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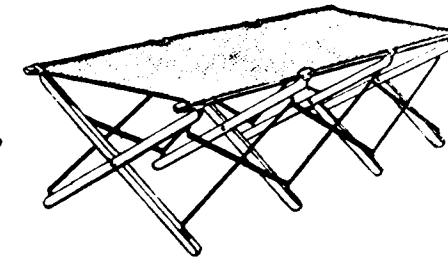
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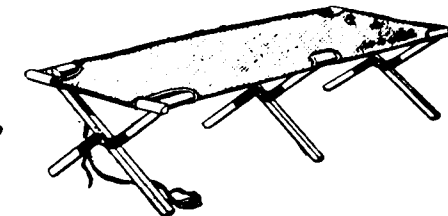
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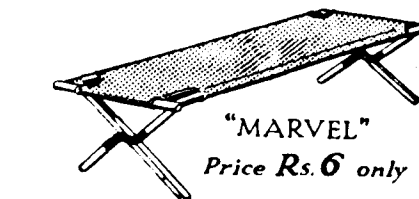
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JULY 1931

[No. 7

SUGAR-CANE IN BELLARY

ITS CULTIVATION, MANUFACTURE OF JAGGERY AND THE NEED
 FOR A SUGAR FACTORY

By A. R. YATHIRAJA, B.Sc., A. I. I. Sc. (BANGALORE),
 A. R. T. C. (GLASGOW),

Sugar Technologist.

In the neighbourhood of Hospet in the Bellary District, there are large areas of land devoted to growing sugar-cane. There are between 6,000 to 7,000 acres within a radius of 10 to 15 miles, and as much as 3,000 to 3,500 acres can be easily had for any sugar factory which may be established in the locality.

In view of such possibilities, a careful study of the sugar-cane and the local conditions, etc., was undertaken. A sugar-cane mill was hired from the Department of Industries to collect the necessary data. Consultations were held both with the ryots and the merchants.

There are two varieties of the *Pundya cane* grown in these parts: The *Hotte* and the *Javari*. In not one of the fields observed did I find them unmixed, though one or the other predominated. The cane is usually rotated with paddy and sometimes cane succeeds cane in better soils. The former is called *Kanagaddi* and the latter *Kabbinamandu*. In the latter soil, the yield of cane is not so good as in the former.

Java cane, it is said, was tried in some fields, but had to be given up owing to difficulties in crushing with bullock-driven mills, the cane being hard, although it gave them a larger quantity of jaggery per acre, and of a better quality too.

The Agriculture of Cane.—The method of cultivation is very old in these parts, and the local ryots can lay claim to a certain amount of specialization. The fields are ploughed soon after cane is harvested in March or April, and the cane that has been set apart from the previous year's crop is used for the following year's seed.

After ploughing the field two times, the farm-yard manure is spread. Drainage channels are made, and the excavated earth is spread over the field and ploughed for the third time. The ryots use the plough for making the furrows as well as the cross furrows for irrigation, finally finishing off with the hand.

The furrows are 2 to 2½ feet apart, and the setts placed about 9 inches apart. The depth of ploughing is 9 inches, and the furrows also are about the same depth. Roughly, 9,200 setts are planted per acre. After the seeds are planted, just enough water is allowed to fill the furrows and the seed is pressed in. After 5 days, it is irrigated again. The cane germinates after an interval of 15 to 25 days. After germination, the field is irrigated once a week. The weeds are removed once or twice during the first 25 days. Oil-cake is added and the cane earthed. The weeds are again removed twice to four times after germination and within the end of the third month, and once or twice after earthing the cane. The irrigation is continued. The cane matures in about ten to eleven months' time.

Twenty to thirty cart-loads of farm-yard manure are added, and 4 to 6 bags of oil-cake (32–48 mds.*) are added per acre.

The field is flooded before harvest 4 times at intervals of a week. The ryots wait about 4 days after the last irrigation and commence harvesting. They usually cut the cane into 2 or 3 pieces, each 2½ to 3½ feet long. The top is not completely removed. The yield of cane per acre is roughly 20 to 25 tons.

The expenses incurred, up to the time of harvesting, are noted below. The other expenses will be noted under the head of Jaggery manufacture.

Sugar-cane cultivation expenses per acre at Hospet :—

	Rs.
Cattle manure	25
Seed-bed preparation	12
Setts... ..	24
Planting, etc.	5
Weeding	24
Earthing	4
Oil-cake or Am. Sulph.	30
Watering	12
Sundries	4
Total	140

* A Maund is 25·92 lbs.

Manufacture of Jaggery.—The preparation of Jaggery though, in general principles, the same as elsewhere, has some peculiarities of its own in these parts. The juice is delivered and boiled in rather large pans of 8 to 9 feet in diameter and 2½ to 3 feet in height. Six pots, each holding roughly 70 lbs. of juice, make a *Bani*, and 6 such *Banies* are taken per boiling. The pan is fired with bought fuel in the beginning, and, later, with the *bagasse* and the dried leaves of the cane. The jaggery obtained per pan varies from 14·5 to 16 mds.

Liming is done, but there is no definite rule which guides the quantity of lime to be added. Each pan has a jaggery maker who thinks he is an expert in himself. He supervises the addition of lime, the firing, and determines the time when the pan has to be lifted off the fire and the thick fluid jaggery poured on to the mats. The mats are spread in shallow squares of each 3½ to 4½ feet and with arrangement for the mass to flow from one to the next. There are usually four in number and are called *Angadis*. The thickness of the jaggery slab varies from ¾ to 1½ inches.

These jaggery makers are often ignorant and they do not know the elementary principles in handling the syrup. Very often the poor ryot has a large stock of bad jaggery.

A standardization in the manufacture of jaggery could easily be effected by careful study.

One of the obvious drawbacks is the size of the pan. Being very heavy, it requires 8 men to lift and a ninth to hold it from tilting. Then the mass is poured into the moulds.

Below is the table incorporating the results of the observations made with regard to the cane from various fields :—

192. Chattanooga Sugar-cane Mill driven by a 14-H.P. Petter's Crude oil-engine was used. The density of the juice varied from 14° to 18° brix at temperature ranging from 20° to 30° C.

No.	Variety	Rotation	Lbs. Cane for 72 pots of Juice	Per cent Extraction on Weight of Cane	Lbs. Jaggery for 72 pots of Juice	Residue in Pan	Tons Cane per acre
I	Hotte	After Paddy	7,316	68·8	739	56	18
II	Javari	Do.	7,732	62·5	828	59	29
III	Mixed	Do.	8,299	60·7	632	60	24
IV	Hotte	After Cane	7,747	65·2	...	...	16
V	Mixed	...	7,248	69·5	875	50	...
VI	Hotte	...	6,961	72·33	771	80	23½
VII	Javari	...	7,320	68·6	827	53	24½

The cost of harvesting and converting the cane into jaggery is about Rs. 11 for two pans. About 16 pans are obtained from each acre under good conditions. This works at Rs. 83 per acre. This sum, when added to the cultivation expenses, brings the total expenses of the ryot to Rs. 228.

The present selling rate of jaggery varies from Rs. 12 to 16 per bag of 9 mds. Calculating on the aforementioned figures, one expects to sell 216 mds. bringing an average total income of Rs. 336. The gross profit comes to nearly Rs. 100 per acre. As a rule sugar-cane crop is followed by paddy which does not give more than a profit of Rs. 20 to 30. So that the average income from land is not even as much as one may get on the value of the land if invested in Government securities—the land of the sort considered above is worth Rs. 1,000 to 1,500 per acre.

The Sindevahe Furnace.—At my request, the Agricultural Demonstrator gave a demonstration of the use of this furnace which is said to be an improvement on the local method, giving better jaggery. The Sindevahe pan and furnace are described by the Department of Agriculture in one of their leaflets. Its essential advantage appears to be in the use of the smoke-vent which takes away the smoke and prevents the soot from darkening the jaggery. The scum is removed with a bamboo strainer and dropped into a gunny filter which naturally clarifies the syrup and a better quality of jaggery is obtained. I recorded the time taken and the weight of fuel used per boiling and its equivalents with the indigenous pan and furnace.

<i>Sindevahe.</i>	Pots	Fuel.	Time.	Jaggery.
Two boilings.	18 × 2.	1,139 lbs.	3½ to 4½ Hrs.	16 mds.
<i>Country.</i>				
One boiling.	36	1,077 lbs.	3½ to 4½ Hrs.	16 mds.

It is interesting to note that the time taken by the Sindevahi furnace is the same as for the country pan, though only 18 pots of juice are boiled per pan and two pans worked simultaneously. But it consumes more fuel to obtain the same quantity of jaggery. It would therefore appear to an outside observer that the same improvements may be effected by attaching a smoke-vent to the existing pans and using a strainer, thus converting the present pans really into the Sindevahe type. This might appeal better to the ryots, for this would save them the necessity of fresh investment on new pans, and what is more, they would still be able to deal with larger quantities than they can by the Sindevahe furnace and pan demonstrated to them. This is bound to be an important consideration in a large jaggery-producing centre like Hospet.

Work to be done.—A careful study of the conditions of sugar-cane in Hospet has suggested to the writer some changes in the methods now in vogue in the agriculture of cane, as well as its conversion into jaggery. It is possible that some points have been overlooked. The observations need to be continued in subsequent years for further lines of improvement.

In the actual agricultural methods, our ryots are good enough, but they are exceedingly illiterate and poor. Their illiteracy keeps them away from the latest literature on the subject and their poverty from making use of any improvements that may be brought to their notice.

I believe that effective work needs to be done in two principal directions in the agriculture of cane:—(1) Increasing the sugar content of the cane itself and (2) increasing the yield of sugar-cane per acre. How this is to be effected, is a matter for experiment and research.

One finds that no effort is made in these parts to select the seed. The setts are taken from the previous year's cane plantation irrespective of the condition of the cane. A common disease which could be minimized or even eliminated by selection, is 'red rot'. Many diseases of cane could be minimised by selection of healthy setts for planting. A seedling-farm, from which healthy setts could be distributed, is a desideratum now.

It is well known that cane-tops are used for setts and they make good seed. Many plantations in Hawaii and Java have separate seed-cane plantations. Three-fourths grown cane is used for setts. This again is a matter for research.

The depth of ploughing affects the growth of cane. It is hardly 9 in. here, and the furrows are 2 to 2½ feet apart, and the setts are planted 9 inches apart. In Hawaii, the furrows are seldom less than 1½ feet deep and 3½ to 4½ feet apart, the setts being planted end to end. A trial demonstration on the above lines will, I think, be well worth the trouble. If found advantageous, the ryot will naturally take it up without hesitation.

It is common knowledge that certain combinations of fertilizers affect the sugar content of the cane as well as the yield per acre. How and in what proportions these fertilizers have to be combined for the Hospet lands, is not known. The only chemical fertilizer used here and by a few, is *Nitrates*.

Lastly, more important than all, perhaps, is the question of breeding new varieties of cane. This question I hope to deal with separately, later.

Results on these lines of work cannot be expected in a year or two. Often it takes many years, before something revolutionary is discovered. The *H.S.P.A.* experiment station was a disappointment to many in the beginning, but when it was discovered that the tonnage of cane per acre is almost doubled by just leaving the cane to grow for another 8 to 12 months, they recognized the value of research. With nearly the same amount of work, the Hawaiian grower obtained twice the quantity of sugar! Ever since, the *H.S.P.A.* has been highly esteemed in the Islands.

I have suggested above, a few lines of work in the agriculture of cane, and I may similarly mention a few for the improved manufacture of jaggery.

At present, bullock-driven mills, unwieldy pans and unscientific furnaces are used. In a locality where there are thousands of acres under sugar-cane, there ought to be a quicker and a more efficient method of milling cane and a better method of making jaggery. The introduction of power-driven sugar-cane mills and of any one of the types of multiple pan furnaces (now commonly in use in many parts of the cane-growing centres in this country) would be useful.

In the preparation of jaggery, proper liming is a very important factor. Often, several pans of jaggery are spoilt because of bad liming. It is found

that testing with litmus paper is a simple and good guide to the addition of the required quantity of lime.

The firing of the pan must be well regulated. There is always a tendency on the part of the firemen to stuff the furnace with fuel, to avoid the tediousness of slow firing, and the jaggery gets therefore charred owing to overheating. A properly constructed multiple furnace as aforementioned will avoid such a mishap.

Need for a Sugar Factory.—I was discussing the question of establishing a sugar factory with the local merchants and the ryots. The co-operation of the merchants is a necessity, and also of the ryots. If one can show some real improvement in the productivity of the land and enable the ryots to get a better quality of jaggery fetching a better price, something would have been done to secure their confidence, and, when once that is established, a sugar factory will be a comparatively easy affair.

The merchants even now recognize the need for a sugar factory, but just now, owing to the prevailing financial stringency, it is rather hard for them to find all the capital needed. But there is no reason why the required capital should not be found, at least in part, from outside the cane area.

[In this connection a paper on 'Jaggery-making in Hospet and Suggestions for its Improvement' by Mr. T. Lakshmana Rao, published in vol. xvi, No. 10, October, 1928, of the *Madras Agricultural Journal* will be read with interest.—Ed., *M.A.J.*]

A NOTE ON *ORYZA SATIVA* VAR. (PLENA) PRAIN*

By N. PARTHASARATHY, B.A., B.Sc. Ag.,

Assistant to Paddy Specialist.

Introduction.—This Bengal variety of paddy, popularly known as 'Double rice' or double grain paddy was obtained from Poona Agricultural College in the year 1920. It is similar in most of the morphological characters to the cultivated types, but differs essentially from them in having more than one pistil in each spikelet—the unit of inflorescence. In this 'Double rice' 6.3,4 the number of pistils varies ordinarily from two to four, and rarely five are met with. The number of developed rice-kernels found in each paddy grain varies from one to three so that the popular name 'Double rice' is a misnomer. The failure of some of the pistils to develop into kernels may probably be due to the infertility of those ovules, and this remains to be investigated.

2. **Rices.**—Rice kernel is enclosed within the covering of the third or flowering glume and the fourth or palea, the first two being small and sterile. The position of the embryo in the rice is opposite the base of the ridge of the flowering glume. In the 'Double rice'—calling the rice developed from the pistil nearest the flowering glume the 'first rice' and the next 'Intermediate' and the last the 'second rice'—it is observed on husking the samples of this paddy that (1) most of the single or whole

* Paper read before the Association of Economic Biologists, Coimbatore, on the 13th March, 1931.

A NOTE ON *ORYZA SATIVA* VAR. (PLENA) PRAIN

rices developed are from the pistil nearest the third glume, (2) that in cases where there are two and three rices in each paddy-grain, the embryo of the first rice is always situated at the base of the kernel opposite the basal ridge of the flowering glume as in other cultivated rice, but the embryos of the other two, though they are situated at the base, have no definite position with regard to the flowering glume.

On husking and sorting out the rices of this paddy from samples, it is found that the proportion of the number of paddy-grains have the following frequencies.

			Percentage.
1. Single or whole rices	(a) first pistil	...	42.4 ± 1.2
	(b) From others	...	4.0 ± 0.6
2. Double rices	...	...	48.2 ± 1.4
3. Triple rices	...	...	5.4 ± 0.6

The development of the rices is indicated by their respective weights.

