

# The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXVI.]

APRIL 1938.

[No. 4.

## EDITORIAL

**Back to the Land.** Ever since the problem of "educated unemployment" began to attract the earnest attention of responsible public men, one of the professions recommended as a practical solution for relieving the same is Farming. We have heard persons talk of the benefits of private farming and the glories of country life and more often than not such advice comes from those who have, never in their life, handled a plough or lived long enough in a village to know what it actually means to live the life of a villager and consequently we are constrained to characterise all such advices, however well-intentioned they may be, as akin to that given by the proverbial 'padre' to his congregation, viz., to do as he professed and not as he actually practised. It is no wonder therefore that this suggestion has so far fallen on very very deaf ears. "Where ignorance is bliss it is folly to be wise".

We find that this was the subject, albeit in another garb, of a note presented to the Board of Agriculture, at its last meeting at Lahore. The author of the note M. R. Ry. Rao Bahadur M. R. Ramaswami Sivan Avl., has made certain very valuable suggestions with a view to induce local governments to collect statistics regarding the availability of suitable unoccupied waste areas for settling unemployed young men on land and prepare a scheme of colonisation on lines more or less similar to the one in actual operation in the Punjab. We are told by the Rao Bahadur that his personal enquiries into the working of the system in the Punjab have made him a confirmed optimist as regards the success of similar schemes in the other provinces as well, of course including Madras. As he says in an explanatory appendix to the above note, he and some of his late colleagues have been interesting themselves in this subject for the last many years. We know that there was not a single year in which this subject was not discussed at the annual agricultural conference held under the auspices of the Madras Agricultural Students' Union. Yet we are still where we were.

It is generally taken for granted that once suitable lands are set apart with the promise of necessary financial help to get things going, there will be a ready and sufficient response from young men to take full advantage of the scheme and start private farming as a means of living. We regret we are not so very optimistic. To us it seems that before we approach government, it would be well to get a good idea of the actual state of affairs as regards the unemployed graduates of the agricultural college in the first instance. We know for certain that there is a good number of the old students of this college who possess large areas of cultivated and cultivable

lands. We would like to know why most of these young men have not taken to an agricultural pursuit in preference to either joining the government department or taking up other walks of life. We find there have been offers from private land owners to place their lands at the disposal of intending 'colonists' with the necessary financial help. We also see that when the old Chintaldevi cattle farm was closed down and the whole site was offered for sale there was no offer from any of the unemployed young men "to colonise" and start private farming. When concerns which are more or less in fair working order do not find favour with these young prospective farmers we may be excused if we find it difficult to feel as optimistic as Mr. Sivan and his late colleagues over the suggestion of colonising "waste lands".

It is certainly not our intention to underestimate the possibilities of finding a solution for unemployment by diverting young men to an agricultural pursuit. On the other hand we would most heartily support any feasible proposal for attaining such an object. Any way this is the most opportune time for bringing forward such proposals since the government is now engaged in collecting statistics regarding the number of educated unemployed.

We are however not very confident of the present government taking action on the lines indicated in Mr. Sivan's note, preoccupied as they are more with schemes for all round retrenchment in expenditure not excluding the development departments.

The object of the note may however be realized in other ways. The agricultural department have now one demonstrator in almost every taluq of the presidency. During their tours these demonstrators may try and get information regarding unoccupied wastes which are in their opinion suitable for cultivation. These can be inspected by them and details collected from the revenue officers in the villages and a consolidated statement sent up to the Director of Agriculture. This will, at least in a very rough way, give a fair idea of the availability or otherwise of such lands. Along with this information the government could be approached to amend the *Darkhast* rules making it obligatory on the part of the revenue officers to show preference to the educated unemployed in assigning such lands. As a corollary to the above, if government could find their way to amend the rules regarding the issue of *Takkavi* and other kinds of loan such as those for land improvement, purchase of agricultural machinery, etc., the requirements of the prospective educated unemployed young colonists would have been met more than half way. It seems to us that the above is a better method of approaching government or perhaps one which would be more acceptable to them and in any case certainly easier of realization than any other.

In this connection we would invite the attention of our readers to an article appearing elsewhere in this issue from the pen of Rao Saheb G. Jogi Raju on economic holdings in the Vizagapatam District. We would like very much to publish similar articles about the other districts in this presidency if only the district officers would help us to do so.

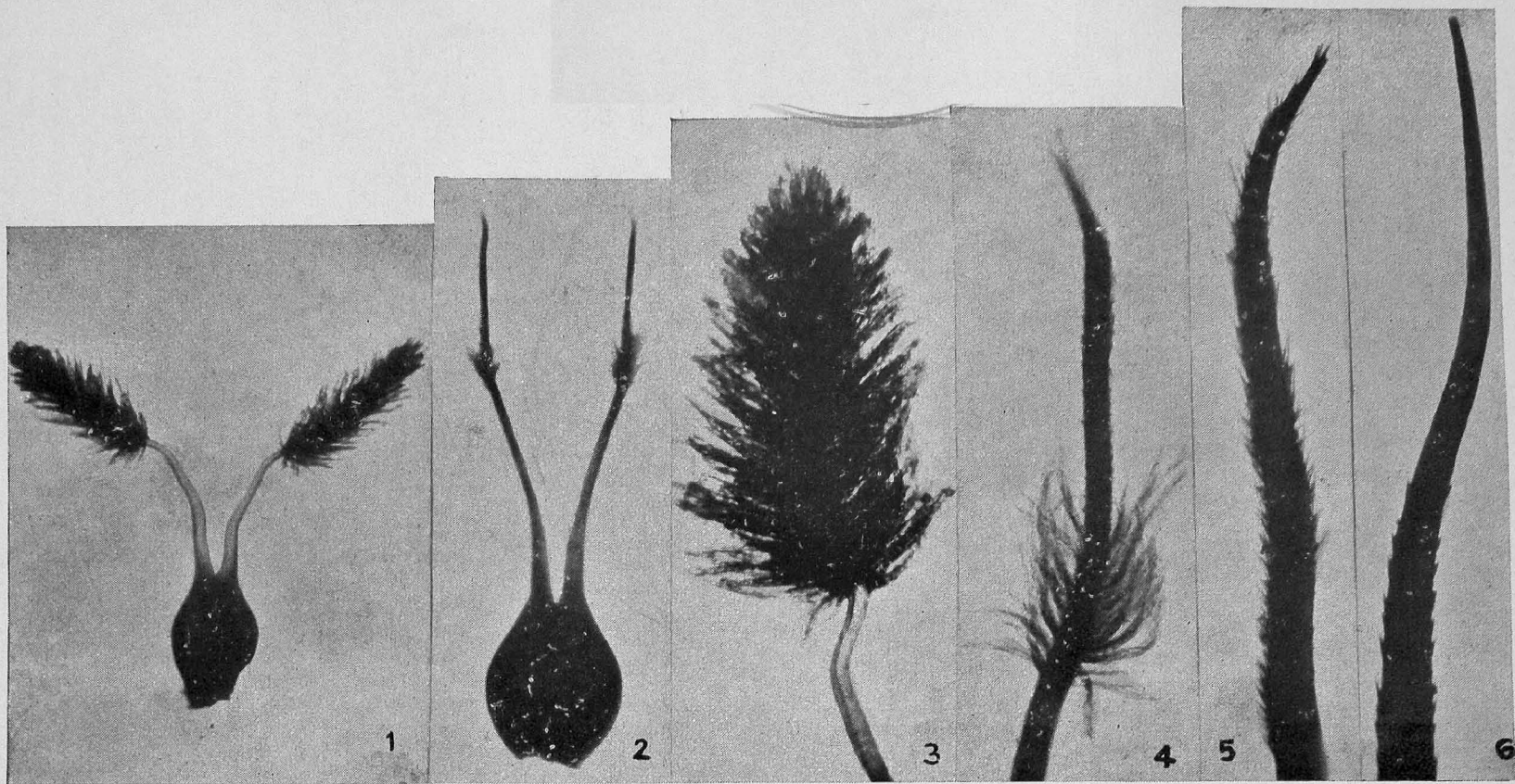


Fig. 1. Fully Feathered stigma. X 7.5.  
,, 3. Stigmatic Arm of fig. 1. Enlarged. X 40.  
,, 5. Fully Barbed Subule of Awn. X 40.

Fig. 2. Basal Feathered stigma. X 7.5.  
,, 4. Stigmatic arm of fig. 2. Enlarged. 40.  
,, 6. Basal Barbed Subule of Awn, X 40.

# THE INHERITANCE OF BASAL FEATHERED STIGMAS (AND BASAL BARBED SUBULES) IN SORGHUM\*

BY

G. N. RANGASWAMI AYYANGAR, B.A., F.N.I., I.A.S.,

and

T. VENKATARAMANA REDDY, B. Sc. Ag.,

*Agricultural Research Institute, Coimbatore.*

In three previous papers<sup>1, 2, 3</sup> many evidences were adduced proving the homology between stigmas and awns in sorghum. In the third paper the occurrence of basal feathered stigmas was recorded and also the fact that along with such occurrence and the presence of awns, the barbs of the subular portion of the awn were also basal in occurrence.

