from leave to be A. D. A. Tinnnevelly.

ADDITIONS TO THE LIBRARY DURING JULY 1932.

A. Books.

(1) *The Principal Soil Types of the World (Map Profiles) Wall Map.* Prof. D. G. Vilensky, drawn by Podjakonoff. (2) *Principles of Dairying—Testing and Manufacture.* H. F Judkins & R. W. Smith. 1931. (3) *The Butter Industry.* O. F. Hunziker. 1927. (4) *City Milk Supply.* H. W. Parker 1917. (5) *Agricultural Geology.* R. H. Rastell 1922. (6) *Meteorology (Physics of the Earth-III).* Kimbal and others 1931. (7) *Productive Soils.* W. W. Weir 1931. (8) *Further Experiments in Electro Farming,* S. S. Nehru 1932. (9) *Progress in English Farming Systems V. A. in Farm Management.* C. S. Orwin 1931. (10) *Do. VI High Farming.* Do. 1931. (11) *Modern Milling of Sugarcane.* F. Maxwell. 19 2. (12) *The International Institute of Agriculture—An Historical and Critical Analysis of its Organisation, activities and policies of Administration.* A Hobson. 1931. (12-a) *Farm Cost Studies in the United States—Their Development, Applications and Limitations.* M. K. Bennett. 1928. (13) *Making Farms Pay—A way out for Owner and Tenant.* C. J. Classen. 1931. (14) *Market Analysis Its Principles and Methods.* P. White. 1925. (15) *Problems in Marketing.* M. T. Copeland, 1931. (16) *Principles of Agricultural Credit.* V. P. Lee. 1930. (17) *Agricultural Reform in the United States.* J. D. Black. 1929. (18) *Practical Methods in Teaching Vocational Agriculture.* H. E. Latig. 1931, (19) *A Text Book of Botany.* Revised Vol. III. *Ecology.* Coulter and Barnes. 1931. (20) *The Botany of Crop Plants.* A Text and Reference Book. W. W. Robbins. 1931. (21) *Recent Advances in Botany.* E. C. Barton Wright. 1932. (22) *Plant Physiology* with reference to the Green Plant. E. C. Miller. 1931. (23) *Genetics and Eugenics.* W. E. Castle. 1930. (24) *Studies on the Genus Pythium.* V. D. Matthews. 1931 (25) *Fifth International Botanical Congress*—Report of Proceedings of 1930 F. T. Brooks and Chipp. 1931. (26) *Vegetable Fats Oils,* G. S. Jamisson. 1932. (27) *Chemistry for Students of Agriculture and Home Economics* R. C. Burrell. 1931, (28) *Soil and the Microbe*—An Introduction to the Study of the Microscopic population of the Soil and its role in soil process and plant growth. S. A. Waksman & R. L. Starkey 1931. (29) *Chemistry at the Centenary (1931) Meeting of the British Association for the Advancement of Science.* H. Hartley and others. 1932. (30) *Sulphur Bacteria*—A Monograph. D. Ellis. 1932, (31) *Technical Methods of Chemical Analysis. Vol. III.* Lunge and Keene. 1932. (32) *Heavy Oil Engines*—Vol. I Classification, Origin and Development. A. G. Khan. 1932 (33) *Water Diviners and their Methods.* Meri Mager. Trans. A. H. Bell. 1931. (34) *Agricultural Machinery.* J. B. Davidson. 1931. (35) *Graph for the Design of Reinforced Concrete Slabs.* A. Mariasusai Pillai, 1931. (36) *A History of Entomology.* E. O. Essig. 1931. (37) *Honey craft* in Theory and Practice. A. Lawson. 1931. (38) *Poverty and kindred Economic Problems in India* G. F. Shirras. 1932. (39) *Japan*—An Economic and Financial Appraisal. H. G. Moulton. 1931. (40) *Poverty and Waste.* H. Withers. 1920. (41) *Principles of Economics.* E. R. A. Saligman. 1929. (42) *Money.* D. H. Robertson. 1930. (43) *Statistical*

Abstract for British India from 1920—21 to 1929—30. 1932. (44) *Agricultural Statistics of India* 1929—30. Vol. I 1932, (45) *Monthly Rainfall of India for 1929.* 1929. (46) *The Organisation of Knowledge and the system of Science* Henry Evelyn Bliss. 1929. (47) *Year Book of the Carnegie Institution* No, 29. 1930. (48) *Year Book of the Carnegie Institution* No. 30. 1931. (49) *Purpose in Evolution.* J. A. Thompson 1932. (50) *Clouds*—Weather Phenomena C. J. P. Cave. 1926. Study for Artists. C. J. P. Cavo. 1926. (51) *The British Journal of Photographic Almanac.* 1932. (52) *The methods of Statistics.* L. H. C. Kippett. 1931. (53) *Science Today and Tomorrow.* Compiled from a series of Lectures delivered at Morley College. E. M. Hubback. 1932. (54) *Tamil Equivalents of English Terms in Physics.* 1932. (55) *Telugu Equivalents of English Terms in Physics.* 1932.