			Weight in m. grams.
1. Single or whole rice	...	...	21.6 ± 0.11
2. Double rices	(a) First rice	...	12.3 ± 0.08
	(b) Second rice	...	10.6 ± 0.09
3. Intermediate rice	...	...	7.8 ± 0.12

In number 2, the difference in weight between the two rices is significant and may perhaps be due to their differential positions with reference to the axis.

3. Germination of Paddy Grains.—It will be expected that on germinating the paddy grain, there will be as many sets of plumules and radicles as there are number of rice-kernels in each paddy-grain. But actually, only one set emerges from the base alongside the ridge of the flowering glume as in other types. (Figure 1). On carefully removing the glumes of each paddy-grain and germinating the rices, it is found that all the rices in each paddy-grain are viable. (Figure 2). This fact suggested the possibility that the fourth glume or palea has no weak spot in the corresponding place as in the third glume, to enable the rice adjacent to send out its radicle and plumule. The next step was to artificially make a slit to a small length at the base of the keel of the fourth glume, and test for germination. Figure 3 shows the result of such slitting. There are two sets wherever there are more than one rice in each paddy-grain. The intermediate rice has little chance of germination if its embryo is hemmed in between the two rices.

A preliminary study of the seedlings raised from individual rice-kernels as sorted out according to their position and number, indicated that there was difference in the rate of growth in the first fortnight. The height of the seedlings raised from single or whole rice, exceeded the others but subsequently all of them attained uniformity of growth, indicating that the difference in endosperm material had no appreciable effect on later stages of growth. (Table 1).

TABLE No. 1

Growth of the plants from different rices
—Heights in c.m.

Date	Single rice	1st rice	2nd rice	Intermediate rice
June 16	...	...	Sown	...
„ 18	Germinated	Nil	Nil	Nil
„ 19	...	Germinated	Germinated	Germinated
„ 20	1.6	0.7	0.7	0.8
„ 22	4.6	3.1	2.5	3.6
„ 24	6.4	5.5	5.3	5.6
„ 26	9.6	7.6	7.9	7.3
„ 28	11.4	10.3	11.2	11.4
„ 30	15.3	13.0	14.0	14.0
Final Height	100.0	100.0	98.0	100.0
Flowering	All from 5th to 7th October.			

4. **Inheritance.**—Four natural crosses were spotted out in this type in the year 1926 at the Agricultural Research Station, Aduturai, and these crosses had only a single pistil, indicating the dominance of the single over-multiple pistils, and the F₂ progenies of the above confirmed the simple recessive nature of the multipistillate condition in rice.

*Family No.	Number of plants with single pistillate spikelets.	Number of plants with multipistillate spikelets.
2697 N	204	77
2698 N	85	37
2699 N	141	40
2700 N	156	42
Total ...	586	196
Cal, 3 : 1 ratio	586.5	195.5

5. **Probable Evolution.**—R. K. Bhide mentions some abnormalities he observed in this type as regards the increase in the number of stamens to more than six, the normal number, to seven and even eight and also of the increase of the number of flowering glumes.

In addition, he has noted some abnormal variations in local paddies which he classifies as—

(a) Variation in the size of the sterile glumes reaching up to the length of the flowering glume.

(b) Production of additional sterile glume by the side of normal ones.

*Annual Station Report of the Agricultural Research Station, Aduturai, 1927-28,

(c) Production of additional flowering glumes by the side of normal ones, the extra one being more or less developed.

(d) Increase in the number of stamens.

(e) Number of pistils occasionally double.

Of the above, a, b, c, and e, have been observed in two of the types grown at Coimbatore, T. 2 and T. 443, and in addition triple ovaries in single spikelet have also been occasionally noticed, as in Sorghum 2. There was also observed, reduction or suppression of floral bracts or glumes, and also a tendency for aggregation of individual spikelets (Figure No. 4).

Bhide¹ regards the doubling of the ovaries may be due to 'temporary season' or 'the beginnings of progressive changes'. Progress in evolution is indicated according to Small⁸ and Worsdell¹⁰ by the simplification, reduction or saving of material in floral structures to the advantage of the plant. Small⁸ in his article on the origin and development of *Compositae* suggests that the evolution of *Senecio*, a species of the primitive genus in *Compositae*, from *Lobelioideae* was on the lines of reduction of flower material by the complete disappearance of the pedicels and the close aggregation of flowers to form the head. In the case of *Oryza sativa*, it is noted that the wild types have the spikelets arranged sparsely in the panicle, and the cultivated varieties show a marked range of variation in the arrangement of grains from this sparseness to a closer aggregation as typified in a bunched variety called *Jecraga samba*. Another type of variation is shown in 'Cluster paddy' where a systematic grouping of 3 to 4 spikelets at regular distances occurs in the panicle. It is suggested that 'Double rice' may be a still further advance in that, in a panicle, the aggregation has taken place with the loss or complete suppression of the intervening glumes, thus increasing the number of pistils without at the same time increasing the number of stamens to more than six. Rice is essentially a self-fertilized crop⁵, the extent of cross pollination being 1 to 3 per cent. The pollen production in all the six anthers in each flower is certainly enormous and superfluous, allowing for all chances (the number of pollen grains being about 600 to 1000 in each anther), and in the 'Double rice' the same amount is utilized for more than one pistil. This certainly is a safe reduction of vital material in the line of progress. In this connection, it must be pointed out that there must be some significance in the facts that all these types, bunched, cluster, cigar,⁵ (another type of all-round reduction) and 'Double rice' are all simple recessives to normal types. Progress in evolution takes place according to DeVries by mutations, and we can regard all these above types as mutants from the normal, and the observations recorded can be regarded as showing a tendency towards progress. These mutations should have occurred by the powerful interaction of climate and environment, resulting in the destruction of the dominant gene or loss of a factor (Bateson). Stadlers⁹ X-ray effects on maize have produced mutants which are recessives, and the outward effects and genetic behaviour of these mutations are, he affirms, identical with the normal recessive genes, and this conception may equally well be applied to normal recessive mutations occurring in nature. From a scientific point of view, the line of evolution of 'Double rice' is only a suggestion, and more than that, one can repeat only the dictum of DeVries as quoted by Horne and Small⁸ 'that the great lines of evolution of whole families and even genera obviously lie outside the limits of experimental observation.'

6. **Conclusion.**—It may be asked now that if double-riced paddy does represent 'advance', why has it not assumed the importance which it should deserve. The reason is obvious. This progress has been hindered by the successive suppression of the germination of all the rices other than that formed by the ovary adjoining the flowering glume, and this is quite different from that of *Sorghum* where there is no such hindrance. This certainly is unfortunate to the plant as all the increased seed, produced by doubling and trebling, have no chances of survival, and the present condition indicates a changing back or retrogressive evolution towards the normal type, by the following observations.

1. Number of pistils in each spikelet and corresponding rices is less.
2. Proportion of single, double, and three rices. 3. Corresponding weights of these rices. 4. The very low percentage of single rices formed of other pistils than the first. This variety is certainly a very interesting material to test the effect of successive suppression of the legitimate function in the course of evolution.

Acknowledgments.—The writer is indebted to Messrs. K. Ramiah, Paddy Specialist, and M. Anandan, Superintendent, Agricultural Research Station, Aduturai, for their help and guidance in the investigation.

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OME EXPERIMENTS ON FLY CONTROL IN THE CENTRAL FARM, COIMBATORE

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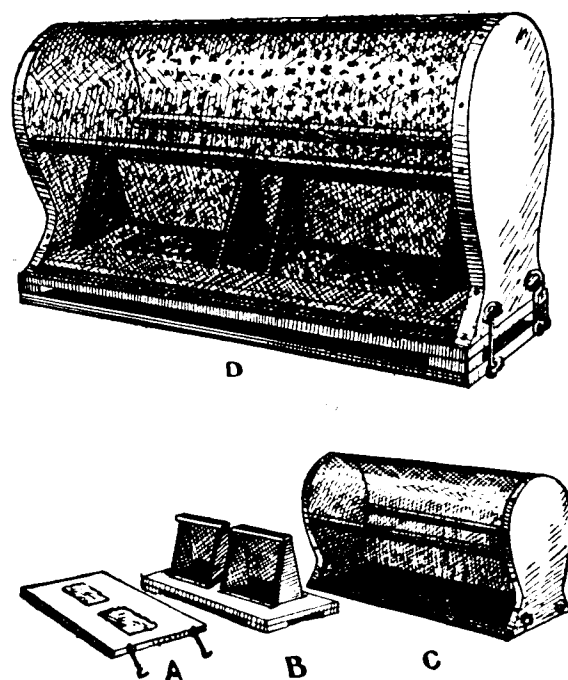
Introduction.—Before giving an account of the various experiments tried at the Central Farm towards Fly control it may be useful to consider what flies are, and how their control is of importance.

What are flies? Flies are insects with a single pair of wings and belong to the order *Diptera*. Their mouth parts are adapted for sucking in liquid food. They pass through four stages in their life history, viz., egg, larva, pupa and adult. In the case of the common housefly, eggs are laid by the female in manure heaps, etc. After a short period of 8 to 24 hours, maggots hatch out of the eggs and feed on nutrient substances in the manure. When full fed, they pupate and in course of time, emerge as adult flies. The whole life-cycle of a fly worked out in November (1930), came to about 10 days, the egg, larval and pupal periods being 8 hours, 3 days and 6 days respectively. The total life-cycle may vary according to the different seasons.

Economic importance of flies.—Flies are of various kinds and may broadly be divided into two groups, *i.e.*, those which are beneficial and those which are injurious. Among the former may be mentioned the hover flies (Fam. *Syrphidae*), the robber flies (Fam. *Asilidae*) and the parasitic flies (Fam. *Tachinidae*), the former two being predaceous and the latter parasitic on crop pests. Among the injurious forms may be noted the crop pests, the disease carriers and those which annoy live stock and human beings by sucking their blood, or in other ways.

Among the disease carriers may be included the mosquitoes, tsetse flies, Tabanids, and house-flies. Mosquitoes, in addition to their annoying blood-sucking habits, are well known as carriers of the protozoan diseases: Malaria and Yellow Fever. Tsetse flies are the carriers of another protozoan disease in man known as *Trypanosomiasis* or sleeping sickness. Tabanids, in addition to their biting habits, are carriers of the *surra* disease in domestic animals. Germs of Typhoid, Cholera, Dysentery, Infantile diarrhoea etc., are also carried by the house fly by feeding on infected material and transferring the germs later on to human food.

Several species of flies form quite a nuisance to live stock. In this category are included several species of the house fly and other flies also of the family *Muscidae*, some of which like *Stomoxys calcitrans* are blood suckers. It is mainly against flies affecting live stock that the present trials of control methods were made on the Central Farm. A list of these flies is given below.



THE MINNESOTA FLY TRAP. (After Washburn)

TABLE I

List of Flies reared, caught on live stock or trapped with baits in the Central Farm, Coimbatore.

No.	Name of fly	Family	Baited in Minnesota trap with	Reared from	Caught on	Remarks
1	<i>Musca nebul</i> , F.	Muscidae	Mutton	Loose box	Bullock.	These flies formed the bulk of those trapped with baits.
2	<i>Musca conducens</i> , Walk.	do.	do.	do.	do.	These formed about 10 per cent of baited flies.
3	<i>Musca vicina</i> , Macq.	do.	do.	do.	do.	...
4	<i>Musca crassirostris</i> , Stein.	do.	do.	Fresh cattle dung	do.	...
5	<i>Musca spinolunera</i> , Awati.	do.	do.	do.	Buffalo.	...
6	<i>Stomoxys calcitrans</i> , L.	do.	do.	Loosebox.	do.	...
7	<i>Chrysomya megacephala</i> , F.	do.	do.	do.	do.	...
8	<i>Chrysomya ænea</i> Feb.	do.	do.	Manure pit	do.	...
9	<i>Sarcophaga</i> sp...	Sarcophagidae	do.	do.	do.	...
10	<i>Psychoda</i> sp. ...	Psychodidae	do.	Fresh cattle dung	do.	...
11	Sepsid flies ...	Sepsidae	do.	Fresh cattle dung	do.	...
12	Anthomyiid flies.	Anthomyiidae	do.	do.	do.	...
13	<i>Cuticoides kief-feri</i> , Patton.	Chironomidae	do.	do.	Bullock.	During day time resting on pillars of byres but at night sucking blood of live stock.

Control experiments.—That the control of flies is a problem bristling with difficulties, is the experience not only in this Presidency but also in other parts of India and other countries of the world. A few of these difficulties will be noted in the course of the accounts of the various methods tried at the Central Farm.

Broadly speaking, fly nuisance to live stock may be tackled in three ways :—

- (1) By the use of repellents,
- (2) by controlling the breeding of flies and
- (3) by trapping adult flies.

The Use of Repellents.—This method, it is true, does not effect a permanent cure but it gives temporary relief to live stock.

Floors of byres in the farm were washed with Cresol in the mornings to see whether flies could thereby be prevented from settling on cattle tied therein. It was found that for an hour or so, there was some relief but after a while flies were seen in numbers as before.

A light coating of neem (*Melia indica*) oil was given on the forehead and round about the eyes of the bullocks, but this was also found to be of little effect.

Foreheads of bullocks where flies used to settle in large numbers, were washed with boric solution. This too had only a temporary effect and a few hours later, the fly infestation was just as bad as before. Thus the repellents so far tried, would appear to be of little use.

Checking the Breeding of Flies.—The chief places of breeding in the Central Farm are four permanent and two temporary manure pits outside the farm-yard, and two byres, one loose box and one circular pit inside the farm-yard. In the byres, there is no breeding worth taking into account, except stray cases under the feeding troughs, but in the loose box and manure pits, there is a good deal of breeding going on. This statement may easily be verified if some of the dung were raked up, when large numbers of eggs, maggots and puparia would be revealed to view. It is essential that such extensive breeding should be checked if it is desired to control the flies effectively.

Trials of a spray of crude oil emulsion on the surface of the manure heaps in pits did not give very encouraging results. Besides, the use of such chemicals has the great drawback of lowering the manurial value of the dung since the fermentative activity of bacteria is thereby affected. Experiments in this direction had therefore to be given up.

Again, another difficulty cropped up in the course of these experiments. At first, it was considered that by putting up wire-gauze covers over the manure pits, flies could be prevented from breeding. But later, it was found that egg-laying took place even in the fresh dung cast by bullocks in the byres and the loose box. Actual observations have shown that egg-laying began even within half-an-hour of casting the dung. When one takes into consideration the fact that it is this dung which is later dumped into the manure pit, the futility of using wire-gauze covers as protection against egg-laying could easily be realized.

In the case of the loose box, a slight reduction in breeding was noticed when the litter and dung were well pressed in by trampling but further detailed observations are necessary before any definite statement can be made.

Trapping of Adult flies.—It is only in experiments in regard to the trapping of adult flies that some success has been achieved. Three methods of trapping were tried, viz., formalin and milk, fly paper, and the Minnesota fly trap. Of these, the last one gave the best results.

Formalin and Milk.—Formalin and milk exposed in shallow vessels, kept on the walls of byres and loose box, did not give encouraging results though it is reported that this method has been found effective in houses.