The stigmas in sorghum are generally fully feathery (Fig. 1.). The length and disposition of the feathers may vary between varieties<sup>4</sup>. The experience in the suppression of the feathers in the top portion of the usually feathery area of the stigma was met with in 26 sorghum varieties from Central and East Africa, i.e., N. Rhodesia, Nyasaland, Tanganyika and Kenya territories. These sorghums belong chiefly to the groups *S. conspicuum* Snowden and *S. Roxburghii* Stapf, groups characterised by gaping glumes. In these varieties the stigmatic portion is feathery at the base only with a bare cylindrical projection at the top (Fig. 2). The length of the feathery area varies from one-third to two-thirds the length of the stigma and is constant within the variety. To the naked eye, the non-feathery portion of the stigma appears smooth. Under the microscope, there are seen incipient projections, connoting suppressed feathers (Fig. 4.). Stray feathery out-growths can occasionally be seen in this otherwise smooth looking area. This peculiar kind of stigma is constant in its occurrence in the varieties mentioned above and to our knowledge the first experience of its kind in the Gramineae. The setting of the seed is normal in spite of the restricted feathery area in the stigmas.

Of the 26 varieties in which basal feathered stigmas occur, 24 were awnless and two long awned (9—11 mm.). In these long awned varieties, parallel to the basal feathers of the stigma, the subule of the awn, was barbed at its base only (Fig. 6). In one of these long awned varieties, there occurred a natural cross with normal (fully feathered) stigmas. This cross had short awns 2—4 mm. in length. When sown next year, this selection (A. S. 4971) segregated and gave plants with 81 normal and 27 basal feathered stigmas in the second generation. The family segregated for awns

---

\* Paper read before the Agricultural Section of the Indian Science Congress, Calcutta, in January 1938.

also giving 81 short awns (0.5–5 mm.) and 27 long awns (9–13 mm.). Cross-collated, the figures were as follows:—

**Family No. A. S. 4971.**

	Short awn.		Long awn.	
Stigma—	Fully feathered 60	Basal feathered 21	Fully feathered 21	Basal feathered 6

In the short awn group, the length of the awn at the longer end though separable into column and subule, does not give enough subular area for a clear pursuit of the distribution of the barbs in that area. Even with this difficulty, when the awn is long enough, it is noticed that when the stigmas are basal feathered, the bases alone of the subules are barbed. In the long awn group, all the 21 plants with normal stigmas were barbed the entire length of the subule (Fig. 5.) and the six plants that had the basal feathered stigmas had barbs only at the base of the subules of their awns (Fig. 6.). In a second family A. S. 4961, raised from another natural cross from a nil-awn family, a similar di-hybrid ratio was obtained, the numbers being 43, 16, 15 and 3.

From the family A. S. 4971, four selections with long awns and fully feathered stigmas were carried forward and a third generation raised. Of these, one bred true and three segregated giving a total of 153 plants with normal stigmas and fully barbed subules and 52 with basal feathered stigmas and basal barbed subules.

Crosses between normal (fully feathered) and basal feathered stigma selections resulted in the  $F_1$  with fully feathered stigmas. Two of the  $F_1$  selections were carried forward to a second generation. These segregated and gave a total of 282 plants with fully feathered and 79 with basal feathered stigmas. The barbs of the subular portion of the awn were inherited in a parallel way to the feathers of the stigma. When the stigma was fully feathered, the subule was fully barbed and when the stigma was basal feathered, the subule was basal barbed.

In four other families which were awnless, simple monogenic segregations have been obtained for normal and basal feathered stigmas, the total figures being 253 normal and 87 basal feathered.

A gene designated  $St_{bf}$ , Central and Eastern African in origin, seems to be responsible for the suppression of feathers in about the top two-thirds of the stigmas. This peculiar characteristic has proved a simple recessive to the fully feathered condition of the stigma whose genetic constitution is  $St_{Bf}$ .

This genic pair  $St_{Bf} St_{bf}$  seems to be independent of the sheath colour factors **P** and **Q**, as the following two tables will show (Tables I and II).

TABLE I. Segregating for  $St_{Bf}$  and Q.

Selection No	Stigma Sheath	Fully feathered $St_{Bf}$		Basal feathered $St_{bf}$	
		Reddish Purple Q	Blackish Purple q	Reddish Purple Q	Blackish Purple q
A. S. 4961		42	16	16	3
„ 4968		41	14	15	6
„ 4969		32	10	10	4
„ 4971		61	20	22	5
	<b>Total</b>	176	60	63	18
Expected ratio 9:3:3:1		178.30	59.45	59.45	19.80
		$X^2 = .417$	$P > .93$		

TABLE II. Segregating for  $St_{Bf}$ , P and Q.

Selection No.	Stigma Sheath	Fully feathered $St_{Bf}$			Basal feathered $St_{bf}$		
		Purple P	Brown p	Purple P	Brown p	Reddish Purple Q	Blackish Purple q
A. S. 4972		51	21	25	21	6	7
Expected ratio 27:9:12:9:3:4		54.40	18.15	24.20	18.15	6.05	8.05
		$X^2 = 1.277$	$P > .93$				

In the experiences so far met with, it has been noticed that this  $St_{Bf}$  gene is also independent of the grain colour factors  $B_1$ ,  $B_2$  and  $W$  as the following tables III, IV and V will show.

TABLE III. Segregating for  $St_{Bf}$  and one of the B factors.

Selection No.	Stigma Grain	Fully feathered $St_{Bf}$		Basal feathered $St_{bf}$	
		Brown	White	Brown	White
A. S. 4972	73	24	25	9	
Expected ratio 9:3:3:1	73.70	24.55	24.55	8.2	
		$X^2 = .105$	$P > .99$		

TABLE IV. Segregating for  $St_{Bf}$ ,  $B_1$  and  $B_2$ .

Selection No.	Stigma Grain	Fully feathered $St_{Bf}$		Basal feathered $St_{bf}$	
		Brown	White	Brown	White
A. S. 4971		43	38	15	12
Expected ratio 27:21:9:7		45.60	35.40	15.20	11.80
		$X^2 = .346$	$P > .95$		

TABLE V. Segregating for  $St_{Bf}$  and  $W$ .

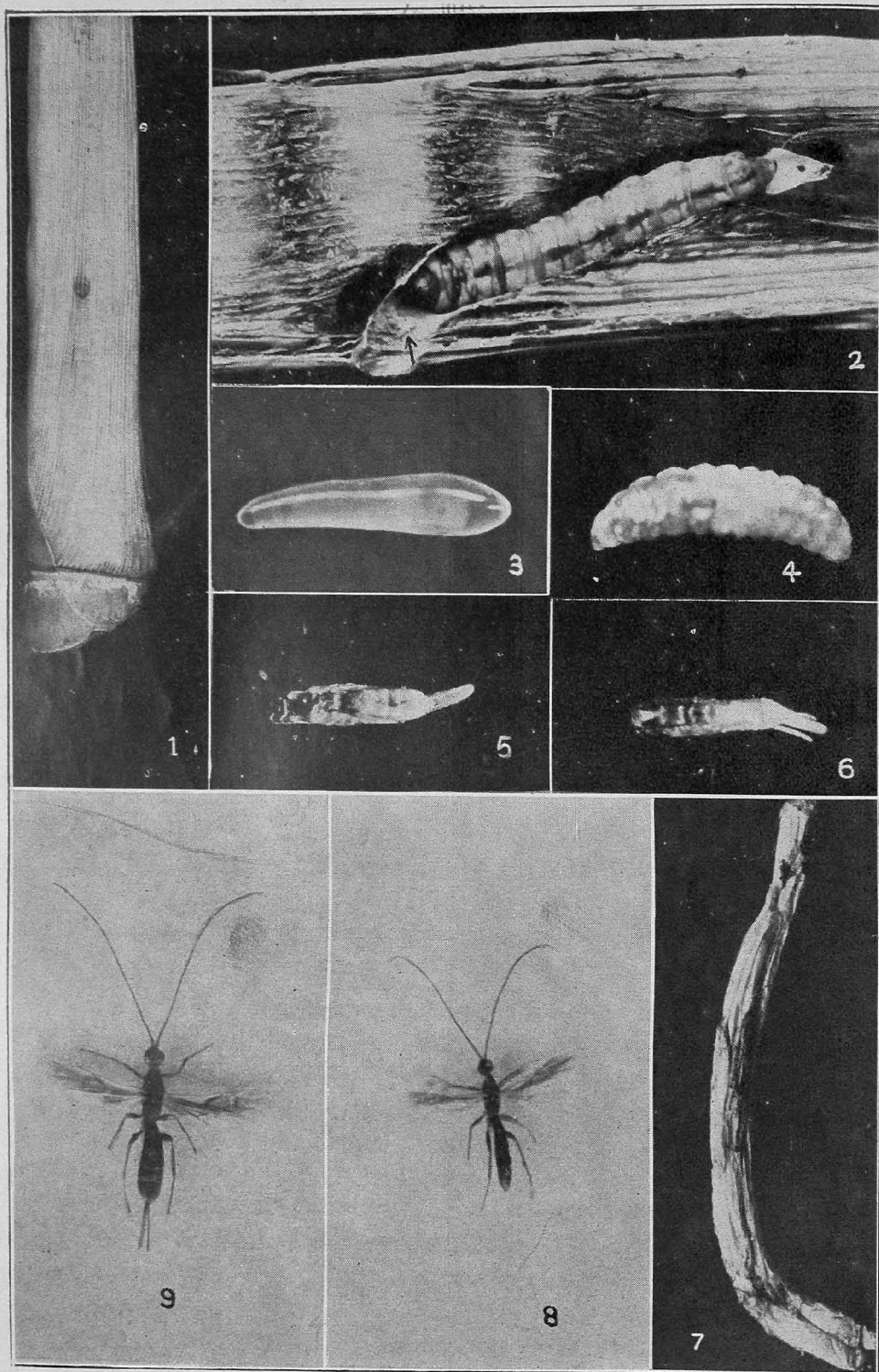
Selection No.	Stigma Grain	Fully feathered $St_{Bf}$		Basal feathered $St_{bf}$	
		Pink W	White w	Pink W	White w
A. S. 4961		42	16	14	5
Expected ratio 9:3:3:1		43:30	14:45	14:45	4:80
		$X^2 = .238$	$P > .96$		