B. Reports.

(1) Scientific Reports of the Imperial Institute of Agricultural Research, Pusa. 1930—31. (2) Review of Agricultural Operations in India. 1938—29. (3) Report on the Working of the Department of Agriculture of the Central Provinces. 1930—31. (4) Indian Coffee Statistics. 1930—31. (5) Indian Tea Statistics. 1930. (6) to 8 (a) Raw Cotton Trade Statistics. August, September, October, November and December 1931. (9) to 31. Census for 1931—Village Statistics. Anantapur, Bellary, Chittoor, Coimbatore, Cuddapah, East Godavari Agency, East Godavari (Uplands), Guntur, Kistna, Kurnool, Madura, North Coorg, Malabar, Nellore, Nilgiri, North Arcot, South Arcot, South Kanara, Tanjore, Tinnevelly, Trichinopoly and West Godavari Districts. 1932. (32) Annual Report—East Malling Research Station. 1931, (33) Livestock Diseases Report No. 7. Dept. Agri. New South Wales. (34) Annual Report of the Department of Agriculture, North Borneo. 1921. (35) Annual Report of the Department of Agriculture, Fiji for 1931 1932. (36) Year Book 1931. California Avacado Association. (37) Calendar for 1932—33. Teachers' College, Saidapet. 1932.

C. Bulletins.

(38) Milk Price Margins. E. M. B. Pub. No. 51. (39) Dairy Produce Supplies in 1931. E. M B. Pub. No. 52, (40) Empire Marketing Board May 1931 to May 1932. E. M. B. Pub. No. 53. (41) Survey of Vegetable Oil Seeds and Oils—Vol. I. Oil Palm Products. E. M. B. Pub. No. 54. (42) Laterite and Laterite Soils. Imp. Bur. Soil Sc. Tech. Comm. No. 24. (43) Sisal. Bibliography. Imp. Bur. of Soil Sc. Publication. (44) Studies in the Biology of the Fleece of the Scottish Mountain Black face Breed of Sheep. Reprint. (45) The Cultivation and Manufacture of Tea in Ceylon and in India. F. M. S. Agri. Dept. Gen. Series No 9. (46) The Codling Moth and Measures for its Control in South Africa. Union of S Africa Agri. Dept. Bull. 108. (47) Fruit Production in the Union Report No. 11, Union of S. Africa Agri. Dept Bull. 109. (48) Fruit Production in the Union Report No. 12 Union of S. Africa Agri. Dept. Bull. 114. (49) The Biology and Morphology of the Braconid Chelonus Annulipes Wesm. A Parasite of the European Corn Borer. U. S. A. Tech. Bull 294. (50) Crested wheat grass as compared with Broomgrass, Slender wheat grass and other Hay and Pasture Crops for the Northern Great Plains. U. S. A. Tech. Bull. 307. (51) The California Avacado Industry. California Ext. Cir. 43. (52) Variations in Moisture and Nitrate content of Field Soils Receiving Different Methods of Cultivation. Arkansas. Bull No. 270. (53) Abundance of Boll Weevil in Relation to Summer Weather and to Food. Arkansas. Bull No. 271 (54) Cotton Wilt Studies. IV. Effect of Fertilisers on Cotton Wilt. Arkansas. Bull. No. 272. (55) Seed Inspection. Mass. A. E. S. Bull. 62. (56) A Bacteriological Method for Determining Mineral Soil Deficiencies by use of the Soil Plaque- Colorado Bull. 375.

D. Leaflets, Circulars etc.

(57) Powdery Scab of Potatoes. Min. of Agri. & Fish. Ad. Leaf. 99. (58) Insurance of Farming Stock Against Fire. Min. of Agri. & Fish. Ad. Leaf. 101 (59) Red—worm Disease of Horses of Strongylidosis. Min. of Agri. & Fish. Ad. Leaf. 102, (60) Sheep Scab. Min. of Agri. & Fish Ad. Leaf. 103. (61) Pig Feeding. Min. Agri. & Fish. Ad. Leaf. 104. (62) Poultry Farming—Advice to Beginners. Min. Agri. & Fish Ad. Leaf. 105. (63) Apple Aphids. Min. Agri. & Fish. Ad. Leaf. 106. (64) Black Leg of Potatoes. Min. Agri. & Fish. Ad. Leaf. 107. (65) Rearing and Marketing of Geese. Min. Agri. & Fish. Ad. Leaf. 112. (66) Slugs and Snails Min. Agri. & Fish. Ad. Leaf. 115. (67) The Cultivation of Allotments by Tamil Labourers. F. M. S. Agri. Dept. Cir. No. 3. (68) Goat Raising. Univ. Philippines. Circular No. 22. (69) Notices of Judgment under the Food & Drugs Act. 18701 to 18725. U. S. A. Dept. Agrl. N. J. F. D. (70) Notices of Judgment under the Food & Drugs Act. 18726 to 18750. U. S. A. Dept. Agri. N. J. F. D. (71) Notices of Judgment under the Food & Drugs Act 18751 to 18850. U. S. A. Dept. Agri. N. J. F. D. (72)Production of Organic Acids from Carbo-hydrates by Fermentation. U. S. A. Cir. 216. (73) The Break O' Day Tomato. U. S. A. Cir. 218. (74) Agricultural Supplement No. 48. Cyprus Gazette No. 2226.

E. Reprints & Translations.

(75) Growth Record of Fertilized Apple Trees grown in Metal Cylinders Rep. J1. Agri. Res. Vol. 44 No. 3. (76) The Effect of Yeast and Casein Supplements to Corn and Soybean Rations when Fed to Rats and Swine. Rep. J1. Agri. Res. Vol. 44 No. 3. (77) Factors Influencing the Blood Sugar Level of Dairy Cattle. Rep. J1. Agri. Res. Vol. 44 No. 4. (78) Calculation of Error and Variation Statistics with special reference to the Cultivation Trial. Trans. of I. A. B. P. G. (79) On the Absorbing Influence of Crossing. Trans. of I. A. B. P. G.