Fly paper.—Fly papers coated with a sticky mixture prepared of rosin, castor oil and jaggery were tried to trap adult flies. Twenty papers hung vertically in the byres just over the bullocks and kept exposed for six days (renewed on the fourth day) gave a total catch of 216 flies. Besides these Muscid flies, blood-sucking gnats (of the family *Chironomidae*) were also found trapped in large numbers on some nights. Apart from this fact, the catch of 216 flies for 6 days should be considered very poor indeed. Fly papers were also kept flat on the floor, but gave similarly disappointing results.

Minnesota Fly trap.—This is a trap devised by Washburn (*vide* illustration), and is about 2 feet long, one foot high and 8 inches wide. It consists of three portions, namely, a base-board with two bait pans (A), another board which carries two wedge-shaped structures having wire gauzed sides, open at the top and bottom (B), and a wire-gauze cover (30 finesse) (C) fitted over (A) and fully enclosing (B) for encaging the adult flies trapped. The trap is assembled by placing (B) over (A) and (C) over (B). Figure (D) gives the general view of the trap.

Baits are placed in the two receptacles, and flies attracted by the bait enter through the spaces between (A) and (B) and feed on the bait but later fly up through the slits on top of the roof-shaped structures (B) and are practically imprisoned inside the receptacle (C).

The following baits were used for the experiments:—Jack-fruit, (*Artocarpus integrifolia*), sugar-cane, mutton, beef and fish, of which the first two were tried in August and the last three during November and December. Contrary to expectations, the catches with the former two were very poor, the number being less than hundred per day. Much greater success was however achieved with the last three baits. It may be interesting to note that the number of flies caught increased when the baits became slightly putrefied. The maximum number caught one day rose as high as 6,081 while the average for 22 days was 1,388 per day. A table of daily catches recorded is given in Table II. The flies were killed by covering the trap with a gunny bag and fumigating it with Calcium cyanide dust. Flies could also be killed by immersing the trap in hot water.

TABLE II.
Daily catches of flies with the Minnesota trap in November-December 1930

Date	No. Caught	Bait	Remarks
Nov. '30			
16	2,404	Mutton	Bait putrefied.
17	370	Do.	do.
18	317	Do.	do.
19	65	Do.	do.
20	2,045	Beef	Putrefied.
21	463	Do.	do.
22	2,473	Do.	Putrefied.
23	653	Do.	do.
24	783	Do.	do.
25	71	Do.	Fresh beef-bait used only for three hours.
26	953	Do.	do.
27	5,863	Do.	Putrefied.
28	6,081	Beef and Fish	Flies removed thrice during the day. 677 from beef, and 3,554 plus 1,850 from fish.
29	2,402	Fish	...
30	2,452	Do.	...
Dec. '30			
1	863	Do.	...
2	504	Do.	...
3	270	Do.	...
4	718	Mutton	Putrefied. Trap used only for 6 days.
5	584	Do.	...
6	97	Do.	Poor catches due to holes in wire-gauze.
7	104	Do.	Do.

Total for 22 days : 30,535 flies.
Average per day : 1,388 ..

If trapping is carried out daily throughout the year, it is hoped that there will be considerable reduction in the number of flies. The cost of making a trap is about Rs. 5, and the cost of meat or fish used as bait is about 4-6 annas per month.

Acknowledgments.—The authors take this opportunity of thanking Rao Sahib Y. Ramachandra Rao for guidance in this work, and Mr. T. B. Fletcher, Imperial Entomologist, Pusa, for kindly identifying the specimens.

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SOME EXPERIENCES WITH COCONUT IN THE WEST COAST

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It is generally the rule in plant life, as in the case of animal life, that the characters of the parent determine the progeny. The object of this study on coconut is to find out how far the visible characters of a tree influence its yielding quality and whether this yielding quality can be improved, modified or altered by cultural and manurial treatments.

It is a matter of common observation that, in spite of similar conditions of light, spacing, cultivation and manuring, remarkable differences are often seen between individual trees of any coconut garden, not only in the yielding capacity, but also in the colour, size and shape of nuts.

Seed-selection is an important, well-recognized fact in the case of any crop, and especially so in the case of any valuable perennial crop like coconut. The attempt at seed-selection to improve the progeny, in the case of coconuts, has not always been attended with happy results. The writer had read before the Science Congress at Benares in 1924 a paper on 'Pollination in Coconut' where it was stated that Nature has fitted the coconut tree mostly for cross-fertilization, although there is provision for self-fertilization as well. Even under very careful selection of seednuts, one notices all sorts of variations in the trees. In the Government coconut stations at Nileshwar and Pilicode of South Kanara, though the seeds were collected from some of the best trees available on the West Coast under the direct supervision of responsible officers, variations are observed in the young trees. Attempts are, however, being made in the Government coconut stations to make a study of self-pollinated seeds.

For purposes of this study, observations made at the Kasargod coconut station are fairly conclusive. This station was acquired in 1916, when the age of the coconut trees was between 20 and 25. The soil is red loam with a good admixture of sand.

Detailed studies of the character and yield of trees in Block I of this Station, which is 2.5 acres in area containing 144 trees, of almost the same age, and situated at about 27 feet apart, were made. All the trees in this block receive the same or similar cultural and manurial treatment. During the Monsoon, the monsoon plough is worked three times, and during the hot weather the cultivator or *guntaka* is worked six to eight times. The block is manured uniformly with a mixture of 10 lbs. of fish guano and 20 lbs. of ashes per tree. A green manure and cover crop is grown during the Monsoon. The soil in this block is uniform for all practical purposes. Other factors, like season, affect all trees alike, although a good tree would stand an unfavourable season better than a bad tree.

Coming to classification, the character of a coconut tree can be determined by examining its various parts, such as the stem, the crown and the leaves, in addition to the most important factor, yield. The colour and size of nuts give a clue to the classification of the trees. Thus, the coconut trees have been classified into different types according to the colour and shape of their nuts.

Colour.—The main types of coloration, commonly met with, are the greenish and the reddish, although variations extending from green to reddish green, and from reddish green to red, are also noted. One can easily fix the colour of the nut, as this is generally correlated with that of the leaf and flower-stalk. In attempting a broad classification of the nuts into greenish and reddish, difficulty was experienced with those whose colour lay near about the border line. But they have been classified according to the type to which they appeared to approach most. That there are still exceptions, which cannot be brought under the above classification, is no doubt undisputed; for example the writer, during his recent tour in the Laccadives, observed on one coconut tree, in the Kalpeni Island, three bunches with green nuts, one bunch with yellow nuts and another, a fifth bunch, with both yellow and green nuts.

Shape.—Taking the shape of the nuts into consideration, a classification was also made. Here also, they are, for purposes of this study, grouped into two broad divisions, the round and the oval, although, in this case also, there are variations in shape, which are sometimes appreciable from bunch to bunch, and even from nut to nut of the same bunch of a tree. Then, there are nuts more long than oval—exceptions to the above classification. But they have been brought under either of the two divisions to which they appeared to approach most.

Thus, the two main types of character, colour and shape, are grouped into and classified under the following four divisions:—

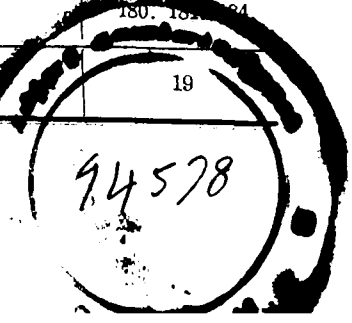
- (i) Greenish round.
- (ii) Greenish oval.
- (iii) Reddish round.
- (iv) Reddish oval.

The table, below, shows the classification of the trees in Block I according to the colour and shape of their nuts. The numbers denote the tree numbers.

Greenish round	Greenish oval	Reddish round	Reddish oval
2. 6. 7. 9. 11. 12. 13. 17. 20. 22. 23. 24. 29. 30. 31. 36. 39. 43. 45. 57. 58. 60. 62. 76. 81. 83. 84. 86. 87. 88. 93. 103. 104. 106. 109. 117. 118. 119. 121. 123. 124. 126. 133. 147. 149. 156. 159. 170. 171. 173	3. 10. 14. 15. 16. 19. 21. 25. 28. 32. 33. 37. 41. 42. 44. 48. 51. 55. 56. 59. 61. 63. 64. 65. 66. 67. 68. 74. 78. 79. 80. 82. 85. 91. 100. 101. 102. 105. 110. 111. 114. 116. 120. 125. 127. 131. 132. 136. 148. 151. 152. 154. 155. 157. 160. 163. 164. 165. 167. 168. 169. 172. 174. 176. 177. 178. 179. 183.	27. 50. 113. 134. 146. 158. 182.	26. 52. 77. 122. 128. 129. 130. 135. 138. 139. 142. 143. 161. 162. 166. 175. 180. 181. 184.
Total ... 50	68	7	19

3

31
J. 20. 100
N 31. 17. 00



To classify the trees according to their bearing capacity, the average yield for the past five years ending 1927 was taken into consideration. Trees which yield up to 30 nuts per year are classified as poor bearers, those which yield between 30 and 100 nuts as medium bearers, and the rest, i.e., those which yield above 100 nuts per year, as heavy bearers. Under the two types, the greenish and the reddish, the trees are again classified according to their bearing capacity into the above three divisions as given in the following table.

Reddish nuts					Greenish nuts				
Poor	Medium		Heavy		Poor	Medium		Heavy	
26.	50.	52.	77.	180.	2. 3.	7. 9. 11. 12. 13. 14.	15.	10	
						16. 17. 20. 21. 22.	23.	41	
27.	113.	122.	128.	182.	6. 19.	24. 28. 29. 30. 31.	32.	44	
						33. 36. 37. 39. 42.	43.	58	
143.	129.	130.	134.	184.	25	45. 48. 51. 55. 56.	57.	62	
					67	59. 60. 61. 63. 64.	65.	76	
162.	135.	138.	139.		74	66. 68. 78. 79. 80.	81.	109	
	142.	146.	158.		84	82. 83. 85. 86. 87.	88.	114	
	161.	166.	175.		91	100. 101. 102. 103.	104.	168	
	181.				93	105. 106. 110. 116.	117.	174	
					111	119. 120. 121. 123.	124.		
					118	125. 126. 131. 132.	133.		
					127	136. 147. 149. 151.	152.		
					148	154. 155. 157. 159.	160.		
					156.	163. 164. 165. 167.	169.		
						170. 171. 172. 173.	176.		
						177. 178. 179. 183.			
Total .. 4	19		3		15	93		10	

It would be interesting to describe the main characteristics of a few (say three) typical trees classified according to their bearing capacity.

Poor bearers.—1. Tree No. 3.—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
3	9	15	21	9		14.00

Short description.—Stem is rough due to stunted growth. Crown loose. Leaves apart. Petioles long and slender. Flower stalks lean and weak. There was a nux vomica tree near this, which was removed. Nuts green oval.

2. Tree No. 25.—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
25	18	11	16	18	17	16.00

Short description.—Stem rough due to deep leaf-scars. Crown compact and rather closed. Petioles broad and narrow. Leaflets broad and near. Flower-stalks short but somewhat slender. Nuts green oval.

3. Tree No. 127.—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
127	21	7	13	21	12	14.8

Short description.—Tree tapering towards the crown and inclining south-west. Stem rough due to scars caused by peeling of leaves, leaves apart. Petioles thin, short and very weak. Flower stalks short and strong. Leaflets short and slanting to the tip. The tree is suspected of root-disease and so isolated by trenching. Nuts green oval.

Medium bearers.

1. Tree No. 29.—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
29	69	57	69	72	57	64.8

Short description.—The stem is rough due to leaf-scars. Crown compact. Petioles fairly long and thick. Leaflets near and pretty broad. Flower stalks long and rather weak. Nuts green round.

2. Tree No. 65.—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
65	67	72	68	67	55	65.8

Short description.—Stem smooth and a bit sloping to the west. Crown rather closed. Petioles short and thick and leaves apart. Leaflets broad,

near and drooping. The tree is very shady. Stalks are short, but slender, though well supported. Nuts green oval.

3. *Tree No. 167.*—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-27)
167	73	47	58	93	50	64.2

Short description.—Tree is tapering towards the crown. The girth at the base is about 3 feet 6 in. Scars, due to peeling of leaves, are seen on the stem. Leaves are rather apart. Petioles broad and weak. The crown not shady. Flower stalks rather long. Nuts green oval and of good size.

Heavy bearers.

1. *Tree No. 58.*—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
58	125	122	126	118	113	121

Short description.—Stem is fairly smooth with an average girth of 2 feet 4 inches. Crown quite compact. Petioles long, thick and broad. Leaves are strong, and of a persistent nature with plenty of broad leaflets arranged very close. Flower stalks strong and rather long. Nuts are light green in colour, oval in shape and medium in size.

2. *Tree No. 76.*—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
76	113	111	98	121	101	110

Short description.—Stem is smooth with an average girth of 2 feet 4 inches. Crown is very compact with broad and well-formed leaves arranged very close. Petioles short, broad and strong. Peduncle is very strong. Nuts, green, oval and medium-sized.

3. *Tree No. 168.*—Annual yield of nuts :—

Tree No.	1923	1924	1925	1926	1927	Average of 5 years (1923-7)
168	154	129	114	100	104	120

Short description.—Stem is rough and not uniform in girth. Crown compact and spiral distinct. Leaves long and closely packed, with long,

broad and strong petioles. Flower stalks are strong and long. Nuts are light green, oval and medium-sized.

Analysing the various factors which influence the yield of trees, one finds the inherent quality of the tree counts and not the environmental factors like soil, manure, etc. The fundamental difference between any two plants whether it be in the physical appearance or yielding capacity, is due to their heredity. It is seen from the individual records of trees that, in spite of the uniform cultural treatment, certain trees are inherently superior yielders and certain others poor yielders. Better cultivation or manuring can improve the yields only up to a certain limit. It is the inherent yielding quality that is primarily responsible to make a certain individual a good yielder, another a medium yielder and a third a poor yielder.

The ultimate aim in the improvement of this crop should therefore be to get a strain which has an inherent good yielding quality and develop a race from it. The first step to achieve this object is to see that the seeds are selected from the best types; for, it is clear that it is through seeds that all characters are inherited. Hence, seed-selection from reputed bearers is one of the important things that can be done at present to improve the progeny.

THE MOTOR VEHICLES TAXATION ACT AND MADRAS AGRICULTURE

By E. S. SUNDA, B.A., B.L., F.A.U.

Vakil and President of the City Audit Union, Madras.

Readers of the Journal are aware of the recent passing of the Madras Motor Vehicles Taxation Act. They may be also aware of Section 11/A of the Act which came in at the instance of our President-elect, Rao Bahadur T. A. Ramalingam Chettiar. The section reads thus :

‘Nothing in this Act shall apply to a motor vehicle used solely for the purposes of Agriculture.

Explanation—A Motor Vehicle used for transporting agricultural produce along a road shall not for the purpose of this section be deemed to be used solely for the purposes of Agriculture.’