**Summary.** A gene  $St_{Bf}$ , Central and Eastern African in origin is responsible for the stigmas being fully feathered in sorghum.  $St_{bf}$  results in stigmas whose bases alone are feathered, leaving the top one-third to two-thirds of the feathery area devoid of feathers and simply columnar. This restricted feathering has not affected seed setting and has been noted to occur in varieties with gaping glumes.  $St_{Bf}$  is a simple dominant to  $St_{bf}$ . In awned varieties this differentiation in the feathery area shows a parallel effect in the homologous organ, i. e., the subule of the awn. When the stigma is fully feathered, the subule is fully barbed and when the stigma is basal feathered, the subule is basal barbed. The  $St_{Bf} - St_{bf}$  factor pair behaves in inheritance independent of the sheath colour factors  $P$  and  $Q$  and of the grain colour factors  $B_1$ ,  $B_2$  and  $W$ .

This is the first record of a restricted feathered occurrence of stigma in Gramineae. This kind of stigma is a varietal characteristic and is Mendelian in inheritance.

#### Literature Cited.

1. Rangaswami Ayyangar, G. N. and V. P. Rao. 1935. Stigmas and Awns -Their Homology. *Curr. Sci.* III (2), Pp. 540-542.
2. Rangaswami Ayyangar, G. N. and V. P. Rao. 1935. Further data on the Homology of Stigmas and Awns. *Curr. Sci.* IV (3) Pp. 176-177.
3. Rangaswami Ayyangar, G. N. and T. V. Reddy. 1936. Additional Data on the Homology of Stigmas and Awns. *Curr. Sci.* IV (2), Pp. 817-819.
4. Rangaswami Ayyangar, G. N. and V. P. Rao. 1936. Studies in Sorghum The Great Millet. III. Anther, Pollen and Stigma. *Ind. Jour. Agric. Sci.* VI (6) Pp. 1299-1322.



1. A stem attacked by *Scirpophaga* showing the plug.
2. A parasitised caterpillar with a cluster of eggs *in situ*.
3. Egg—magnified.
4. Grub—full grown.
5. Pupa—dorsal view.
6. Pupa—ventral view.
7. Cocoon spindle.
8. Adult—Male.
9. Adult—Female.

**RHACONOTUS SCIRPOPHAGAE, Wlk.,**  
**A PARASITE OF THE SUGARCANE WHITE MOTH**  
**BORER (*Scirpophaga*).**

By M. C. CHERIAN, B. A., B. Sc., D. I. C.

and

P. ISRAEL M. A.

*(Madras Agricultural Department.)*

**Introduction.** As a result of the intensive study of the natural enemies of the sugarcane white moth borer (*Scirpophaga*) in Coimbatore, seven larval parasites have been collected. A paper on one of these—*Elasmus zehntneri*, Ferr., was published in the Madras Agricultural Journal, Vol. XXV, pp. 273—279. *Rhaconotus scirpophagae*, Wlk., another parasite, is the subject matter of the present paper. Interesting information on the habits and life history of the parasite, egg-laying capacity, longevity, etc., is given and the status of the parasite discussed.

**Life History of the Moth.** A short account of the life history and habits of the moth borer is necessary to understand the activities of the parasite better. Eggs are laid by the female moth on the under surface of the leaves and covered with reddish brown hairs. The larvae, on hatching, find their way into the leaf roll and destroy the growing point. Only one larva will be found in each plant. When full fed the caterpillar constructs a tunnel at right angles to the larval gallery to the outside of the stem and closes it with a lid constructed out of the outermost leaf sheath. It then retreats into the tunnel spinning partitions of silk, one behind the other and finally pupates and the moth emerges in due course through the exit hole. The total life cycle of the pest is about 2 to 2½ months.

**History of the Parasite.** The parasite was first collected by the Imperial Entomologist, Pusa, Bihar, in 1914—16 on caterpillars of the sugarcane white moth borer *Scirpophaga auriflua*, Zeller, and described as a new species by Wilkinson in the Bulletin of Entomological Research, Vol. XVIII, p. 33. Wilkinson also adds that it was later recorded from Africa on rice stem (Ritchie—labelled 12—8—1925, rice stem). Later on it was reported from the Punjab by M. A. Husain as a parasite of *Scirpophaga nivella* on sugarcane (Review of Applied Entomology, Vol. XXV, p. 45). There is also a mention of the parasite in the Pusa Agricultural Research Institute Annual Report, dated June 30, 1936.

**Description of the Parasite.** *Rhaconotus scirpophagae*, Wlk., belongs to the sub-family Doryctinae, family Braconidae. The description of the parasite by Wilkinson is given below:—

*Male:* "Dark red, tinged with black and blackish-red, head capsule tending to be rather paler; all legs rather pale red-testaceous; ovipositor bright red, black red at extreme apex; sheaths black; the apical joint and

often the proapical joint or joints of all tarsi darkened to nigrescent; wings with tegulae and costal vein pale red testaceous, remaining wing veins red brown; stigma very pale yellow to almost colourless; wings hyaline except for a very slight general infuscation.

*Female*: All integuments coriaceous and with strong pubescence. *Head*: Antennae longer than head, thorax and abdomen together; flagellar joints about 40, but the number is variable. *Thorax*: notauli anteriorly strongly marked, posteriorly more or less obsolete; scutellar depression broad but not deep, with at least a median longitudinal carina; metathorax at least crenulate medianly; propodeon with at least three longitudinal carinae at base, one in the middle, the others at the sides, these carinae extending almost half way down the propodeon and becoming lost amongst the wrinkles with which the apical two thirds of the propodeon abounds; basal third of propodeon more or less devoid of wrinkles. *Wings* with the recurrent interstitial or received distinctly into the 2nd cubital; nervulus interstitial or very slightly postfurcal; radial cell reaching apex of wing; stigma sub-lanceolate; 2nd abscissa of radial vein three times, and 3rd abscissa five times, as long as 1st abscissa; 2nd abscissa in the neighbourhood of 0.495 mm. long; radial emitted from about the middle of the stigma; 2nd cubital cross-vein very faint. *Legs*: front femur usually 0.6 mm. long with a noticeable tumescence on the antero-dorsal surface at apex of basal third; front tibia usually 0.6 mm. long, and on its anterior surface, a row of generally eight small stout spines commencing at about the apex of the basal third and extending to about the base of the apical fourth; front tarsus usually about 0.96 mm. long; middle femur usually 0.6 mm. with a noticeable tumescence on the antero-dorsal surface at apex of basal third; middle tibia 0.65 mm. long, and on its antero-dorsal surface a row of general five small stout spines, usually four of them evenly spaced and placed towards the apex of basal half of tibia, the fifth somewhat isolated at about the base of the apical third, but the number of spines may vary from four to six and their position is somewhat inconstant; middle tarsus 0.66 mm. long; hind coxa about 0.38 mm. long, with a small, fairly sharp prominence (blunted tooth) towards base of ventral surface; hind femur 0.68—0.75 mm. long, with a tumescence on the antero-dorsal surface at apex of basal third; hind tibia 1.05—1.2 mm. long, devoid of spines; hind tarsus 1.2 mm. long; the third and fourth joints of all tarsi the smallest, the 5th joint being definitely longer than the 3rd; basal joint of hind tarsi as long as, or shorter than, 2nd and 3rd joints together. *Abdomen* with the four basal tergites nearly completely longitudinally carinate; 5th tergite only carinate basally and with basal half noticeably more strongly coriaceous than apical half; 1st suture plain, 2nd, 3rd and 4th sutures strongly crenulate; 1st tergite longer than broad; 2nd tergite transverse; 2nd suture, which is more or less obsolete laterally, strongly curved; 3rd and 4th tergites transverse and noticeably shorter than the 5th tergite, which is also transverse; 3rd and 4th sutures straight; ovipositor long, extending at least 1.5 mm. beyond

apex of abdomen, which length is less than the combined lengths of the 2nd, 3rd, 4th and 5th tergites.

The description of the female applies equally for the male, except for the following:— *Head* - antennae with a smaller number of joints. *Wings* with the recurrent received only into the 2nd cubital cell. *Legs* - front femur and tibia 0.54–0.6 mm. long; front tarsus 0.83–0.87 mm. long; middle femur 0.51–0.57 mm; middle tibia 0.6–0.68 mm; hind of femur 0.6–0.72 mm; hind tibia 0.9–1.13 mm; hind tarsus 1.05–1.11 mm; hind femora without tumescence. *Abdomen* with 5th tergite generally (more seldom only basal half) as completely carinate as the basal segments, and the more strongly coriaceous condition invariably extending almost to apex; 2nd suture not strongly curved, almost straight; 3rd and 4th tergites not noticeably shorter than the 5th.