The main body of the section gives an appearance that the Act is out to help the Agriculturists. Mr. Chettiar in proposing the amendment said ‘as in other countries, in this country also motor tractors and other machinery are coming to be used for agricultural purposes. If the Government are going to tax these vehicles as is proposed in the schedule, then the practice of using machinery for agricultural purposes will be suppressed completely. I think that is not the intention of anybody here.’ But the explanation takes off the merit of the body of the section when it says ‘transporting agricultural produce along a road’ (say to a market or godown) is not an agricultural purpose under this section. Many of us are aware that Indian agriculture suffers for want of facilities for quick transport and easy means of communication. If taking paddy to a market for sale or to a godown

along a public way is not an agricultural purpose, then what is the merit of the section? Reliance is placed on a similar provision in the Bihar Act. There is no obligation to copy a wrong legislation elsewhere, and Bihar need not offer us an example. Why should not Madras take a new position and make Bihar copy us?

In fact the explanation to 11/A is against the decisions and ordinary meaning understood by the phrase 'agricultural purpose'. Rowlatt J. in the *London County Council v. Lee*, 19143, K. B. 255 would state 'that the purpose of their farms would in my opinion include the carriage of farm produce to market'.

Sherman J. wrote in the same case 'In my view the exemption of agricultural locomotives was made with the object of favouring agriculture. Section 17 sub-S. 1 (b) shows an intention to consider the case of a farmer who can afford to own a locomotive and also the case of a number of persons who combine to buy one, the use in either case being solely for the purpose of their farms. It seems hardly arguable that, when they proceed to take their farm produce to market, they must pay this tax from which it was the object of the legislature to exempt them.' This view of the English court has not been dissented from anywhere. In fact 'lease to an agriculturist for rearing fish and stacking grass for cattle' was held as one for a purpose auxiliary to cultivation and is deemed to be an agricultural purpose under the Bengal Tenancy Act. *Surendra Kumar Sen vs. Chandra Tara Nath* 130. 1 C. 219; 34 C. W. N. 1063; 1931 C. 135. The Indian case is more liberal than the English case.

Such being the prevailing legal view all over, it is strange that our Madras legislature should have taken a reactionary attitude and should have declared 'transport of agricultural produce along a road is not an agricultural purpose.' This sort of legislation is not going to give an impetus to our agricultural marketing in spite of the express statement that the Act stands for the Agriculturists.

It is stated in justification that the motor transport for agricultural produce is not common and a restrictive explanation of the type we have, is not going to affect the prospects of agriculture. If that were so, and if the number of vehicles for agricultural transport is few, why should there be any restriction at all? Is the Government growing richer by taxes on these few vehicles? Whether this is true or no, at any later time when the motor transport of agricultural produce becomes the order of the day, pleas will be then put forward that to grant exemption to such vehicles would mean a huge loss of revenue. I feel that the explanation to Section 11/A cannot be tolerated by any co-operator or an agricultural economist¹. It is the duty of both to agitate and have it cancelled.

¹ For a more legal commentary on Section 11/A of the Act, refer to the Author's forthcoming book on the Act—obtainable from the Author.

REPORT OF THE INDIAN TARIFF BOARD ON THE SUGAR INDUSTRY, 1931¹

By C. A. B.

This small and handy volume of 120 pages contains the most exhaustive summary of the economic structure of the Indian sugar industry that has as yet been published: it may, in a sense, be taken as a supplement to the monumental Report of the Sugar Committee of 1920, verifying and, in places, modifying the conclusions arrived at then. It is divided into eight chapters as follows:—The World Position, The Indian Sugar Industry, Conditions of the Fiscal Commission, The Problems Stated, Costs and Fair Selling Price of White Sugar, Import Prices and Method and Amount of Protection, the Consumer, Other Measures of Assistance. Then follow a summary of conclusions and a series of appendices, containing among other things comparative data as to costs of production in white sugar factories in Java and India. As the Report is closely argued throughout, an analysis in a short article is impossible, and this will not be attempted here, but rather an endeavour to place before the readers of this Journal the main facts of the case as disclosed, and the conclusions arrived at.

There are many apparent contradictions in the Indian sugar industry. It is by far the oldest in the World and is generally considered the most backward: kept back in its development by age-long vested interests. And yet the impure mixture, *gur*, which is the main product, is probably a much better food for the people than the shining white crystals aimed at elsewhere. India extends 2,000 miles north and south, from the tropical heat of Madras to the frosts in winter in the Punjab, and the sugar industry pervades the whole, from south to north and east to west. And yet the area under cane, in that part of India where thick tropical canes can be grown as well as anywhere else in the world, is comparatively insignificant, while in the north, where only thin rapidly-maturing indigenous kinds can be grown in a growing season of less than half the year, lies the main sugar tract. Attempts to make white sugar have been made in India more or less for a century, but it was only when the indigo industry of Bihar was ruined by the synthetic product, that any permanent foothold was established. Now that it is, the total output is under 100,000 tons a year, whereas a million tons of white sugar are imported from Java in a year, in spite of a steadily-increasing import duty. It is surely anomalous that a country with nearly three million acres under sugar-cane should be in this position, but this is explained by another paradox, for India, with the cheapest labour in the world, is no more able to enter the world market for sugar than Queensland with the dearest.

The following summary of the Indian Sugar Industry is drawn from Chapter II:—There are three distinct products of the sugar-cane of economic importance in India at the moment; *gur*, *bel*-sugar and white sugar. The manufacture of *gur* is a very simple process, and is a typical peasant-industry almost throughout the country, the annual production being

¹ Government of India, Central Publication Branch, Calcutta, 1931. Price Re. 1 or 1s. 9d.

between 2½ and three million tons, according to the seasonal rains and price fluctuations. The cane is crushed in three-roller mills usually turned by bullocks, though more or less satisfactory small power-mills have been devised and their use is spreading. The expressed juice is carried by hand to jars or tins to the open boiling pan and heated till it begins to solidify. As the boiling proceeds, the scum is removed, and various clarifying agents are introduced. When the juice is beginning to solidify, it is rapidly stirred until the required consistency is reached; it is then run off into wooden moulds or earthenware vessels, and allowed to harden. Undoubtedly, this method is wasteful as far as the sugar content of the cane is concerned: only one crushing leaves much juice in bagasse, and inversion goes on rapidly during the boiling. The sucrose content of *gur* lies between 65 and 75 per cent. as against 99 to 100 per cent., in white sugar. But this inversion is only of importance when the *gur* is used as a raw material for refining to white sugar, which, as we shall see, is condemned in the Report. Comprehensive data are given as to the relative extraction and costs of production of small power and bullock-turned mills. The comparative extraction in such mills is given as about 68 per cent. to 62, and the cost in the principal sugar tract is about halved. But it is doubtful how far the power-mills can be established among the cultivators as a whole, with their small and scattered plots of cane.

The *bel* industry, including the making of *rab*, may be regarded as the limit which can be reached by the purely indigenous methods. It is an attempt at making a product more on a level with white sugar, and is typically developed in the Rohilkhand division of the United Provinces, where 200,000 to 250,000 tons of this sugar are prepared annually. The process is thus described in the Sugar Committee's Report. The juice is boiled down in a series of five pans arranged in the form of a cascade, and diminishing in diameter and depth from above downwards. Such a *bel* would need 8 or 9 bullock mills to keep it supplied with juice, working ten hours a day. In the first pan the juice is merely heated, in the second and third it is also clarified, sodium carbonate and the juice of *bhindi* (*Hibiscus esculentus*) being added, it is concentrated to a syrup in the third and fourth pans, and in the last pan it is boiled down to the final product—*rab*. The scum is removed by perforated iron ladles and strained through muslin and the juice returned to the pans. The hot massecuite is run into a series of small earthenware coolers, in which it is kept in violent motion until crystallization commences and it is then poured into spherical earthenware vessels holding approximately 120 lbs. each. These are stored for 3 to 4 months and then sold to the small local 'refineries.' Here the pots are broken and the contents are placed in bags, stacked in piles of twelve, and pressed down by the feet, the molasses exudes and is run off in small drains for about 8 hours, and then the product is removed from the bags and to another room where it is stacked to a depth of 3–4 ft. on bamboos and cotton stalks. Here it is covered by a layer of water weed called *siwar* (*Vallisneria spiralis* ?), which is removed on alternate days. After a month's treatment in this way, the uppermost layer has been bleached and is scraped off, the process of covering with *siwar* and scraping being repeated on alternate days: each of the succeeding layers removed is darker in colour and less valuable than the one above it.

This process is crude and wasteful, the 'white sugar' obtained being estimated as 4 per cent. on the cane used. But since 1920 this interesting

method of treating the *rab* has been improved by the introduction of centrifugals in the refineries—raising the recovery to 5.25 per cent. on cane. In addition, a good second class *gur* is manufactured from the second massecuite, and the following figures are obtained: white sugar 5.25 plus *gur* 3.58 plus molasses 2.04 = 11.48 per cent. on cane which compares not so unfavourably with an ordinary factory in North India: white sugar 9 plus molasses 4 = 13 per cent. on cane. For this and other reasons, the Tariff Board reverses the condemnation of the *bel* process by the Sugar Committee. The factories are on a small scale and the overhead charges are also small; they can be quickly installed and can be operated in the interior parts of the country, where the scattered nature of the fields and the absence of communications are at present unfavourable to the erection of factories. The Local Government considers that, during the period of transition, such *Khandsai* factories are, besides being the mainstay of the cultivators in an important tract of country, essential to the development of the sugar industry, and, undoubtedly, they will play an important part in providing an outlet for the threatened surplus of cane to be referred to later.

White sugar is made, both by refining *gur*, and direct from the cane as elsewhere. *Gur* is refined in 14 factories (besides others in part). The business is highly speculative, as it depends on the relative prices of *gur* and sugar, which by no means move on parallel lines; its interests are, moreover, against those of the *gur* producers, and it is thoroughly uneconomic, with a recovery of 5.5 per cent. of sugar on cane against over 9 per cent. in the white sugar factories. The outturn in 1923–34 was 59,555 tons of sugar and this was fairly maintained for about four years, but is now rapidly declining. The Tariff Board is strongly against any measures for the continuance of this industry.

There are 29 white sugar factories in India, 28 of which were worked in 1929–30, producing 89,000 tons of sugar, of which 80,000 were obtained in North India. A Table shows a steady rise from 1921–22 when under 30,000 tons were manufactured. The average extraction has risen from 6.85 per cent. when the Sugar Committee's Report was written, to 9.07 per cent. in 1929–30, which sufficiently indicates a real advance in factory control during the ten years which was criticized by the Committee. This, by the way, is not far behind the recovery from similar canes in Java factories.

Before proceeding to the problems to be solved by the Tariff Board, two aspects of economic importance in cane cultivation are referred to. The first is the status of this cultivation as regards the general well-being of the cultivator. The area under sugar-canes is slightly under three million acres, and has varied little during the past 20 years, nine-tenths of it being in Northern India and more than half in the United Provinces and Bihar: what follows refers in the main to the latter tract, in which alone the Board is able to suggest any important increase in the white sugar industry. Sugar-cane in this area is a valued crop in the customary rotations, as it has been found that other crops succeeding it, usually give increased yields; it also provides a considerable amount of fodder for cattle (in a part of the country where there are practically no pastures), and it also provides employment for men and cattle in the off-season, between the main *kharif* and *rabi* crops. Furthermore, while the world slump in prices has had its effect on those crops in India whose produce is exported, it has had very

little if any effect on the price of *gur*: jute, wheat, cotton and rice have declined in the last two years round-about 50 per cent. each in value. Thus, sugar-cane remains the one source from which the cultivator may hope to pay his rent and provide the necessities of life for which cash has to be paid. The cultivation of cane becomes, in short, of national importance.

The second aspect concerns the outturn of the cane fields, and is by no means so reassuring. The canes grown are undergoing a remarkable change in the main sugar tracts in North India (to which the Punjab might be added in this respect, with over half a million acres of cane), owing in the main to the new variety produced at the Coimbatore sugar station: the Tariff Board records a warm appreciation of the value of the work done there. This station was founded in 1912 and most of the new canes were produced in the first seven years of its existence. Their appreciation in North India has, from the nature of the case, been slow, but is now rapidly increasing, as shown by the acreage in the North of India during the last three years: 219,000, 363,000, 877,000. Of this last figure, 700,000 lie in the United Provinces and Bihar (with 1,644,000 acres under cane); and the Board anticipates that within three years, practically the whole of the indigenous canes in this tract will be replaced by the new variety. This change, moreover, has been brought about without any material increase in the areas cultivated or in the costs of cultivation, and it is estimated by the Directors of Agriculture concerned that the increase in yield of *gur* has been at least 50 per cent. There has, as yet, been no definite fall in the price of *gur*, although it must undoubtedly set in soon. The Board is obviously impressed with the results thus far obtained through research, and it recommends that the facilities for this should be greatly increased at once—the main objective being, as heretofore, lessening the cost of the production in the cane fields.

With these data before us, we can envisage the main problems with which the Tariff Board is faced, and we can only give the barest outlines of these and the methods by which they propose to deal with them. Considering that the cultivation of sugar-cane is a matter of national importance to India, the main problem is to find an outlet for the impending glut of canes to be milled, and the consequent menace to the whole Indian sugar industry. Encouragement is suggested to the consumption of *gur*, but this strikes one as rather vague and unconvincing, unless the current price is considerably reduced. The *bel* industry must be fostered and extended, both for the very existence of the large tract of country where it prevails, and to act as a natural stepping stone to an extension there for an up-to-date white sugar industry in due course. And every encouragement must be given to a wide extension of the white sugar industry over the part of the country where it has obtained a foothold. And only by these means can the wanted outlet of the threatened surplus be obtained. It is therefore necessary, at the earliest possible date, to make such protective arrangements as will discourage Java from sending her surplus sugar to India: this million tons of sugar now imported is the trump-card held by the Tariff Board for its recommendation of an increased protective duty.

There are many other matters of the greatest interest in this report, chiefly dealing with the purely economic side. Such are¹: the current cost

¹ See I.S.J., 1931, 156.

of making *gur*, refined *rab*, and white sugar in India, as compared with that at which these or similar products can be landed by Java in Calcutta; a fair price that should be paid to the cultivator by the factories for his canes; a fair selling price for the Indian sugar products named; the amount of protection needed, and a comparison with that in other countries which have an indigenous industry to protect; the comparative cost of research in India and in other cane-growing countries, the methods by which the cost of production can be reduced, and the status of the Indian sugar industry be gradually raised, so that when the present prices in the world industry have passed and prices improve, India may be more able to maintain its independence of the world's markets. The period of protection is fixed at fifteen years, being higher in the first seven years, so that the extension of the *rab* and white sugar industries may be stimulated in the near future; the amount of protection recommended is not greater than that already existing in other sugar-producing countries.—*International Sugar Journal*.

THE TANJORE DISTRICT CO-OPERATIVE MANURE SOCIETY, NIDAMANGALAM

On the occasion of the Silver Jubilee Celebration of the Nidamangalam Agricultural Bank, the Tanjore District Co-operative Manure Society extended its bone-crushing plant which was opened by M. R. Ry. N. S. Kulandaiswami Pillai Avergal, Deputy Director of Agriculture, Trichinopoly. The note on the origin and progress of the Manure Society and the speech of Mr. Kulandaiswami Pillai will be read with interest.

THE ORIGIN AND PROGRESS OF THE T.D.C. MANURE SOCIETY

Naturally, non-credit activities will follow when credit movements are successfully working. After the Nidamangalam Agricultural Bank had been working successfully for seven years and after the Co-operative Societies Act had been amended in 1912, our colleague, Rao Sahib A. Sethurama Ayyar, created an impression at the third Co-operative Conference held at Annmapet that the Tanjore paddy lands were in great need of phosphates, as per the investigations of the Research Institute at Coimbatore. The authoritative bulletin on the soil survey was published in 1915 and we, co-operators, wanted to organize a non-credit agricultural society called the 'Tanjore District Co-operative Manure Society' to put the investigations of the Research Institute to test.