*Length*: F. about 4.5–5.0 mm; M. about 4.25–4.5 mm."

**Emergence and Behaviour of the Parasite.** The adult parasite when ready to emerge cuts a small hole in the cocoon and crawls out of it. When further passage to the outside is found closed by the lid constructed by the host on the outermost leaf sheath, the parasite cuts a hole in this lid and escapes through it. It is seen that the heads of all the parasites in the cocoons lie in the direction of the lid. Table I gives the number of parasites from host larvae collected from the field. It is seen from the table that out of 201 adults which emerged from 17 cocoon spindles the number of females was 169 the percentage being 84. In the rearings at the laboratory also the proportion of females to males was about the same. On an average about 12 adults emerged from each host larva, the maximum and minimum being 21 and 5 respectively.

**TABLE I.**  
Statement showing the number of parasites emerged from each host Larva Collected from the field.

Ser. No.	Total No. of adults.	No. of females.	No. of males.	Date of Emergence.
1	15	13	2	21 4 36
2	13	12	1	10 10 36
3	11	8	3	4 11 36
4	8	6	2	12 12 36
5	11	9	2	3 1 37
6	11	10	1	3 1 37
7	13	11	2	10 9 37
8	7	6	1	13 9 37
9	18	17	1	13 9 37
10	11	10	1	17 9 37
11	5	3	2	18 9 37
12	14	12	2	24 9 37
13	14	13	1	2 10 37
14	5	3	2	11 11 37
15	21	16	5	14 11 37
16	17	14	3	22 11 37
17	7	6	1	25 11 37
Average number of adults } emerged from each host }		12		

**Longevity of Adults.** Under laboratory conditions, when fed with honey solution, the maximum longevity of a female was 107 days and of a male 59 days. Without food no parasite lived for more than 12 days. Table No. II gives the longevity records of 33 parasites.

**TABLE II.**  
Length of Life of *Rhaconotus scirpophagae* Wlk.

Ser. No.	With food				With food and allowed to lay eggs.				
	Emerged on.	Died on.	No. of days lived.	Sex of the Adult.	Ser. No.	Emerged on.	Died on.	No. of days lived.	Sex of the Adult.
1	21 4 36	7 5 36	16	Male	1	11 3 37	9 4 37	29	Female
2	21 4 36	9 5 36	18	Female	2	24 4 37	5 5 37	11	do.
3	21 4 36	4 5 36	13	do.	3	10 9 37	20 10 37	41	do.
4	21 4 36	8 5 36	17	do.	4	10 9 37	1 10 37	21	do.
5	21 4 36	16 5 36	25	do.	5	10 9 37	3 10 37	23	do.
6	21 4 36	15 5 36	24	do.	6	10 9 37	6 10 37	26	do.
7	21 4 36	11 5 36	20	do.	7	10 9 37	21 9 37	11	do.
8	15 5 36	4 7 36	50	Male	8	12 9 37	1 11 37	50	do.
9	15 5 36	5 7 36	51	Female	9	13 9 37	18 10 37	36	do.
10	20 5 36	12 6 36	23	do.	10	13 9 37	10 10 37	28	do.
11	20 5 36	6 6 36	17	do.	11	13 9 37	24 9 37	11	do.
12	16 7 36	23 7 36	6	do.	12	13 9 37	12 10 37	30	do.
13	10 10 36	10 12 36	61	do.	13	13 9 37	1 10 37	19	do.
14	10 10 36	29 10 36	19	do.	14	13 9 37	3 10 37	21	do.
15	10 10 36	29 10 36	19	do.	15	14 9 87	24 10 37	41	do.
16	10 10 36	7 12 36	58	do.	16	17 9 37	6 10 37	20	do.
17	10 10 36	1 1 37	83	do.	17	24 9 37	28 10 37	35	do.
18	3 11 36	3 1 37	61	do.	18	8 10 37	15 11 37	37	do.
19	3 11 36	1 1 37	59	do.	19	8 10 37	10 11 37	33	do.
20	4 11 36	19 2 37	107	do.	20	8 10 37	15 11 37	37	do.
21	28 11 36	26 1 37	59	Male	21	8 10 37	8 11 37	30	do.
22	3 1 37	15 1 37	12	do.	22	11 11 37	17 12 37	6	do.
23	3 1 37	17 2 37	44	Female	Without food.				
24	3 1 37	19 3 37	74	do.					
25	11 3 37	9 4 37	29	do.	1	16 5 36	20 5 36	4	Female
26	12 9 37	3 10 37	21	do.	2	16 5 36	28 5 36	12	do.
27	12 9 37	18 10 37	36	Male	3	3 1 37	14 1 37	11	do.
28	12 10 37	20 10 37	8	do.	4	3 1 37	9 1 37	6	do.
29	12 10 37	28 10 37	16	do.	5	3 1 37	9 1 37	6	do.
30	12 10 37	3 11 37	22	do.	6	3 1 37	9 1 37	6	do.
31	16 10 37	26 10 37	10	do.	7	3 1 37	10 1 37	7	Male
32	16 10 37	14 12 37	59	do.	8	3 1 37	10 1 37	7	Female
33	17 10 37	8 12 37	52	do.	9	3 1 37	10 1 37	7	do.

Average Longevity } 38 days (Fed); 27 days (Fed and allowed to lay eggs);  
for females } 7 days (unfed).  
Average Longevity } 30 days (Fed);  
for males } 7 days (unfed).

**Oviposition.** The females usually take 5 to 10 days to deposit eggs. The first indication of ovipositing stimulus is the slight unsheathing of the ovipositor. When supplied with a sugarcane stem with a host larva, the parasite commences to prod rapidly with extended antennae and finally locates the hole perforated by the host which is covered by a thin lid and thrusts the ovipositor through the lid to reach the larva inside. If the ovipositor comes into contact with the larva it is thrust into the latter to paralyse it. If the larva is not encountered, it does not abandon the spot but pauses for a moment to resume her exploratory thrusts. It is not easy for the parasite to encounter the larva, for, it possesses only a short ovipositor

measuring  $1\frac{1}{2}$  mm. It is able to paralyse the larva only between the time when the latter comes to cut the outermost lid and withdraws to construct the series of silken partitions in the tunnel. The parasite generally takes 30 - 45 minutes to paralyse the host. As soon as the borer is paralysed the parasite pushes inside the entire length of the ovipositor and holds it there for 10 - 15 minutes during which time it deposits its eggs on or near the body of the larva. Eggs are laid in clusters of 10 - 15 but occasionally stray clusters of 20 - 25 are also on record. Table III gives the egg-laying records of 20 females. Under laboratory conditions, a female laid as many as 86 eggs, the average for a female being 37 eggs. A close study of table III also reveals that the parasite has not got the habit like *Stenobracon nicevelli*, Bingh., to distribute its eggs. When once it encounters a host larva it deposits on it, all the available matured eggs and never seeks to distribute its eggs on another host, even if it was nearby. In most cases under rearing it is noticed that some indefinite time (from 2 to 10 days) elapses before the second batch of eggs is laid.

As a result of a series of trials, it was found (1) that a host parasitised once is not again parasitised by the same parasite or by other individuals of the same species, (2) that eggs are laid by a parasite only on one host even if more are supplied, (3) that the parasites do not accept caterpillars which are given exposed, (4) that if one host alone is supplied to a number of parasites some of them may simultaneously attack the host and lay eggs on it, and (5) that parthenogenesis occurs in the species, the progeny in such cases being males.

**Life History.** *Egg*: Eggs are generally translucent or almost transparent, about 1 mm. long, elongate, cylindrical, curved at the centre with one end more pointed than the other. They are laid attached to the inner circumference of the tunnel or in some cases on the head of the host caterpillar in a bunch. The egg period is 1-3 days. In five cases, the egg periods have been noted as 49, 43, 32, 30 and 30 hours, the first two in November and October respectively and the remaining ones in May.

*Larva*: The newly hatched grub measures 1 mm. and is white and transparent. If the eggs are laid away from the host, the grubs when hatched glide on the smooth silken lining of the tunnel until they reach the host. The grubs attach themselves firmly to the host with their head-end and puncture the skin of the host at some tender part of the cuticle and suck the juice of the host on account of which they attain the color of the host on the second day. The grub reaches its maximum size of  $6\frac{1}{2} \times 1\frac{1}{2}$  mm. in 3-4 days by which time the host larva is completely eviscerated. At this stage, the grubs spin individual white cocoons of silk which measure from 7-10 mm. within which they pupate. These small cocoons are attached to one another and this cocoon spindle running through the tunnel measures 3.8 to 4.8 cm. The larval period is 6-10 days.

*Pupa*: The freshly formed pupa is uniformly white and measures 7 mm.  $\times 1\frac{1}{2}$  mm. One to five days after the formation of the cocoon the grub

TABLE III  
Oviposition record of Twenty mated females of *Rhaconotus scirpophagae* Wlk.

Serial No. of Female	Emer- ged on	1st batch		2nd batch		3rd batch		4th batch		5th batch		6th batch		7th batch		8th batch		9th batch		Died on	Total No. of eggs		
		Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.	Laid on	No.				
1	21	4 36	28	11	1	5 36	14	1	5 36	10	4	5 36	12							4	5 36	25	
2	21	4 36	24	4 36	4	27	4 36	14	1	5 36	10	4	5 36	12							8	5 36	40
3	21	4 36	25	4 36	5	1	5 36	17	10	5 36	5										16	5 36	27
4	21	4 36	28	4 36	14																15	5 36	14
5	21	4 36	4	5 36	11	13	5 36	10													15	5 36	21
6	21	4 36	6	5 36	15	27	5 36	13	6	6 36	15	7	6 36	8							12	6 36	48
7	20	5 36	22	5 36	12	6	6 36	18													6	6 36	32
8	20	5 36	24	5 36	14																23	7 36	6
9	16	7 36	19	7 36	6																10	12 36	68
10	10	10 36	21	10 36	19	29	10 36	25	10	11 36	12	29	11 36	12							29	10 36	32
11	10	10 36	21	10 36	15	28	10 36	17													29	10 36	38
12	10	10 36	22	10 36	17	27	10 36	19	28	10 36	2										29	10 36	38
13	10	10 36	1	11 36	3	2	11 36	15	4	11 36	6										7	12 36	24
14	10	10 36	7	11 36	18	19	11 36	15													3	1 37	33
15	3	11 36	10	11 36	8	17	11 36	12	19	11 36	18	23	11 36	12	25	11 36	8	2	12 36	7	3	1 37	86
16	3	11 36	23	11 36	24	27	12 36	36	24	12 36	13	14	12 36	15	2	12 36	15				1	1 37	85
17	11	3 37	23	3 37	20	24	3 37	5													9	4 37	25
18	24	9 37	7	10 37	15	13	10 37	12	18	10 37	14										28	10 37	41
19	24	9 37	29	10 37	18																10	11 37	18
20	8	10 37	20	10 37	11	28	10 37	14	7	11 37	13										15	11 37	38

inside generally pupates. The rudiments of legs and antennae on the ventral side of the pupa and the wings on the dorsal side are clearly visible. The whole pupa turns brownish on the fourth day and a day later the eyes assume the black color. The pupal period ranges from 11–16 days. Table IV gives the total life cycle of the parasite which is about 17–28 days.

TABLE IV.

Detailed Life-history record of *Rhaconotus scirpophagae* Wlk.

Ser. No.	Egg Laid on.	Larva hatched on.	Egg period in days.	Cocoon formed on	Active larval life.	Pupated on.	Total larval period.	Adult emerged on.	Pupal period.	Total life Cycle.
1	27 4 36	28 4 36	1	2 5 36	4	4 5 36	6	15 5 36	11	18
2	27 4 36	28 4 36	1	2 5 36	4	4 5 36	6	14 5 36	10	17
3	28 4 36	29 4 36	1	3 5 36	4	5 5 36	6	15 5 36	10	17
4	1 5 36	2 5 36	1	7 5 36	5	8 5 36	6	19 5 36	11	18
5	1 5 36	2 5 36	1	6 5 36	4	8 5 36	6	18 5 36	10	17
6	2 5 36	3 5 36	1	8 5 36	5	9 5 36	6	21 5 36	12	19
7	4 5 36	5 5 36	1	9 5 36	4	11 5 36	6	21 5 36	10	17
8	6 5 36	8 5 36	2	12 5 36	4	13 5 36	6	25 5 36	11	19
9	13 5 36	14 5 36	1	19 5 36	5	20 5 36	6	3 6 36	14	21
10	27 5 36	28 5 36	1	1 6 36	4	3 6 36	6	16 6 36	13	20
11	6 6 36	7 6 36	1	12 6 36	5	13 6 36	6	26 6 36	13	20
12	28 6 36	30 6 36	2	7 7 36	7	8 7 36	8	23 7 36	15	25
13	20 7 36	21 7 36	1	27 7 36	6	28 7 36	7	2 8 36	11	19
14	21 10 36	23 10 36	2	27 10 36	4	1 11 36	9	12 11 36	11	22
15	22 10 36	24 10 36	2	28 10 36	4	2 11 36	9	13 11 36	11	22
16	27 10 36	29 10 36	2	3 11 36	5	8 11 36	9	19 11 36	11	22
17	28 10 36	30 10 36	2	4 11 36	5	10 11 36	9	21 11 36	11	22
18	2 11 36	4 11 36	2	8 11 36	4	13 11 36	9	28 11 36	15	26
19	4 11 36	6 11 36	2	10 11 36	4	15 11 36	9	26 11 36	11	22
20	7 11 36	9 11 36	2	13 11 36	4	18 11 36	9	29 11 36	11	22
21	10 11 36	12 11 36	2	16 11 36	4	21 11 36	9	2 12 36	11	22
22	10 11 36	12 11 36	2	16 11 36	4	21 11 36	9	2 12 36	11	22
23	19 11 36	21 11 36	2	25 11 36	4	30 11 36	9	12 12 36	11	22
24	19 11 36	21 11 36	2	25 11 36	4	30 11 36	9	11 12 36	10	21
25	27 11 36	29 11 36	2	3 12 36	4	9 12 36	10	23 12 36	14	26
26	29 11 36	1 12 36	2	5 12 36	4	10 12 36	9	21 12 36	11	22
27	29 11 36	1 12 36	2	6 12 36	4	10 12 36	9	26 12 36	16	27
28	30 11 36	2 12 36	2	6 12 36	4	11 12 36	9	27 12 36	15	27
29	14 12 36	17 12 36	3	22 12 36	5	27 12 36	10	11 1 37	15	28
30	20 12 36	22 12 36	2	27 12 36	5	31 12 36	9	16 1 37	16	27
31	23 3 37	25 3 37	2	29 3 37	4	3 4 37	9	14 4 37	11	22
32	24 3 37	26 3 37	2	30 3 37	4	4 4 37	9	15 4 37	11	22

Average total 21.8

**Seasonal Incidence.** Field observations on the incidence of the parasite in Coimbatore show that the attack of the parasite is noticed in larger numbers from January to April. From October to December and in May, there is only slight attack.

**Status of the Parasite** As far as our studies show, there are some points in favour of, as well as against the parasite. Except for the fact that only one stage of the caterpillar is attacked and that eggs are not distributed singly but in clusters all other factors are in its favour. This parasite has

not been known to attack any other host under field conditions. The longevity records show that the parasites are fairly long lived and the egg laying capacity is not low as in other cases. The cocoons collected from the field as well as those reared at the laboratory give rise to a higher percentage of females than males. Moreover, the life cycle of the parasite is much shorter than that of the pest. All these considerations make the parasite a fairly efficient one in the control of the pest under South Indian conditions.

**Acknowledgments** The thanks of the authors are due to Mr. C. F. W. Muesebeck of the Bureau of Entomology, Washington, for his help in kindly identifying the specimens.

---

## STUDIES IN THE QUALITY OF CROPS II

### Nutritive values of proteins of different varieties of Red gram (*Cajanus Indicus*).

BY P. V. RAMIAH M. A., B. Sc.,

*Government Agricultural Chemist,*

and

P. SATYANARAYANA, B. A., M. Sc.,

*Assistant in Chemistry, Agricultural Research Institute, Coimbatore.*

It has been shown in a previous communication by the present authors (1) in their work on *ragi* grains that different varieties of the same cereal possess different nutritive values. In this communication the nutritive values of different varieties of red gram obtained locally and from the hills are presented as determined by Mitchell's N-balance method. The technique of the experiments was the same as that used in a previous communication (1), and the diets were compared at 5% and 10% protein levels. Whole grains with the husk on, and *dhalls* prepared out of them by the local method of mixing the grains with red earth and pounding were analysed for their food values, and the results of those analysis, presented in Table IV. Marmite at the rate of 50 mg. per rat per day, and codliver oil at 4-5 drops per animal daily were fed to provide the necessary vitamins. The N content present in marmite was not taken into consideration while calculating the results. As usual it has been assumed that the variation in the values of endogenous N of urine and metabolic N of feces from the first to the final period is linear.

**Discussion.** The analytical data of the food values (Table 2) shows that the protein content of the local variety is decidedly higher than that of the rest. There are, otherwise, no marked differences in any of the other nutrients analysed for food value.

Considering the digestibility coefficient and biological values, it is found (Table 1) that the local variety has the highest digestibility coefficient and next to it comes the white variety, small, hill type. The black variety (hill type), is easily the worst of the lot both as regards digestive coefficient

and biological value, but it has a slightly higher protein content. The local variety is inferior to some of the hill types as regards biological value and the white variety (big) ranks first at both protein levels. A consideration of the net protein value which is an all important factor in deciding the relative nutritive values of foodstuffs shows that the local variety takes the first place by virtue of its high digestive coefficient and higher protein content.

TABLE 1. Total net protein values of the different red gram samples.

Variety of grain tested.	Protein content of gram on dry basis.	At 5% Protein level.			At 16% Protein level.		
		Digestibility coefficient.	Biological value.	Net Protein value.	Digestibility coefficient.	Biological value.	Net Protein value.
1. Black (Hill Type)	23.69	85.92	70.09	14.27	79.25	66.65	12.51
2. Brown (do.)	22.54	83.01	78.19	14.64	81.63	73.32	13.49
3. White (small) (do.)	22.53	89.10	80.57	16.17	84.51	75.25	14.33
4. White (big) (do.)	22.79	86.79	82.98	16.42	85.19	81.00	15.72
5. Brown (Local)	25.62	89.89	76.80	17.68	86.69	74.53	16.55

TABLE 2. Chemical analysis of the several red gram samples (Food analysis).