The economic question involved by this problem works to about 50 lakhs of rupees. To work out this agricultural experiment, our Society was started in 1916 and it began its work by collecting bones, phosphatic nodules, etc., for manufacture of bone-meal and flour phosphate in the disintegrator. Our oil engine was a 9-h. p. engine and the disintegrator was of the smallest size available, viz. No. 'O' Christy and Norn's type. It turned out about 8 to 10 cwts. of bone-meal per day of 10 working hours.

The local skin merchants used to purchase bones at Rs. 15 to 20 per ton from the Adi-Dravidas and sell at Rs. 40 to manure-manufacturing

firms. The Society, by its inception, made these Adi-Dravidas earn 50 per cent more by raising the value of bones to about Rs. 30. The market value of the bone-meal at the time was Rs. 100, but the Society was able to sell at Rs. 65 per ton to its members.

Then we had to gradually raise the prices of bone-meal as the price of the bone went up and we began to sell bone-meal at Rs. 70 and so on, till it now sells at Rs. 90 per ton.

At one time, the market value of bone-meal was Rs. 110 and we sold at Rs. 95. Our maximum sale was only about 8 to 18 tons per year when the demand rose up to nearly 40 tons. Unfortunately, the disintegrator and oil engine having become old, as well as the price of bones having gone up very high, being till recently Rs. 60 per ton of raw bones, we were not able to meet the demand.

The experiments with phosphatic manures on the members' lands have conclusively proved that the results of the investigations of the Research Institute are quite right.

Now we have purchased a 18-h. p. engine, cold-starting oil engine and a correspondingly bigger size disintegrator, which will turn out about 15 cwts. of bone-meal per day. Owing to general trade depression which has especially hit the Indian ryots hard, we have been advised to reduce the cost as far as possible and we are now selling bone-meal at Rs. 90 per ton for a quality which was not to be thought of in the old disintegrator, being of the very finest type. I therefore request you to kindly open this engine and disintegrator and bless this Society to serve its useful purpose for a long time to come.

MR. N. S. KULANDAISWAMI PILLAI'S SPEECH

Gentlemen,

I must first thank Rao Sahib Sethurama Ayyar for giving me the honour of opening the disintegrator which has been installed for manufacturing bone-meal. I accepted the invitation for two reasons—firstly, to oblige and honour my personal friend Mr. Sethurama Ayyar who is a veteran Co-operator, scientific and practical agriculturist, and, secondly, he is a former student of the Agricultural College, Saidapet, from which I have had the honour of taking the diploma in Agriculture.

The important work before him, i.e., crushing bone-meal and distributing the same to the agriculturist, can be understood only if you know the part phosphatic manure plays in increasing the output of grain and the amount of phosphates contained in bone-meal. Among other ingredients that are required for the growth of a crop, the most important are Nitrogen, Phosphoric acid and Potash. Speaking only of the Tanjore Delta, a soil survey has been made and it has been found out that the major portion of the delta is deficient in Nitrogen and Phosphoric acid. Potash is, however, present in sufficient quantity.

To find out the cheapest form of supplying Nitrogen and Phosphoric acid to the paddy crop in the shape of manures, an experimental farm was opened at Manganallur (it is now closed after an experimental work of nearly 15 years). The results of these experiments have been compiled

in a book known as *The Results of the Manganallur Experimental Station*. I can say it is a hand-book on Agriculture for the *Mirasdars* of Tanjore. A perusal of this book will clearly show that of all the manures, well-preserved cattle-dung is the cheapest and best manure giving the best results. It is a complete manure containing all the requirements of a crop. Cattle manure in addition to its manurial effect improves the physical texture of the soil. It is good for all soils—clays, loams and even saline soils. It is for want of sufficient cattle manure we have to look to other manures.

You will also understand from the book mentioned above that the cheapest Phosphatic manures are bone-meal and Trichi-phosphate. The former contains about $3\frac{1}{2}$ to 4 per cent of Nitrogen and about 25 per cent of Phosphoric acid, while the latter, being a rock phosphate, contains only 25 per cent of Phosphoric acid and no Nitrogen. The phosphates contained in these manures being in an insoluble form, their action is very slow but when used in conjunction with organic manures like green leaf, oil-cake, or cattle manure, their effect can be observed in the very year of their application. This is because the organic acids produced by the leaves, cake, etc., while rotting, are able to act on the insoluble phosphates and make them soluble and to be utilized by the plants. *Super-phosphate* is a rock phosphate treated with sulphuric acid. The phosphate in this is therefore soluble and can be utilized by the plants at once, and this need not be applied in conjunction with leaves, etc. It is, no doubt, a chemical manure, but can be utilized by ryots who have not been able to grow a green manure crop or who cannot afford to go in for oil-cakes which sometimes are expensive and beyond the means of the ryots.

From the same book, you will also find that long before the advent of the manure firms, sulphate of ammonia and calcium cyanamide have been found to be quick-acting and promoting rapid growth of plants. But the cost of these at that time being nearly double the present price, their use was not advocated. You may be assured, Gentlemen, that no new manure is advocated to the ryots before it is tried and experimented upon in an Experimental Station and found to be profitable to the ryots.

This morning, the President in the course of his speech said that 'Imported artificial manures of doubtful value are being pushed with the active support of the Agricultural Department.' I beg to disagree with the President. Early last year there was a Conference of the Deputy Directors of Agriculture at Coimbatore, wherein this question of manures was discussed thoroughly. The importance of conserving cattle manure and preserving it was decided to be one of the chief items of work for every Agricultural Demonstrator. It has been made such an important item of work of a demonstrator, that if you meet any one of them and ask his opinion of the manure, I am sure he will tell you all about well-preserved cattle manure in which the urine of the animals and the cast-off litter are combined. Several leaflets have been published. This subject finds a place in every villager's calendar, digest, etc. If proper system of conserving cattle manure has not spread largely, it is the ryots who are to be blamed. But, Gentlemen, if you know that in the so-called civilized country like Ireland it took nearly one century to introduce a labour-saving implement, we need not be surprised that introduction of the better system of collecting cattle manure is very slow in our country where illiteracy is the rule.

In this connection, Gentlemen, please permit me to give an explanation for a statement contained in the report of the Director of Agriculture on the operations of his Department for 1929-30. 'Our work should be mainly concerned in giving advice to cultivators on the use of artificial manures'. To understand this statement I must explain the policy of the Department. We know by manuring the fields better yield can be obtained. We know that well-preserved cattle manure is the best and we know also that the total amount of cattle manure available in the country is hardly sufficient for one-tenth of the total cultivable area. The advice given to the ryots is to apply half the dose of cattle manure or cake and supplement the balance with artificials. This has been our advice as regards the artificial manures. To give you an instance, in a plantain garden near Karur, one plot was manured with 8 *barams* of groundnut cake per acre, another plot with 4 *barams* plus 1 cwt of super and 3 bags of ammonium sulphate. The cost of manuring in both cases was the same, but the latter had produced bigger bunches fetching 2 annas more per bunch which meant Rs. 100 net profit per acre. I still hold that organic manures such as green leaf, oil-cake, fish-guano, etc., are the best manures. But it all depends on the prices of these manures and the purse of the ryots.

As regards the phosphatic manures, bone-meal is the best form of supplying phosphoric acid to the soil, provided it is used along with green leaf, oil cake, or cattle manure. Unlike superphosphate, this contains as stated already early $3\frac{1}{2}$ to 4 per cent of Nitrogen which is a distinct advantage. Knowing the importance of this manure which besides being organic is indigenous, the Imperial Board of Agriculture have been repeatedly insisting on Government that the export of this stuff should be stopped. The next best idea is to make the stuff cheaper by manufacturing bone-meal in villages where bones are available and make the ryots utilize it. To this end, the Central Research Council of Agriculture has instituted a prize of Rs. 3,000 for an inventor of a simple machine for disintegrating bones by means of bullock-power. It is a matter of very great gratification that before this simple machine comes into the market, the Nidamangalam Society had been at it for some years past and has now installed a more powerful engine and disintegrator for manufacturing bone-meal.

This engine and disintegrator I have been requested to open this evening. I have very great pleasure therefore in declaring this engine and disintegrator open. May it prove useful to all the ryots of the Tanjore Delta and increase their grain output, is my prayer.

Notes and Comments

1. **The College Day and Conference.**—It was notified in the June issue of this journal that the annual College Day and Conference will be held this year in December instead of in July as usual. This temporary shifting is done, at the suggestion of the Director of Agriculture, to coincide with the Gazetted Officers' Conference which is timed to be held in December. The executive of the Madras Agricultural Students' Union will be glad to receive the views of the members on the desirability or otherwise of permanently shifting the dates for the celebration of the College Day and the holding of the Conference, to December.

2. **Hope for the Agriculturist.**—The declaration of moratorium by President Hoover of America is a generous gesture. It is more generous of the Governments to extend the benefits to India also. This country is one of the primary producing countries of the world and, as such, is likely to be benefited by the increased buying power now created in the world by the moratorium. The increase in the buying power assists us in the disposal of our stocks of rice, cotton, wheat, groundnuts and other agricultural produce.

3. **A munificent Gift for the Andhra University.**—The new Raja of Jeypore (Vizagapatam District) has promised the Andhra University an annual recurring grant of one lakh of rupees. The University is contemplating the establishment of a Science Institute and has appointed a powerful committee to examine the question and to make recommendations. We hope the scheme includes adequate provision for scientific investigations into the possibilities of agricultural industries aiming at the better utilization of agricultural and horticultural produce.

4. **The Mysore Agricultural Union.**—Our readers need no introduction to the Mysore Agricultural and Experimental Union which is an important organization in the Mysore State. Its noteworthy feature is the happy combination of official and non-official agriculturists jointly striving for the development of agriculture in Mysore. This institution recently celebrated its thirteenth anniversary. We offer our felicitations to the Union on its successful completion of thirteen years of valuable work and wish it a greater and more useful future.

5. **Tax on Motor Vehicles.**—Elsewhere in this issue we publish a short note from a correspondent showing how the Act as it stands at present fails to benefit the agriculturist. In its present form, the Act distinctly benefits only the rich man and high paid officers who use the car constantly for touring purposes. For, with the abolition of the tolls, the touring motorist is free to go anywhere in the presidency with a charge of only Rs. 100 per annum, while formerly he was paying much more than this annually on account of toll-gate fees.

6. **Rural Uplift.**—In the course of a speech on the opening of the Co-operative Conference recently held at Tiruchendur, the Hon. Mr. S. Kumaraswami Reddi declared that the policy of the present Ministry

was to do everything that would promote rural reconstruction and uplift, and that a potent factor and agency in promoting rural uplift, co-operation and its development would be their object. Three things, he said, were necessary to bring about rural uplift. The first was the spread and expansion of transport facilities such as roads and bridges; the second, the rapid growth of universal elementary education and the removal of illiteracy; and the third, the spread of co-operative movement in all its aspects. How far these lines of improvement, excellent as they are, will affect the position of the small farmer and at what point in the scheme of development he comes in, is difficult to say. The small farmer is significant by being the atomic unit of production for the supply of the food requirements of the community. The best means of assisting him can be devised only when we completely understand the conditions of the small farmer and his struggle for existence.

7. **Adulteration of Ghee.**—Consequent on the setting aside by the High Court at Madras a conviction under the Madras Prevention of Adulteration Act, a deputation of the ghee merchants of Madras waited on the Hon'ble the Chief Minister and prayed that in the preparation of rules to the Act, their opinions may be obtained and that in safeguarding the interests of the public health, the legitimate rights of the trade may not be ignored and no restrictive conditions incapable of performance, or capable of performance with very great delay and expense, may be imposed on them. In the course of their memorandum, the merchants state that it is very difficult, if not impossible, for any merchant to have the ghee analysed by the Public Analyst and label the result of the report on the tins or vessels and that this procedure is unnecessarily expensive and dilatory. They further state that ordinarily the merchants in the City of Madras get large consignments of ghee from various up-country districts and if they are required by rules to indicate the purity of the ghee, they submit that it is an unnecessary hardship and expense and that the ghee trade would be paralyzed. These arguments are not convincing, and public health should not be subordinated to the interests of the ghee merchants. The original source of ghee is the small farm-house in the village and the ghee is almost invariably pure when it leaves its birthplace. It is *en route* to the merchant that all kinds of adulteration take place. It is not impossible to test the ghee rapidly to find out if it is pure or adulterated with animal and vegetable fats, mineral oils or other substances that may look like ghee but is not ghee. It is not the Government that should modify the rules to suit the convenience of the ghee merchants but it is the ghee trade that should organize itself and maintain the standards of purity. No one should be sorry if a bad ghee trade is paralyzed when the public are not able to get what they pay for.

8. **Artificial Food question again.**—The synthesis of albumen from coal is said to have been achieved by German scientists. It would appear that the new synthetic albumen is less expensive than the natural one and it is claimed that this discovery, if confirmed, opens up new prospects for the production of artificial foods.

9. **A new manure firm.**—A company under the name of the Indian Agricultural Development and Manure Organisation Ltd., was recently formed at Coconada. The chief object of the promoters is to form the ryot population into a self-contained federation through an organization solely

intended to promote their welfare, and to educate them on the value and efficiency of various kinds of indigenous manures. The system of working is based on the principle of co-operation by enlisting the ryots as shareholders as far as practicable. There is need for an organization of this kind, and it has not come a day too soon. The efforts of the promoters and the working of the concern will be watched with interest. We trust the organization attains the success it deserves.

10. **Rural Reconstruction.**—We are glad to note that the Y.M.C.A. Rural Reconstruction Centre at Ramanathapuram, under the able management of Messrs. J. N. Jayakaran and T. Stephen, is making notable contributions towards rural reconstruction. It completed on June 6 its seventh Summer school. There were thirty-two students of both sexes, of different religions and castes, and of ages varying from 18 to 62. The noteworthy point is that there were about a dozen graduates. Besides a number of lectures on diverse subjects and instructive excursions, the institution gave specialized training in cottage industries such as poultry-farming, dyeing and calico printing, and bee-keeping. According to the Secretary's statement, the four hundred beehives that are working in Coimbatore and many hundreds that are working all over India have come to exist as a result of the work of this rural centre through its Summer schools. Again, the institution has made no small contribution to the development of the poultry industry with the White Leg horn breed. Many who were taught dyeing and printing of cloth have taken to the vocation. The latest development of the rural centre is the introduction and the distribution of the Berkshire Breed of the English pigs. The prices these swine fetch, have induced even caste people to go in for them.

REVIEW.

'A contribution towards our knowledge of the Aleyrodidae (White flies) of India' by KARAM SINGH, M.Sc.

Memoirs of the Department of Agriculture, India, Pusa, Vol. xii, No. 1, pp. 1-93, April 1931.