Serial No.	Heads of analysis.	Analysis of whole grains (with husk on).					Analysis of dhalls.				
		Hill Type. Black.	Hill Type. White (small).	Hill Type. White (big).	Hill Type. Brown.	Local. (Brown).	Hill Type. Black.	Hill Type. White (small).	Hill Type. White (big).	Hill Type. Brown.	Local. (Brown).
1.	Moisture.	9.57	9.37	10.24	9.58	10.35	9.94	7.83	9.01	8.74	8.66
	<i>Food value.</i>										
2.	Ash.	3.98	4.45	4.11	3.92	4.17	4.09	4.21	4.19	4.03	4.19
3.	Crude Proteins	22.44	21.55	20.77	21.44	23.64	23.69	22.53	22.79	22.54	25.62
4.	Ether Extract	1.60	2.36	1.74	2.26	2.47	1.69	2.00	1.89	1.96	1.54
5.	Fibre	6.17	8.91	7.77	8.00	7.86	1.09	2.74	2.11	2.19	2.46
6.	Carbohydrates (by difference)	65.81	62.73	65.61	64.38	61.86	71.80	69.13	69.03	69.28	66.19
7.	Total.	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
8.	Albuminoids	20.32	18.77	18.65	18.85	21.67	21.12	19.49	20.25	20.31	23.11
9.	Acid value (No. of mg. of KOH for 1 gm. of extract).	39.99	62.92	17.26	32.10	26.04	—	—	—	—	—
10.	CaO.	0.30	0.33	0.33	0.37	0.37	0.504	0.268	0.339	0.398	0.364
11.	MgO.	0.28	0.30	0.29	0.25	0.28	0.414	0.359	0.374	0.426	0.408
12.	K <sub>2</sub> O.	1.98	2.09	1.99	1.96	1.96	2.03	2.15	2.03	2.01	2.01
13.	P <sub>2</sub> O <sub>5</sub> .	0.85	0.98	0.91	0.95	0.98	1.06	1.05	1.08	1.16	1.32
14.	N.	3.59	3.45	3.32	3.43	3.78	3.79	3.61	3.65	3.61	4.01

Apart from these differences there seems to be little to choose among the varieties.

The popular belief is that the local variety is more easily digested, and the data presented above would seem to show that the belief is to some

extent justified. Apart from chemical analysis and data collected by biological assay, it may be that the varieties behave differentially on cooking and have different flavour, both qualities that cannot be measured.

The biological values obtained for the local variety agree with those obtained by Niyogi *et. al.* (2) and confirm their observations.

**Summary.** Different varieties of Red gram obtained locally and from the hills have been compared for their relative nutritive values, and it is found that the local variety has a high protein content, and digestibility value.

Our thanks are due to Mr. V. Ramanatha Iyer, Cotton Specialist, who kindly supplied the samples required for the experiments, and suggested the investigation. Our thanks are also due to Mr. C. Balasubrahmanya Mudaliar who helped in the analysis.

#### References.

1. Ramiah, P. V. and Satyanayana, P. (1936) *Proceedings of the Association of Economic Biologists, Coimbatore*, 13—21.
2. Niyogi, S. P. *et al* (1930—31) *Ind. Jour. Med. Res.* 18, 1217.

## ECONOMICS OF WET AND DRY LAND CULTIVATION IN THE VIZAGAPATAM DISTRICT

BY RAO SAHIB G. JOGI RAJU,

*Assistant Director of Agriculture, Vizagapatam.*

In Bulletin No. 40 of the Madras Agricultural Department on "the economic condition of the ryot in the Vizagapatam district, and how to improve it", the net annual cash income from an average holding of about 5 acres supporting a family of 5 adults (2 children being considered equivalent to 1 adult) and consisting of both wet and dry land partly commanding facilities for well-irrigation was estimated at Rs. 137. Adding the value of food grains consumed, the total family income of an owner-cultivator works out to Rs. 237. To enable the productive capacity and the costs of cultivation of each kind of land to be judged, the economics of 5 acre holdings of wet and dry lands with and without a well, under normal cropping suitable for each, are now presented. Crop-var data were worked out in detail, as well as the cropping schemes, the cost of cultivation and the estimated yield from each kind of holding. A summary of the figures therefrom is given in Table I. for ready reference and comparative study. The family incomes which a lessee manager (one who takes land on lease and cultivates it entirely with hired labour), a lessee cultivator (one who takes land on lease but cultivates it with as much of his family labour possible supplemented by hired labour), an owner-manager and an owner cultivator respectively, derive from each kind of holding are shown therein. The family income of a lessee manager represents the net business income, all cultivation expenses and the lease amount (interest on the value of the land *plus* other equipment *plus* assessment) being deducted from the gross value of the produce. The family income of a lessee cultivator will be the above,

*plus* the wages of permanent labour saved by the cultivator's family working on the land. The owner manager's family income consists of the lessee manager's income *plus* the lease amount *minus* the assessment. The owner-cultivator's income is the above, *plus* the wages of the permanent labour saved.

TABLE I.

Particulars.	Land unprotected by wells.						Land protected by wells.	
	2	3	4	5	6	7	8	9
	5 ac. Wet.	5 ac. Dry.	10 ac. Wet.	15 ac. Dry.	20 ac. Wet.	30 ac. Dry.	5 ac. Wet.	5 ac. Dry.
1. Cattle labour required day-pairs ...	97	83	194	249	388	498	152	158
2. Pairs of cattle to be maintained	1	1	2	2	4	4	1	1
3. Human labour required—								
(a) permanent labour day-men	179	146	358	438	716	876	375	427
No. of men to be employed in lieu of family labour	1	1	1	1	2	2	1	1
} boys	1	1	1	1	1	1	1	1
(b) Casual labour—men	72	21	144	42	288	84	110	45
Do. in lieu of permanent labour	—	—	59	138	118	276	75	127
(c) Women or boys	249	215	494	645	988	1290	411	400
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
4. Cost of permanent labour or value of own labour ...	135	135	135	135	225	225	135	135
5. Cost of casual labour ...	48	33	113	131	226	262	102	91
6. Cost of maintenance of cattle...	72	72	108	108	216	216	96	96
7. Other items of expenditure ...	88	25	176	75	352	150	169	103
8. Assessment ...	60	20	120	60	240	120	60	20
9. Interest on the value of land and other capital ...	115	65	220	170	440	340	170	170
10. Depreciation on stock ...	30	30	40	40	80	80	40	40
11. Total expenditure ...	548	380	912	719	1779	1393	772	655
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
12. Receipts from crops ...	459	284	918	852	1836	1704	945	851
13. Value of cattle dung and urine	9	9	15	15	30	30	12	12
14. Total receipts ...	468	293	933	867	1866	1734	952	863
15. Deduction for bad seasons ...	47	59	93	173	187	347	48	86
16. Net receipts ...	421	234	840	694	1679	1387	909	777
17. Net (item 16—11)								
Family income of a								
Lessee manager ...	127	146	72	25	100	6	137	122
Lessee cultivator ...	8	11	63	110	125	219	272	257
Owner manager ...	12	81	148	145	340	334	307	292
Owner cultivator ...	123	54	283	280	565	559	442	427
18. Net family income per acre of a								
Lessee manager ...	25	29	7	2	5	—	27	24
Lessee cultivator ...	2	2	6	7	7	7	54	51
Owner manager ...	2	16	15	10	17	11	61	58
Owner cultivator ...	25	11	28	19	28	19	88	85
19. Percentage to gross receipts of—								
Permanent or family labour ...	32.0	57.7	16.0	19.4	13.4	16.3	14.8	17.4
Other cultivation expenses ...	56.5	68.4	52.0	51.0	52.0	51.2	44.8	42.4
Assessment ...	14.2	8.6	14.2	8.6	14.2	8.6	6.6	2.6
Interest on value of land and other capital ...	27.3	27.7	26.4	24.5	26.4	24.5	18.7	21.9
Net profit or loss ...	30.0	62.4	8.6	3.5	6.0	0.6	15.1	15.7

2. In discussing the significance of the foregoing figures, it should be borne in mind that the incomes worked out are for good land which may be classed as of first *tharom* and under careful management. To provide for exigencies of the season an allowance of 10% on the value of gross produce in the case of wet land and 20% in the case of dry land unprotected by well irrigation and 5 and 10% respectively in the case of wet and dry land protected by wells has been made.

3. The figures in the summary show that while five acres of wet or dry land with wells may give an owner cultivator an annual family income of about Rs. 450 and which at the rate of Rs. 50 per adult (Rs. 20 for food grains and Rs. 30 for other expenditure) can support nine adults (or nearly 2 adults per acre) the same area of wet land unprotected by well irrigation gives to its owner cultivator a family income of only Rs. 123, which can support only 2.5 adults (2 children taken as equivalent to 1 adult). The case is much worse in the case of dry land without wells which yields a family income of only Rs. 54 and can support only a single adult. A lessee manager of a 5 acre holding of wet land with well can get an income of about Rs. 137 and support a family of 3 adults. The same area of dry land, if protected by a well, gives him an income of Rs. 122 with which the same number of adults can be supported though not perhaps on the same standard.

4. For an owner cultivator of wet-land without wells to support a family of five adults he has to possess a holding of 10 acres as is shown in column 4 of the summary. Similarly an owner cultivator of a dry land without wells has to possess at least 15 acres as shown in column 5.

5. For a lessee cultivator to support a family of five adults he has to cultivate 30 acres of dry land. In the case of wet land without wells even 20 acres will not enable him to support such a family and he cannot manage a larger area with his family labour, for, out of an average family equivalent to five adults it may not be that more than  $2\frac{1}{2}$  will be capable of working on the farm and the employment of permanent labour to cultivate the extra area leaves no further margin of profit to the lessee manager.

6. Item 19 in the summary shows the percentages of the different components of expenditure to the gross value of the produce from the different kinds of holdings after making a deduction for vagaries of season as already stated. The figures show that in the case of a 5 acre holding of dry land without wells, the value of the cultivator's own labour or permanent labour that may be employed instead and the other cultivation expenditure alone exceed the gross receipts, leaving nothing for the payment of even the assessment, let alone the interest on the value of the land or a profit to the cultivator to enjoy. In the case of a wet land holding of 5 acres without wells there is barely a margin for payment of assessment, but nothing against interest nor is any profit left. Five acre units are thus quite un-economic in both wet and dry lands without wells. A 10 acre holding of wet land and a 15 acre holding of dry land are the smallest economic units and show

considerable economy as compared with 5 acre holdings. The labour and other cultivation expenses work out to 68 and 70% respectively leaving a margin of 18 and 21% to the owner manager towards interest on the value of land, which at 5% comes to 26.4 and 24.5% respectively. In the case of holdings double the size of the above, the economy in labour due to the larger size of the holding is comparatively small. And larger holdings will not be more economic unless a different system of cultivation (with labour saving mechanical devices) which has yet to be demonstrated, is adopted. In the case of land protected by wells, the figures show a happy contrast to the above. Even 5 acre holdings of such land afford about 16% profit after deducting cost of labour and other cultivating expenses, assessment and interest on land. The first two items work out to about 59% in both cases and the assessment and interest to about 25%.

7. It is thus clear that land un-protected by wells or other sources of perennial irrigation cannot leave a margin of profit to the cultivator even if the holding is the best of its kind and of the optimum size. The cultivator at present barely gets his wages for his labour, and agriculture on such holdings is thus only a mere source of regular employment, which no other occupation can furnish to such a large percentage of the population.

8. What is the remedy for this state of things? This is a question that will naturally arise from the above study of the existing state of things. The best way to improve the condition of the ryot which naturally suggests itself besides popularising the improvements advocated by the Agricultural Department, is to create more sources of perennial irrigation, of course, without prejudice to drainage and thus enable the land to be more intensively cultivated than at present. For this purpose aiding the ryots in digging wells wherever possible by *Takavi* loans is a step that could be immediately taken up, while suitable irrigation projects may be undertaken in due course after proper investigation.

9. When intensive cultivation is thus encouraged on a large scale care has to be taken to plan the cropping in such a way that the produce is such as can be readily consumed locally or in the nearest town. For the sale of any produce that is not thus locally consumed, a proper organisation for marketing has to be set up. To enable produce to be marketed easily and at a reasonable profit its quality has to be improved, and the quantity produced per unit area increased, while the cost of production is minimised by the adoption of the improvements advocated by the Agricultural Department.

10. The problem of enabling the ryot to clear off his present debts and keep himself free from debts in future has received attention at the hands of the present Government and it is hoped that the new act will prove of considerable benefit to the agriculturists.

11. The reduction of the assessment on the land is also being considered by the Government and some relief has already been afforded. The figures as per item 19 of the summary show that even in the case of 20 or 30 acre holdings of wet or dry land un-protected by well irrigation, no margin of profit is left to the cultivator with the present rates of assessment.

As the Government however cannot forgo land revenue altogether, as much concession as possible has to be shown. The reduction of assessment should be at least such as to allow him to enjoy the full wages for his labour. A family equivalent to five adults requires at least Rs. 250 per year for maintenance at the rate of Rs. 50 per adult. If, as stated above,  $2\frac{1}{2}$  adults equivalents of the family work on a farm, they should get at least this amount of Rs. 250 (which works out to Rs. 100 per adult) per annum as wages for their labour. In the estimates under discussion, wages to permanent labour have been calculated at Rs. 90 per annum and at least this has to be left to the cultivator as return for his toil. Now taking the wet land holding of 10 acres which is the minimum size of an economic holding, the assessment which is put down at Rs. 12 per acre has to be reduced by 60 % to wipe off the loss and let the cultivator get his full wages. In the case of a dry land holding of an optimum area of 15 acres the assessment which is put down at Rs. 4 per acre has to be similarly cut down by 40%. No reduction will be necessary in the case of lands commanding irrigation facilities throughout the year unless the present rates are un-reasonably high as in some Zamindaries.

12. Smaller holdings unprotected by wells cannot bear even this reduced assessment, unless they are consolidated to form such economic units. All possible measures have therefore to be taken to encourage consolidation of such small holdings and prevent further splitting up. If such consolidation is not immediately possible, at least their joint cultivation in economic units has to be encouraged by showing a further concession in assessment temporarily for a certain number of years on all small holdings thus jointly cultivated.

13. A reduction of assessment to the extent referred to above while leaving a margin for a four anna wage a day to the cultivator, allows the landlord interest at five per cent on the value of the land. Landlords who possess large areas and obtain a large income by leasing out their lands may be made to pay a reasonable tax on the income obtained above a certain minimum to compensate for the reduction of assessment on the smaller holdings to some extent.

14. The proportion of a share of the produce which a farm labourer may reasonably expect from a cultivator is another problem on which the figures worked out also throw some light. There was a demand at an agricultural labour conference held at Bezwada in July last, that half of the net profit out of the work contributed by the labourers should go to them; but it will be seen from the figures discussed above that there is no such profit left even in the case of an optimum sized holding of wet or dry land unprotected by wells. The labourer does well therefore to claim a minimum wage per day rather than a share. In the Vizagapatam district, the permanent labourer's annual emoluments, which he gets mostly in kind, do not exceed Rs. 45 or Annas 2 per day. A ryot who employs a permanent labourer pays even this low wage, not from the profits he earns but as a

penalty for his inability to do the work himself as he should, and at a sacrifice of his own income and comfort. The actual work turned out by a labourer who agrees to serve on such a meagre remuneration is also very poor, hard work being put in only on a few days of the year and the rest of the time spent on light jobs or mere tending cattle or watching crops on the farm yard. A casual cooly is usually paid better wages but he has to work hard and does not obtain employment for more than half the days in the year, except near a town or other industrial centre. In the case of lands protected by wells where intensive cultivation is practised, it is rare that permanent servants are employed, as the holdings are usually small and the owner has enough of his own labour to put in. On such holdings, moreover, the same degree of efficiency cannot be maintained as when servants are employed. If, on such holdings, it becomes necessary to employ servants it may be more advisable to engage them on the share system, according to the total number of hands—owners or servants—working on the farm; half of the net profit being distributed amongst them. If the owner does not himself work, this may be distributed amongst the servants alone but it is rare that sufficient profit to satisfy the servants is obtained on this system owing to their inefficiency.

---

## EXTRACTS

**The Relation of Growth Substances to Horticultural Practice.** Much of our recent knowledge of plant hormones we owe to the Utrecht botanists, whose investigations led to the recognition of the nature and function of these substances. Earlier experiments carried out with seedling oats showed that the shoot apex produced substances capable of regulating growth, and that these substances could be transferred to other seedlings. A wide search was consequently made for a ready source of these compounds and they have since been found in small quantity in grain, pollen and leaves, while higher concentrations occur in urine.

At the Leicester meeting of the British Association, Prof. F. Kogl described the isolation and chemical recognition of auxin *a* and *b*. Their structure is complicated, but with these two compounds a third active compound hetero-auxin, was found which proved to be indolyl-acetic acid previously well known to chemists.

Small quantities (5 mgm.) of indolyl-acetic acid when applied in lanolin to the young stems of tomato plants growing vigorously cause, within 24 hours, twisting and bending of the petioles and stems, as unequal growth takes place on the two sides. This is a quick ready means of testing closely-related and other chemical growth-promoters. In a few days roots appear from the stem, root-initials also develop inside, and may be clearly seen by cutting the stem longitudinally. Similarly, the production of roots may be induced in several different portions of plants, and vegetative reproduction is thus greatly facilitated.

The paste method has been largely superseded by the use of dilute solutions. Herbaceous or woody cuttings are taken and their basal ends placed in the solution to a depth of an inch. After washing in water, the cuttings are then placed in sand in propagating frames.

The list of active growth-promoting substances includes the related indolyl-butyric and indolyl-propionic acids. The organic salts or esters of these acids are active, so are some of their metallic salts, such as sodium indolyl-acetate. Scatole also has recently been proved to be active, and alpha-and betanaphthalene-acetic acid are very highly active, but phenyl-acetic acid and atracene-acetic acid are less active. Although fairly closely related, iso-indolinone is inactive. The substitution of sulphur for the nitrogen and hydrogen group in indolyl-acetic acid greatly reduces the activity. Though closely related to indolyl-propionic acid, tryptophan is inactive; it may represent a stage in the formation of the growth-promoting substances in Nature.

The treatment causes (a) more cuttings to form roots; (b) more roots to be formed on each cutting; (c) the active process (including *a* and *b*) to be accelerated.