This publication on Indian Aleyrodidae is a welcome addition to the comparatively scanty literature on Indian insects. It is all the more so because this appears to be the first substantial account on this little group of insects since Peal published his paper on Oriental Aleyrodidae in the *Journal of the Asiatic Society of Bengal* twenty-eight years ago. We must congratulate the author, Mr. Karam Singh, on this extremely useful production which will form a nucleus for future workers on this interesting and, to a certain extent, economically important family of insects. To quote the author's own words 'the family has been treated mainly from a systematic point of view' and no one can deny his statement that 'systematic work forms the bed-rock on which an economic structure is erected' and that 'a pest must be definitely recognized before any investigations on it can be undertaken'. In this paper, 44 species are noted as against 16 noted by Peal in 1903 and of these, as many as 23 are described as new species. We think it is possible that many of the forms recorded may also be found in South India though the author has only given three as being noted from

this Presidency. These are *Dialeurodes ixora* from Madras, *Aleurocanthus rosa* from Pondicherry and *Aleurolobus barodensis* from S. Arcot. Evidently, he has confined himself chiefly to N. Indian forms; he has, however, omitted, perhaps by oversight, to note the distribution of at least two more species which are also found in South India and recorded in previous publications—one is that of *Tiraleurodes ricini* which is very commonly found here and which was collected by Misra on castor from Coimbatore (vide 131 of the *Report* of the 5th Entomological Meeting, Pusa, 1923) and the other is *Necomaskellia bergi* which is not only referred to by Misra as found in S. India (vide p. 430 of the *Report* of 3rd Entomological Meeting, Pusa, 1919), but which has been recorded and figured also in Fletcher's *South Indian Insects* (p. 507) in 1914. As the first connected account of the Indian forms of this family the addition of a few paragraphs at the beginning, briefly giving some idea of the general organization of these insects, the striking characters which differentiate them from closely allied homopterous families, the main features in their life-history and habits and their natural enemies, as an introduction to the systematic part, would have considerably enhanced the usefulness of this publication—especially to future amateurs working on this family. The paper is illustrated with numerous black and white diagrams, but it is a surprise to us that the author did not think of adding at least one or two of the already-available Pusa color plates on Aleyrodids showing the insects in their natural habitats—we know there are at least four of these (viz., two of the cane Aleyrodids, one of the castor and another of the orange species), and at least one of these could have been added as a frontispiece to the paper. The tables added to distinguish genera and species are rather interesting and novel; though they may be useful in their own way, we are inclined to think that in a systematic work of this nature, the standard form of synoptical keys would be more welcome for easy identification and noting of the affinities of different forms. A very exhaustive and useful bibliographical list is added at the end; however, the reference to the different species would be more helpful for easy reference had they been inserted with the species in their respective places in the text. We have just one doubt as to whether Misra's account of *T. ricini* in the *Report* of a meeting can be taken as a valid description of a new species according to the accepted and recognized codes in Entomology which say that 'Publication of new names in newspapers, popular magazines, non-technical agricultural journals, school and meeting programmes, or in price lists are not valid.'

All these are, however, small points and friendly suggestions which do not, in any way, lessen the value of this excellent memoir. It is evident that the author has taken considerable pains to describe the species at some length; for, unlike as in the case of large insects like grasshoppers, butterflies, or beetles, the study of these minute forms entails a good deal of laboratory technique and microscopic study. On the whole, the paper is a very valuable contribution to Indian Entomology. There is no doubt that many more species of white flies are awaiting discovery all over India, and while congratulating the author again on this excellent work, we feel that if the author continues in the same line, as we wish, he will surely be able to considerably supplement our present knowledge of these very interesting insects.

T. V. R.

Gleanings.

Cotton-growing in the British Empire.—The outstanding feature of the year is the continued success of the Barberton selection of Jassid-resistant strains of cotton. This success is not limited to South Africa, where it has given a new lease of life to an industry threatened with extinction through the depredation of the insects; it extends through a wide tract of country embracing the whole of East Africa as far as Uganda, and even into Sudan. Though in the latter country U-4, the main resistant race, did not show up well under irrigation, of the cottons grown it proved itself one of the most resistant to leaf curl. Being itself a preliminary selection as yet unestablished in respect of many characters of economic importance, it promises to become, by selection or hybridization, the parent of numerous strains adapted to one or other of the varied conditions which naturally occur through so wide a stretch of country. In South Africa itself selections from U-4 are being crossed with Cambodia, certain selections from which have proved to be even more Jassid-resistant than the original U-4.—*Reports from Expt. Stations, Empire Cotton Growing Corporation 1929-30.*

[Our readers will be interested to know that Mr. F. R. Parnell, formerly of the Coimbatore Research Institute, is responsible for the evolution of such a valuable strain of cotton as U-4.—Ed., *M.A.J.*]

Sure-kill Poison for Troublesome Bushes.—This new agent in man's chemical warfare against tough weeds is ethylene oxide, chemically related to the ethylene chloride which has been found very effective in hastening the ripening of fruits and vegetables. Prof. Harvey discovered the value of ethylene oxide during the course of his experiments with various ethylene compounds. He found that the oxide killed the fruits and vegetables instead of speeding up their ripening processes.

He tried the compound on some large barberry bushes, which are being harried out of existence in the great grain areas because they harbour the black stem rust of wheat. What he calls 'depth charges' of ethylene oxide dissolved in water were sunk into holes pierced in the soil at the roots. A few days later the bushes were revisited, and in every case they were found to be in the last stages of the death struggle. About one and one half ounces of ethylene oxide, diluted to a ten per cent solution in water, usually sufficed for a large bush.

At present barberry bushes are fought either by digging them up, which leaves stray roots free to sprout again, or by dumping quantities of common salt into holes at their roots, which is rather hard on the soil. Other chemicals which are effective against them cannot be used because they are poisonous to cattle. 'Depth charges' of ethylene oxide, Prof. Harvey concludes, seem to offer the best means so far discovered for killing these and similar noxious plants.—*Scientific American*—June 1931.

Viability of seeds.—For many years now, a popular belief has existed that seeds which have been removed from ancient tombs retain their ability to germinate. Wheat grain, the so-called 'Mummy wheat' has been a case

in point for several decades. A claim has been made by an American farmer that wheat taken from the tomb of Tutankhamen has been made to grow and this fact has received much publicity in the press. The viability of seeds varies very much depending upon several factors, external and internal. This subject was discussed in an article in *Nature* of 2nd May 1895 in which it was stated that kidney bean seeds which had remained in the Herbarium for a hundred years, germinated, and *Mimosa pudica* seeds after sixty years. But the viability of wheat thousands of years old is a different matter. So far, there has not been an authentic case of 'Mummy wheat' being viable, and it is extremely unlikely that there ever will be. For hundreds of years the halls of tombs have been used as granaries by the natives. The grain can be conceivably ascribed to that and therefore possibly be only a few years old. A viable seed is still living and undergoing decaying process however slowly, but it is not likely that it is so slow as to last over thousands of years.—*Nature*, 2nd May 1931.

Uses of Platinum.—Found until recently exclusively in sands and gravels and chiefly in the Urals or Columbia, Platinum is used, apart from jewellery, by the dentist and the surgeon, and is used extensively in laboratories on account of its high melting point and immunity from most chemical reagents. It is also used in the making of permanent photographic prints, in the ceramic industry, in the artificial silk industry for spinnerets and for many electrical purposes. Agriculture throughout the world depends upon Platinum as fine platinum gauze is used in the oxidation of Ammonia during the manufacture of synthetic fertilizers. Of the other precious metals, Palladium is used for much the same purposes. The palladium-plating of microscopic parts, spectacle frames, and automobile and aerodrome reflectors, to render them non-tarnishable, is rapidly approaching the commercial stage.—*Nature*, 2nd May 1931.

Moisture and Mould in Copra.—Separate lots of carefully-dried copra with an average moisture content of 5.87 per cent. were stored at Nzima, Gold Coast. The time taken for 100 per cent. mould to develop ranged from 36 to 187 days, the mould on every lot being the harmless, grey-green type (*Penicillium spp.*), which do not cause the production of free fatty acids from the oils. Most of the lots increased in weight, as a result of absorbing moisture from the air, particularly during the wet months of June and July, but, under the conditions of the experiment, this was not sufficient to allow of the development of the harmful brown and black moulds (*Aspergillus spp.*) which only occur on copra containing at least 7 to 8 per cent. of moisture. It was concluded that under local conditions copra with not more than 6 per cent. moisture content could safely be stored for long periods. For plantation purposes, it may be accepted that stored copra will not be attacked by harmful moulds if its weight at the time of storing does not exceed 58 per cent. of the weight of the original fresh kernel.—*Review of Applied Mycology*, May 1931.

Cotton-seed cake as healthy food.—Caspar Schmitt, Chemist of Heidelberg, has established the fact, after years of research, that the great mass of waste material from cotton seed after the oil has been extracted contains unparalleled human nutritive value. He has developed a process whereby that waste can be converted into a substance that can be readily utilized in conjunction with other foods to give them additional health-giving qualities.

His research has proved that over half of the substance of this former waste product is pure albumen, known to be a great body-building agent. The remainder of the substance contains considerable amounts of phosphoric acid and aluminium salts. Vitamins A.B.C. and E have been found in the preparation, thus giving it more vitamins than tropical fruits such as oranges, lemons, bananas and dates. The importance of vitamins for the building up of bodily and mental strength, aiding the digestive functions, and strengthening the general physical condition of the human body is well recognized. The use of cotton seed meal, or 'Florida Albumen,' as Mr. Schmitt calls his product, is considered feasible because of the low cost of the cotton-seed after the oil has been extracted as that product was formerly considered waste or used for cattle fodder. During the war an attempt was made in the United States to use cotton seed flour as a substitute for wheat or corn flour for baking purposes.

'Florida Albumen' has already been successfully introduced in Egypt where it is used in coffee and cocoa, giving them additional health-giving properties without affecting the original flavour and aroma as 'Florida Albumen' is tasteless and odourless.

India produces nearly one-sixth of the world's cotton supply, and this discovery should prove of much interest to those involved in attempting to alleviate the present crisis in the cotton situation.—*South of India Observer*.

Cattle feeds.—Work-cattle at the Agricultural Research Station, Maruteru, even after heavy work this season are reported to be in a better condition than they were last year. The reason attributed to this is that they were fed on sprouted horsegram which contains vitamins to a larger extent than boiled horsegram, their normal food.

At the Pattambi Agricultural Research Station silage was made during the last monsoon with a very succulent grass grown along water-courses but not eaten by cattle when green, due to ill-effects on their bowels. Silage made out of it was readily eaten by cattle without any untoward effect. The Maduthupalaiyam Co-operative Society in Coimbatore District prepared silage out of ragi straw which was relished by cattle. People accustomed to curing tobacco in pits seem to have no objection to silage manufacture, whereas in some parts of the country the idea is still a novelty among ryots.—*Madras Agri. Department Quarterly Digest No. 91*.

Sindewahe Furnace.—This furnace is being used with great advantage for boiling sugar-cane juice. Recently, it was introduced in the Guntur District for boiling turmeric. It was found that in the local method one rupee worth of redgram stalks or other fuel was found necessary for a boiling. But where a Sindewahe furnace was used, with the same quantity to boil, one anna worth of groundnut husk available in plenty in that locality was found enough. In Chittoor District where this furnace has practically replaced the local one, certain interested parties seem to suggest that jaggery obtained by boiling juice in this furnace lacks in keeping quality. There does not seem to be any foundation for this statement because this furnace is now employed practically in all agricultural stations where sugar-cane is grown, and at no place has it been our experience that jaggery suffers from the defect attributed to it. It has come to our notice

that in Chittoor, jaggery contractors are also fuel contractors, and, since the introduction of Sindewahe furnace, the fuel contractors have suffered a great deal as they have not been able to sell their fuel. It is suggested that, with a view to compel ryots to purchase their fuel, such contractors seem to have set up this story, and that some have gone to the extent of even refusing to purchase jaggery made in the Sindewahe furnace. Ryots are warned to be careful of such threats and are advised to combine together and protest against outside interference. On the other hand, should ryots find that the jaggery made in this furnace does suffer in its keeping quality, they are requested to invite the attention of the nearest Agricultural Demonstrator or District Agricultural Officer to investigate the causes.—*Madras Agricultural Department Quarterly Digest No. 91.*

Correspondence—Queries and Answers.

The following queries of Mr. K. R. Subramanya Ayyar of Salem which appeared in the June issue are answered.

1. *Question.*—I would be glad if you can give me information about growing of Pomegranates.

Answer.—We would refer Mr. Subramania Ayyar to the article on 'A Note on the cultivation of Pomegranates in Somanur' which appeared in Vol. xix No. 1 (January 1931) of the Madras Agricultural Journal. If he requires further information on any specific point, we shall endeavour to furnish it.

2. *Question.*—How can we prevent beetles spoiling the fruits?

Answer.—We presume the writer refers to the fruit-sucking moth which is a serious pest in Pomegranate gardens. The remedy which the Entomologist recommends is the covering-up of the fruits with paper or muslin bags when they are about half-ripe.

3. *Question.*—How to begin a coconut plantation and what manures could be used for the garden?

Answer.—The answers to this question will be found in Leaflet No. 44 of the Department of Agriculture, Madras, which will be sent gratis by the nearest Agricultural Demonstrator, District Agricultural Officer, or Deputy Director of Agriculture.

4. *Question.*—What is the best manure for plantains and how to apply it?

Answer.—Bulletin No. 93 of the Department of Agriculture, Madras, sold at 2 As. per copy can be had from any of the Agricultural Officers mentioned in the previous para.

I Cochineals on Brinjals?

To

The Editor, The Madras Agricultural Journal.

Dear Sir,

There is a scare in the Coimbatore town which has evidently spread like wild-fire throughout the district and even to the neighbouring districts that the Prickly-pear cochineal has begun to attack brinjal plants, and that brinjals are rendered poisonous, with the result that this old friend of the family is being rigorously boycotted from almost every household as an article of food. It is reported that due to want of buyers, several basket-fuls of this vegetable are thrown to the manure pit and hardened owners are pulling out the plants wholesale. I have seen some plants in which the lower surface of the leaves are covered with white mealy insect. I shall be grateful if you could inform me through the medium of the Journal whether the white insect found on brinjal plants is really the cochineal, whether it is destructive to the crop and whether it is harmful to use the fruits of infected plants.

Yours, etc.,
SCARED.

Answer.—Specimens of the reported insect attack received from the correspondent were submitted to the Government Entomologist, Coimbatore, who reports as follows :—

Dear Mr. Editor,

In reply to your correspondent, I venture to make, through your columns, the following observations for his information :—

The Prickly-pear cochineal feeds exclusively on prickly-pear and it may interest your correspondent to know that the species of Cochineal we now have is so very fastidious in its food habits that it thrives well only on one species of prickly-pear (*O. dillenii*) and does not feel happy on the other cacti.

The mealy insect found on brinjals is quite a different one from the Cochineal; the brinjal insect is *Phenacoccus insolitus*, Gr., while the Cochineal is *Dactylopius tomentosus*, L. The brinjal mealy bug has been found on brinjal all over the country for years and is nothing new. It is of course a pest of brinjal and can be checked by spraying, etc. Fruits from such infested plants are never poisonous! Incidentally, I may add that none of these insects is in any way poisonous (in fact very few insects are poisonous). In this connection, I would invite the attention of your correspondent to the quotations in the letter of Mr. R. Swami Rao published on pp. 230-231 of your issue of May last. It is unfortunate that such unfounded and wild rumours are circulated, perhaps by some irresponsible and interested parties who often take a parochial view of such things and spoil them.

I would therefore request your correspondent and his friends to do their best to contradict these wild rumours and thereby not only help the poor vegetable vendors from an unhappy situation but also honourably

acquit the innocent cochineal which, instead of being welcomed and thanked for its very beneficial work, is falsely arraigned as a criminal and poisoner ! I believe it is the duty of every one who is an agriculturist to help in this work.

T. V. R.

Rapid Propagation of Canes by Short-cut Method.

To

The Editor, The Madras Agricultural Journal.

Dear Sir,

I am surprised to read the letter on page 270 of your valued Journal on the rapid propagation of canes. The author of the Note must be fully aware of the fact that only top halves of canes are fit for planting. The eye-buds of the bottom nodes are either damaged during thrashing, or germinate earlier and become useless. In several cases, old eye-buds are too inert to germinate, while, in the short-cut method the whole cane is young (six months old) and the eye-buds in all parts of the canes are very active. Further, Java 247 exhibits relatively poor percentage of germination (as low as 60) when compared with Fiji B. Hence his figures require further enlightenment.

I am interested to know (through the medium of your popular Journal) the following particulars of his observations :—

- A.
 1. Number of setts planted in 25 cents.
 2. Whether setts were prepared from whole canes.
 3. Percentage of germination.
 4. Number of canes cut.
- B.
 1. Percentage of germination in the 4-50 acre plot.
 2. If the crop had been harvested of canes obtained or the number of cart-loads quantity of jaggery obtained.

COIMBATORE
July 3, 1931.

Yours, etc.,
S. R. SRINIVASA IYENGAR.

Sindewahe Furnace and Quality of Jaggery.

To

The Editor, The Madras Agricultural Journal.

Dear Sir,

Anent Mr. R. Swami Rao's letter regarding the keeping quality of jaggery influenced by the type of furnace and the nature of fuel used, I submit some of my personal experiences.

The keeping quality of jaggery depends chiefly on the consistency of the syrup at the last stage (just before being poured out into the cooling vat). In the local furnace, where logs are used, the burning cinders maintain a high degree of temperature uniformly at all parts of the furnace ; and the syrup gets thickened uniformly and well. In the Improved Furnace

a man regulates the feeding of the furnace and economises the cost of fuel by using easily combustible materials like trash and begasse ; and if he is slack, then the fire within the hearth completely goes out. More often scanty feeding results in unequal heating of the large bottom pan. Then the syrup is not of uniform consistency throughout. It has been found that the fireman must continue to do his duty and keep a steady and low fire ; and the syrup must be stirred continuously as it gets thickened. Very good jaggery had been obtained and they kept well in the South Arcot and Chingleput Districts (litteral tracts) during the rainy months of October-December, till they were disposed of during Pongal festival in January.

Yours faithfully,
S. R. SRINIVASA IYENGAR.

COIMBATORE.

FARMING CALENDAR FOR THE COIMBATORE DISTRICT

August-September (Tamil-Avani).

'The Ani monsoon hems you in but the Avani monsoon recedes in front of you', "ஆனி அடைசாரல், ஆவணி முச்சாரல்" Brisk is the monsoon in the month of Ani (June-July) whilst it slackens and is dispersive in Avani (August-September). This proverb applies to the submontane tract of the Tamil districts lying on this side of the Western ghats and favoured by the south-west monsoon rains and as such it applies to parts of Coimbatore as well. The monsoon rains therefore of this month are characterized by occasional drizzles and light rains. The total rainfall ranges from 1 to 1½ inches.

All the dry sowings of the previous month receive intercultural operations. Young crops of *cholam* and *cumbu* are weeded and hoed.

Groundnut and early-sown *sorghums* in the dry lands of Pollachi taluk ripen fast in this month and are gathered. Groundnut harvest at this time at Pollachi affords ample scope for the employment of labour from other taluks where the season is somewhat slack. Dry *cumbu* and gingelly sown in May mature about this period and are harvested. Chillies are planted in certain parts of the districts. Nursery for tobacco is prepared and seeds are sown.

Fields intended for Cambodia are prepared and made ready. Early in September, Cambodia is sown. Cambodia sowings done at this period thrive well and yield a good return. Early ragi planted at the end of May and in the beginning of June mature at this time and is harvested.

Transplanting of paddy in wet lands is continued in parts of the river valleys and the rice cultivation in the single-crop lands is practically completed by the end of the month.

College News and Notes.

Reopening.—The College reopened on June 25, and the second and third year B.Sc. classes assembled on the same day.

Selection of students.—The selection of new students for the College was as in recent years conducted by a Committee. The Committee consisted this year of the Director of Agriculture, the Principal of the College, Dewan Bahadur M. Ramachandra Rao, Mr. Kalifullah Sahib Bahadur and Dewan Bahadur C. S. Rathnasabapathy Mudaliar. As usual, the candidates were divided into three batches and interviewed at Samalkot, Madras and Coimbatore. The Committee has selected 45 students of which 21 are from the Northern Districts, 1 from Madras, 19 from the Tamil Districts and 4 from the West Coast.

Health Lectures.—The travelling motor van of the Madras Health Department visited the Agricultural College, and the District Health Officer gave an exhibition of some interesting health films on the College Maidan. This novel method of propaganda, which is admirably suited for India, was at once interesting and educative and attracted a large audience.

Obituary.—We regret to record the death of Mr. T. Sankaran Nayar, our popular Dairy Clerk. Mr. Nayar joined the Department in 1921 and has seen service in Malabar, Coimbatore, Madras and Hosur and was known to many in the Department as Audit Clerk to the Inspector of Agricultural Offices. By his amiable manners and ever-cheerful disposition he had endeared himself to one and all among whom he was known. Mr. Nayar suddenly took ill and though his ailment never appeared to be serious, he passed away peacefully on June 6, after a brief period of five days, leaving a wife, three children and a large circle of relations and friends to bemoan his loss. Our condolences go to the bereaved family.

Ladies' Club.—Arrangements are in progress to hold a fancy sale in aid of the Building Fund of the Ladies' Club. The Club which has now been in existence for over three years has been steadily growing both in number and usefulness. The need for a habitation of its own has been felt for long and it is hoped that the 'Sale' which is now organized and which is mainly to be of a variety of articles made by the members and their well-wishers, will be an unqualified success.

Students' Club.—At a general body meeting of the Club held on the 29th June, the following office-bearers were elected for the year :—

Club Secretary	...	P. M. Muthuswami	...	Class	III
Games Secretary	...	Udhobo Patnaik	...	"	II
Football Captain	...	G. Ayyadurai	...	"	II
Hockey Captain	...	K. M. Narayana	...	"	II
Cricket Captain	...	R. Mahadevan	...	"	II

Public Servants' Co-operative Society.—Arrangements are in progress for the formation of a local society for the benefit of Government servants employed in the Agricultural and Forest Colleges. The assets and liabilities of the members belonging to these institutions in the Coimbatore District Society along with a share of the Reserve Fund of the Society will be transferred to the new Society which will have its office at the Agricultural College.

New quarters.—Three new 'A' type quarters are nearing completion and will be ready for occupation in August. The addition of these quarters may slightly relieve the need for quarters among the subordinate officers.

Personal.—Mr. N. G. Charley, Research Engineer, who has availed himself of three months' leave out of India, has left for Australia, on the 2nd July handing over the charge of his office to the Principal.

It is understood that Mr. C. Tadulingam, Principal on leave, has been permitted to cancel the unexpired portion of his leave and is expected to rejoin duty sometime during July.

Information has been received here of an adventure which Mr. C. M. John, Senior Assistant to the Oil Seeds Specialist, experienced at Palakuppam, fortunately, without any serious consequences. Mr. John went to the station at night to make some observations on the pollination of groundnuts and while he was at work was bitten by a poisonous snake. He fell down unconscious, but the timely first aid rendered by his colleagues saved his life. Mr. John was removed to Tindivanam where he was treated by a physician and subsequently recovered from the effects of the snakebite after undergoing a prolonged treatment in Travancore.

Visitors.—Rao Bahadur D. Ananda Rao, Offg. Director of Agriculture, came to the College in connection with the selection of students and stayed for a week attending to official duties. Dewan Bahadur M. Ramachandra Rao, Mr. M. Kanti Raj, and Mr. T. Murari were among other visitors. Mr. K. S. Ranganathan, B. Sc. Ag., Herbarium Superintendent at the Government School of Indian Medicine, Madras, and an old student of the Agricultural College, was here throughout the month of June undergoing special training in the Herbarium.

M. A. S. U. Parliament.—A meeting of the M. A. S. U. Parliament was held in the Freeman Hall on the 8th July with Rao Bahadur T. A. Ramalingam Chettiar in the Chair.

THE HUMBERT MARIE JOSIE PRIZE.

(AWARDED BY THE INSTITUTE INTERNATIONAL D'AGRICULTURE, ROME)

[We reproduce below the Regulations for the grant of the Humbert Marie Josie Prize sent to us for publication.—Ed. M.A.J.]

I. An annual prize which on account of the circumstances under which it was endowed, is to be known as Humbert Marie Josie Prize, is instituted for the best work in Agricultural Economics—comprising all problems relating to Economics and Agricultural Statistics.

The prize consists of a gold medal and a sum of 10,000 liras and will be awarded by the Permanent Committee in all years according to these regulations.

The date (of receipt of work) expires on the 30th September and the award will take place on the 31st December 1930.

II. The work of authors belonging to the countries adhering to the Institute and published in the course of the preceding two years, will be alone admitted to the competition.

III. If any work is published in many parts, then it is admitted as a whole, at the period in which the final part has been published.

IV. A new edition of any work published previous to the period, will not be admitted unless substantial changes or additions have been made.

V. Work carried out by any member of the Jury will not be admitted to the competition, nor any work which has already been submitted to any International Competition and for which the author has received any prize in cash.

VI. At the close of each period, the General Secretary of the Institute will invite the members of the Committee for Rural Economics and Statistics of the International Council for Scientific Agriculture—of the Institute, as well as of the Committee for Agricultural Economics, to forward six copies of work carried out by their respective countrymen, which in their opinion deserve to be submitted to the International Jury—by reason of their scientific merit. He may, if necessary, point out any publications known to him which conform to the conditions of the competition.

The members of the International Council of Scientific Agriculture and of the Committee for Agricultural Economics who forward any work for the competition should also send with the copies of the work in all important cases, a brief report indicating the nature and contents of the work as well as their personal appreciation of its scientific character.

Works transmitted directly by the authors to the Institute, will be sent by the General Secretary to a member of the competent section of the International Council of Scientific Agriculture or of the Committee for Agricultural Economics for report as mentioned above.

VII. The final judgment in the competition will be given by a Jury composed of 5 members consisting of the President of the Institute, and 4 members nominated from among the members of the International Council of Scientific Agriculture and the Committee for Agricultural Economics. The selection will be made in such a manner that the Jury will be composed of men belonging to 5 different nationalities.

Each member of the Jury may have a substitute only of the same nationality.

VIII. A copy of all the works presented to the competition and of the reports accompanying them will be sent to each member of the Jury. The Jury cannot examine any other work besides those officially sent to them.

IX. Each member of the Jury, after examining the works, will draw up his order of preference and transmit it to the General Secretary. If any work placed at the top obtains 3 votes, then the prize is awarded. If no work obtains 3 votes, the General Secretary will draw up a list composed of two works placed at the top of the list obtaining the greatest number of votes and send it to the members of the Jury for a fresh ballot. The result of the second voting will determine the prize.

N.B.—Expiry of the second period for the presentation of work: 30th September, 1931.

Grant of the Prize—31st December, 1931.

Weather Review

JUNE 1931.

Rainfall data

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars ...	Gopalpore ...	1.7	- 4.1	2.2	South ...	Negapatam...	0.3	- 1.0	13.4
	Vizagapatam.	3.7	- 1.2	6.8		Madura ...	0.3	- 1.1	4.5
	Cocanada ...	4.2	- 0.6	5.8		Pamban ...	0	- 0.1	?
	Masulipatam	5.7	+ 1.2	?		Palamcottah..	0	- 0.6	1.4
Ceded Districts.	Kurnool ...	5.2	+ 2.3	7.2	West Coast	Trivandrum..	13.1	- 0.3	21.6
	Bellary ...	2.3	+ 0.4	3.8		Cochin ...	23.7	- 4.7	42.0
	Anantapur ...	2.8	+ 0.8	4.6		Calicut ...	26.4	- 7.6	33.8
	Cuddapah ...	3.5	+ 0.6	4.7		Mangalore ...	31.1	- 5.7	45.0
Carnatic...	Nellore ...	3.7	+ 2.4	5.1	Mysore and Coorg ...	Bangalore ...	2.2	- 0.7	5.8
	Madras ...	3.3	+ 1.4	6.7		Mercara ...	13.5	- 12.9	23.0
	Cuddalore ...	1.2	- 0.3	12.4					
Central ...	Vellore ...	4.6	+ 2.3	6.6	Hills ...	Kodaikanal ...	3.5	- 0.5	18.1
	Salem ...	1.0	- 2.0	5.0		Coonoor ...	2.2	- 0.9	9.3
	Coimbatore Town ...	0.4	- 1.5	7.7					
	Coimbatore Res. Inst. ...	0.4	- 1.5	4.0					
	Trichinopoly.	3.3	+ 1.9	11.6					

General summary of weather conditions.—Pressure conditions at the beginning of the month were of the normal monsoon type, with gradients running from South-west, and westerly winds over the whole area, but no active advance of the monsoon occurred till the 13th. From that date squally weather with rough seas appeared on the westcoast accompanied by heavy rain, and continued till the end of the month. The monsoon penetrated rapidly into the interior and sporadic showers appeared in the Deccan and Circars. The advance of the monsoon was not associated with very heavy rain but was of a mild type.

Rainfall was in slight defect over the whole of the area with the exception of the Deccan and Carnatic where it was in slight to moderate excess, the defect being most marked in Coorg and the north of the Circars. No rainfall was recorded in the extreme south of the peninsula.

Temperature was markedly in excess during the period preceding the advance of the monsoon on the east coast, some very high maxima having been recorded, Masulipatam and Cocanada reporting 114°. The temperature fell to normal with the increase in cloud associated with the advance of the monsoon towards the end of the month.

Weather report for the Research Institute Observatory :—

Absolute Maximum in shade	...	...	95.5
Absolute Minimum in shade	...	...	69.5
Mean Maximum in shade	...	...	92.0
Mean Minimum in shade	...	...	74.5
Total rainfall in month	...	...	0.35 inches
Average rainfall for June	...	...	1.83 "
Departure from normal	...	...	- 1.48 "
Number of rainy days	...	...	1
Mean daily wind velocity	...	...	6.6 M.P.H.
Mean 8.00 Hours wind velocity	...	...	9.1 "
Mean humidity at 8.00 hours	...	...	63.2 %
Total hours of bright sunshine	...	...	231.1 Hours
Mean daily hours of bright sun	...	...	7.7

Summary of weather conditions.—The monsoon did not appear till the end of the month though the wind was from the South-west and of normal strength.

The pressure was steady for the greater part of the month and weather was generally fine. Thunderstorms were absent and rainfall scanty being only 0.35 inches against an average of 1.83 inches for the month.

P. V. R.
B. S. N.

Departmental Notifications.

Gazette Notifications.—Mr. H. E. R. Dunhill, Assistant Agricultural Engineer, leave on average pay for 2 months from 15—8—31, preparatory to retirement. The services of Mr. P. H. Rama Reddy, Deputy Secretary, Indian Central Cotton Committee, are placed at the disposal of the Institute of Plant Industry, Indore, to act as Director of the Institute.

I Circle.—T. Paramanandam, A.D., Rajahmundry, extension of leave on m.c. for one week from 10—6—31. P. L. Narasimham, A.D., Narasapatam, l.a.p. for 10 days from 4—5—31. G. Ranganathaswami, F.M., Samalkot., l.a.p. for 10 days from 6—5—31.

II Circle.—V. Achyutam, A.A.D., Bapatla, l.a.p. for 2 months from date of relief by G. L. Narasimha Rao. B. Venkatramana, A.A.D., extension of l.a.p. for 15 days from 11—6—31.

III Circle.—K. Jaganatha Rao, F.M., Nandyal, leave on half average pay out of India for 28 months from date of relief.

IV Circle.—S. Rama Rao, A.D., Chittoor, l.a.p. for 10 days from 6—5—31. K. B. Vaideeswaram, A.D., Conjeevaram, l.a.p. on m.c. for 4 months from 26—5—31 and to report himself on expiry of leave to F. M., Palur. V. Suryanarayana, F. M., Kalahasti, extension of l.a.p. for 17 days from 14—6—31. K. V. Natesan, F. M., Palur, transferred to Cuddalore Division.

VI Circle.—S. Rajaratnam, A.A.D. in Mycology, l.a.p. for 20 days from 22—5—31.

VII Circle.—P. Kesavanunni Nambiyar, A.D., Badagara, transferred to Calicut. K. Govindan Nambiyar, A.D., Calicut, transferred to Badagara. P. Kannan Nambiyar, A.A.D., Manjeri, l.a.p. for 30 days from date of relief by A. D., Perintalmanna.

VIII Circle.—K. M. Venkatachalam Pillai, A.A.D., Namakkal, l.a.p. for 2 months from 22—6—31. K. Rama Menon, A.D., Nanjanad, l.a.p. for 27 days from 1—7—31. P. Govindakutty Kurup, A.D., Coonoor, l.a.p. for 15 days from 10—7—31. M. Gopala Chetti, A.D., Tiruchengode, l.a.p., for 3 weeks from 15—6—31.

G. M.'s Section.—C. S. Gopalaswami Rao, Assistant, permitted to rejoin duty on 8—6—31, cancelling 2 months' leave.

G. E.'s Section.—K. Brahmachari, Assistant, V Grade, confirmed from 1—5—31.

G. S. B.'s Section.—J. David, Sub-Assistant, extension of l.a.p. on m.c. for 2 months in continuation of leave already granted.

Principal's Section.—M. Raman, Upper Subordinate, III Grade, who will attain the age of 55 on 20th September 1931, will retire from service on that date. V. Viswanatha Ayyar, A.F.M., Central Farm., l.a.p. for 10 days in continuation of leave already granted. Mr. C. V. Seshachari, offg. D.A.O. Vellore, l.a.p. for one month from the date of reversion.

D. D. L. S.'s Section.—H. Narahari Rao, F.M., under training in Poultry Breeding at Lucknow, l.a.p. for 2 weeks from 6—6—31. *P. S.'s Section.*—M. Ramunni Kidavu, F.M., A.R.S., Pattambi extension of l.a.p. for 15 days. M. Ramaswami Pillai, Sub-Assistant, l.a.p. for 3 weeks from 22—6—31. S. Ramanujam, Assistant, l.a.p. for one month from 30—6—31.

M. S.'s Section.—T. R. Narayanan, Assistant, leave out of India for 2 years from or after the 20th August 1931 as below: Leave on half average pay for one year, 7 months and 14 days, Extraordinary leave without pay for 4 months and 16 days. U. L. Srinivasa Rao, A.F.M., l.a.p. for one month from 25—6—31.

C. S.'s Section.—S. N. Venkatramanan, Assistant, on reversion from special duty, l.a.p. for 2 months from 1—7—31 and on completion of his leave transfer to Nandyal to be in charge of the station.

APPENDIX

ADDITIONS TO THE LIBRARY, MAY 1931

MEMOIRS, BULLETINS, PERIODICALS, Etc.

United States Department of Agriculture Technical Bulletin—

- | | |
|---|--|
| 1. <i>Macrocentrus Gifuensis</i> Ashmead, A Polyembryonic Braconid Parasite in the European Corn Borer. | <i>Bulletin No. 230</i> |
| 2. The Wonderful variety of Pomegranate, Composition Commercial maturity, and By-products. | <i>Circular No. 98</i> |
| 3. Measuring Hay in Stacks ... | <i>Leaflet No. 72</i> |
| 4. Farm Study of the Cotton Plant Farmer's ... | <i>Bulletin No. 1661</i> |
| 5. Husker—Shredders in Corn-Borer Control ... | " 1662 |
| 6. Oats in the Northern States ... | " 1659 |
| 7. The Horse Bots and their Control ... | " 1503 |
| 8. The use of Logs and Poles in Farm Construction. | " 1660 |
| 9. Adequate Diets for Families with limited incomes. | <i>Miscellaneous Publication No. 113</i> |
| 10. An Explanation of American Lumber Standards. | " 107 |
| 11. Workers in Subjects pertaining to Agriculture in State Agricultural Colleges and Experimental Stations. | " 100 |
| 12. Seasonable Hints from the Dominion Experimental Farms Prairie. | <i>Edition No. 51</i> |
| 13. Do. Eastern and B.C. Edition Spring 1931. | " |
| 14. Ministry of Agriculture and Fisheries Advisory. | <i>Leaflet No. 31</i> |
| 15. Do The Apple Blossom Weevil. | " 28 |

Department of Agriculture Colony and Protectorate of Kenya—

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| 16. A Preliminary Survey of some of the soils in Kenya. | <i>Bulletin No. 1 of 1930</i> |
| 17. Fermentation of Coffee ... | " 8 of 1930
(Duplicate) |
| 18. Improvement of Maize yields in Kenya Colony ... | " 6 of 1931 |
| 19. The yellowing of Coffee ... | " 3 of 1931 |
| 20. Organic Manures ... | " 10 of 1930
(Duplicate) |
| 21. Root Rot, Foot Rot and Head Blight of Wheat in Kenya. | " 4 of 1931 |
| 22. Observations on ticks and Tick-borne Diseases... | " 2 of 1931 |
| 23. Summary of report on pasture investigation in Kenya 1926-29. | " 5 |
| 24. Ear Roots and Root rots of Maize in Kenya and some suggestions for their control. | " 5 of 1931 |
| 25. Investigation on Stem Rust of Wheat in Kenya Colony. | " 1 of 1931 |

University of Arizona College of Agriculture—

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| 26. Lettuce Irrigation Studies... | <i>Bulletin No. 138 of 1930</i> |
| 27. An Economic Study of Range cheese production in Arizona. | " 134 |
| 28. Field Experiments with Cotton ... | " 135 of 1930 |
| 29. Fifteen Years Field Crop Work Prescott Dry Farm, 1912-27 | " 136 |
| 30. Rations for fattening Range calves in Arizona ... | " 137 |
| 31. Timely Hints for Farmers.—The Feeding Value of the Grain Sorghums Hagari and Yellow Milo, compared with yellow corn. | " 161 |
| 32. Organic compounds associated with Base Exchange Reactions in Soils Technical. | " 31 of 1931 |

Union of South Africa Department of Agriculture—

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| 33. Two Destructive Insects of Carnation Plants ... | <i>Bulletin No. 94</i> |
| 34. Die-Back of Fruit Trees in the Western Cape Province. | " 97 |
| 35. A review of the Maize Situation in the Union of South Africa. | " 101 |

Cornell University Agricultural Department Station Ithaca, New York—

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| 36. Some Shade tree pests and Their Control ... | " 515 |
| 37. Oxford Press Bulletin Dated 11th February, 1931. | " 839 |

The University of Leeds and the Yorkshire Council for Agricultural Education—

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| 38. Guide to Experiments and Demonstrations at Askham Bryan and in the Country of Yorkshire 1930. | <i>Bulletin No. 165</i> |
| 39. Results of Experiments with Cereals, Sugar Beet, Swedes, Mangels, and Potatoes in Yorkshire 1930. | " 166 |
| 40. Sugar Beet Growing in Yorkshire, Lessons from Experiments 1925-1930. | " 167 |

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| 41. Final Memorandum on the Linseed and Rapeseed crops of the Bombay Presidency, including Sind and Indian States for the Season 1930-31. | <i>Dated 12-5-31</i> |
| 42. Final Memorandum of the Wheat Crop of the Bombay Presidency, including Sind and Indian States for the Season 1930-31. | " |

Department of Agriculture, Madras—

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| 43. Care and Management of Cattle Manure in South India. | <i>Leaflet No. 24</i> |
| 44. The Sindewahi Furnace for Jaggery Manufacture | " 25 |
| 45. Notes on the results of the Chemical Entomological and Mycological Experiments conducted at the Betelvine research Station, Vellalur, Madras Presidency, during 1925-30. | <i>Pamphlet No. 3</i> |

Department of Agriculture Government of Research Institute, Formosa, Japan—

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| 46. Studies on the Top-Borer attacking the sugarcane in Formosa. | <i>Report No. 50</i> |
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Memoirs of the Department of Agriculture in India, Pusa—

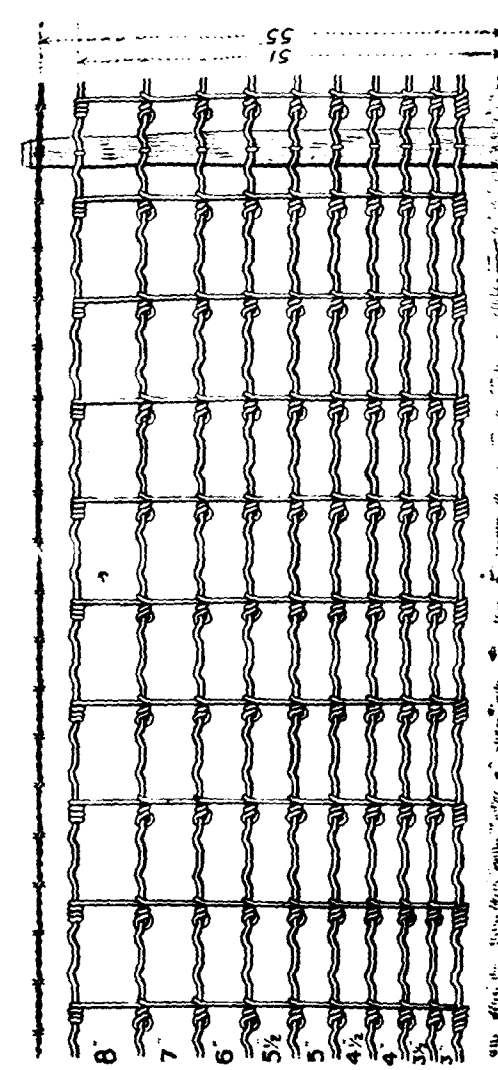
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| 47. Inheritance of Characters in Rice, Part IV ... | Vol. XVIII, No. 8 |
| 48. The Effect of some Meteorological conditions on the growth of Panjab-American Cotton. | Vol. XVII, No. 6 |
| 49. A Leaf-spot Disease of Andropogon Sorghum caused by cercospora Sorghi E. and E. | Vol. XVIII, No. 9 |
| 50. List of Publications on Indian Entomology 1929. | Bulletin No. 207 |

Imperial Bureau of Plant Genetics I.A.B.—

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| 51. Plant Breeding Abstracts ... | Dated 1st April 1931 |
| 52. Department of Agriculture Digest No. 90 ... | (Telugu) |
| 53. Do. Do. ... | (Malayalam) |
| 54. Do. Do. ... | (Tamil) |
| 55. Villager's Calendar ... | Tamil Edition for 1931-32 |
| 56. Agricultural Supplement No. 34 to the Cyprus Gazette No. 2128 of 24th April, 1931. | The Sirividdhi of the Vine |

Annual Reports—

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| 57. Report on the administration of the Department of Agriculture for the year ending June 30, 1930. | United Provinces of Agra and Oudh. |
| 58. Annual Report of the Coimbatore ... | S.P.C.A. for 1930. |
| 59. Indian Students' Union and Hostel ... | F.M.C.A. London 11th Annual Report. |
| 60. Economic Advisory Council, Committee on the Mineral Content of Natural pastures Sixth Report. | 1930 |
| 61. University of the State of New York Education Department. | Annual Report 1930. |
| 62. Colony and Protectorate of Kenya ... | Agricultural Census 1930 11th Annual Report. |
| 63. Colony of Mauritius Report on the Working of Co-operative Credit Societies for the year ended 30th June, 1930. | |
| 64. Colony of Mauritius ... | Annual Report on the Department of Agriculture 1929. |
| 65. Trinidad and Tobago ... | Cocoa Industry of Trinidad. |



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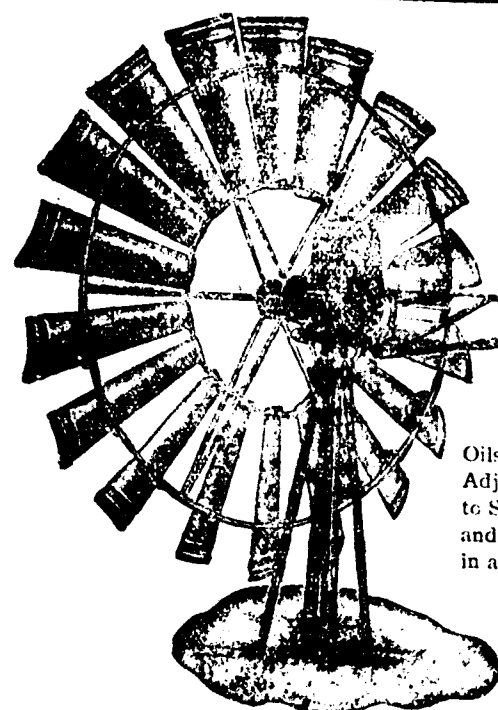
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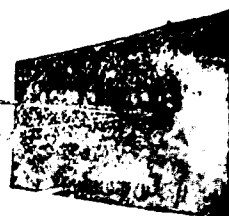
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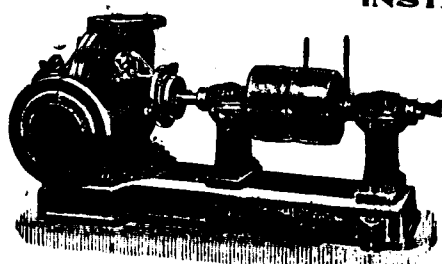
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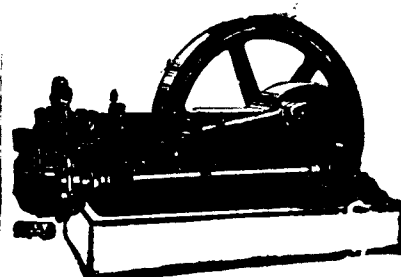


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