Amongst herbaceous plants, cuttings of lupins, delphiniums, pelargoniums, violas and alpine phlox have shown accelerated rooting by treatment with pastes in lanolin and with very weak solutions. There is a tendency to damage delicate tissue by the use of solutions of too high a concentration; 1 part in 30,000 or 40,000 parts of water is recommended for such cuttings.

With holly, taken at the end of June and treated with indolyl-acetic acid, 1 part in 10,000 of water for 24 hours, half the cuttings rooted in 6 weeks, while none of the control, placed in water for 24 hours, rooted in this time. With *Viburnum Carlesii*, cuttings taken at the end of July and treated with alpha-naphthalene-acetic acid and others with indolyl-acetic acid, 1 part in 10,000 of water for 24 hours, rooting took place rapidly. In ten days, the active growth taking place inside the stem split the outer layers. Cuttings of *Ceanothus dentatus*, taken in late November, produced roots in January, and *Myrtus communis* cuttings taken in January, rooted in a month. Stimulation may occur at a season of normal quiescence.

Species and varieties of heather (*Erica*) responded quickly in alpha-naphthalene-acetic acid; *Pieris formosa*, taken in the late August, and *Gaultheria procumbens*, have given favourable results. With *Rhododendron rubiginosum*, 85 per cent. of the cuttings treated in alpha-naphthalene-acetic acid and indolyl-acetic acid, 1 in 20,000 for 48 hours, rooted in three months, whilst only 5 per cent. of the controls formed roots. Other plants tested include species of *Buddleia*, *Camellia*, *Deutzia*, *Escallonia*, *Hydrangea*, *Pernettya*, all of which showed favourable results by these methods. Even with the more recalcitrant genera and species, some encouraging results have already been obtained. Further results are reported in tests made by horticultural and chemical firms, and at various research stations and laboratories. These greatly extend the list of species in which root formation has been accelerated. Certain species may yet prove quite unresponsive, but the indications are to the contrary, provided the time of year and concentration of solution are correctly selected.

The concentrations are surprisingly low; frequently 1 in 40,000 of water is effective. It appears that there is a critical concentration below which little or no activity is induced. Twice the length of time for uptake from a solution half as concentrated may not be so effective as a stronger solution used for the given time.

Pouring the solutions onto the sand before inserting cuttings is *not* recommended, as bacteria interfere. Freshly made solutions should be used, because moulds and bacteria may contaminate them on storing. Since the solutions are not stable in light, storage in coloured and opaque vessels at higher concentration is recommended.

The success obtained has been quickly appreciated by chemists, manufacturers, and by horticulturists. There are now a number of solutions available on the market in many countries.

Thus it is seen that investigations, primarily of botanical interest, dealing with fundamental problems of plant development, have quickly led to results of great value to the plant grower. (*Tropical Agriculture*, February 1938).

**News for Tomato Growers.** Dr. Carver, the famous Negro scientist of Alabama, U. S. A. has shown that the finest tomatoes can be grown from "cuttings". He has pointed out that six inch cuttings taken from the lower branches of the growing plant, and set out in the ground, root in nine days' time, and begin throwing out leaves almost immediately afterwards, and then flower and fruit. The whole period of growth from the planting of the cuttings until the harvest of the crop occupies  $2\frac{1}{4}$  months as against  $3\frac{1}{2}$  to  $3\frac{3}{4}$  and 4 months when the tomatoes are grown from seed.

Mr. Crosley adopted this plan lately in Hyderabad, and was surprised at the rapidity with which the cuttings took root, threw out leaves and blossomed and fruited. The vigorous growth of the plants thus raised leads Mr. Crosley to believe that this method of propagation can be adopted successfully with the very best varieties of tomatoes like Ponderosa, Oxheart, Matchless, Stone, etc., at little expense and much saving of time, and will not only furnish supplies of this vegetable when not usually available but will make them cheap besides enabling tomato growers to dispense with seed altogether after the first sowing. (*Times of India*, (*The Nagpur Agri. College Magazine*, February 1938).

**A New Insecticide.** In the effort to find insecticides which leave no poisonous residue on the crops they protect, many new chemical compounds have been studied. One of the most recent of these is "nicotine thiocyanate." This compound, prepared from the nicotine by-product of the tobacco industry by reaction with ammonium thiocyanate, is definitely more stable in use than other nicotine compounds. Tests with red spiders and with aphids have shown it to be effective particularly if a wetting agent is included in the spray. One of its important advantages is that it does not affect foliage nor does it leave a toxic residue. (*Scientific American*, March 1938).

**Dicalcium phosphate and steamed bone-flour as supplements for a phosphorus-deficient ration**, by W. Godden and S. C. Ray. Experiments are reported with sheep on a basal ration markedly deficient in phosphorus to which in turn dicalcium phosphate and steamed bone-flour were added as phosphatic supplements.

With either supplement the sheep, which on the basal ration had shown a blood picture definitely indicative of phosphorus-deficiency, rapidly returned to normal, and showed normal levels for blood and serum inorganic P and serum Ca and phosphatase.

On the basis of balance experiments it would appear that phosphorus supplied in the form of dicalcium phosphate is utilized to an extent approximately 50 per cent greater than when supplied in the form of steamed bone-flour. Further, dicalcium phosphate, added as a supplement to a phosphorus-deficient ration, appears to exert a more favourable influence on nitrogen assimilation than does steamed bone-flour. (*Empire Journal of Experimental Agriculture*, 6, 79-83.)

**The use of Anti-pedicular vaccine in Foot and Mouth Disease.** Dr. L. A. Borde and Ing. Rolfo have described the treatment of some cases of acute foot and mouth disease by means of anti-pedicular vaccine on cows of the Practical Experimental School of Agronomy, Montevideo (Uruguay). The disease was localized in the udder and the hoofs.

Twenty-seven animals showing the first signs of the disease were selected and divided at random into two groups A and B. The first group included 11 animals and served as a control; the second group was composed of 16 animals treated with anti-pedicular vaccine. The vaccine is given in the form of sub-cutaneous injections and in doses of 20 cm<sup>3</sup>. The animals of both groups were then

placed under the same food regimen and given the same external treatment, on the basis of lysol, 10 per cent. zinc oxide and 1 per cent. copper sulphate. The following conclusions were obtained: (1) the symptoms of the disease appeared in the two groups with the same intensity during the first 48 hours, the animals of group B reacting favourably; (2) the final clinical chart showed very decided and significant differences in favour of group B; (3) the disease occurred with serious complications (mammitis-arthritis) in the animals of group A; (4) the use of anti-pedicular vaccine effected an appreciable shortening of the course of the disease. (*International Review of Agriculture*, February 1938.)

## Agricultural Fottings.

BY THE DEPARTMENT OF AGRICULTURE, MADRAS

**Marketing of Tobacco.** Among the commercial crops of Madras, tobacco occupies a prominent place. The average acreage for the past decade ending 1935-36 in the Presidency was 261,000 acres as compared to 1,350,000 acres for the whole of India. Madras is the second largest province in India growing tobacco, ranking next to Bengal. Among the tobacco growing countries of the world, during the five years ending 1926-30 the United States of America ranked first with 29% and India second with 28% but during 1935-36 India with a production of 726 million pounds led first with 34% and United States only 29%. Although Indian production is high, the export trade of the country is comparatively low being only 29 million pounds in 1936-37 as compared to about 400 million pounds of the United States of America. Of the export trade of India, Madras accounts for about 19 million pounds or about two-thirds. This is in great part due to the cultivation and growth of cigarette tobacco in the Guntur district.

The major growing districts of tobacco during 1936-37 are Guntur (123,000 acres), Vizagapatam (33,500 acres), East and West Godavari (28,000 acres) and Coimbatore (33,800 acres). The area under tobacco in the Madras Presidency can be classified according to different types and uses as follows during 1936-37:—

Class	Type	Area in acres	Production in tons of farm cured tobacco
Indigenous	Cheroot & Cigar type	90,000	45,000
	Chewing	50,000	25,000
	Snuff	3,200	1,600
	Country tobacco for cigarettes, beedies, pipe and other mixed uses	60,000	30,000
Virginia	Cigarette	50,000	18,400
		<u>253,200</u>	<u>120,000</u>

Of the indigenous type producing about 106,000 tons, as much as 68% is consumed locally, 22% is exported to other provinces mainly for cigarette manufacture or as powder for the beedies and hookah trade, while 9% is exported to foreign countries. Of the foreign export about 3 to 5 million pounds annually of brown cigarette tobacco are exported to Japan and in a small measure for the pipe and shag trade (heavy dark) to England. Inferior tobacco and bottom leaf pickings of Guntur tobacco called Primings are exported to Rotterdam, Amsterdam, Korea and Manchukuo, while chewing tobacco is exported to the Straits Settlements and Federated Malay States. The value of all these exports of indigenous types amounts only to 10 to 15 lakhs of rupees annually.

It is however in the recently developed cultivation of cigarette tobacco of American origin that the trade of Madras has shown rapid improvements. Due mainly to the activities of the Indian Leaf Tobacco Development Company, the largest purchasers of tobacco at Guntur, and of some enterprising exporters to England, the area under the type of Virginian tobacco called "Harrison's Special", has increased in the past decade to nearly 50,000 acres, and has also been successfully introduced in the past season at Kistna and this year at Godavari as well. Its cultivation is extending rapidly, and during 1936-37, the foreign export trade in this tobacco increased to 13 million pounds, as against 9 to 11 million pounds in previous years. Of the production of processed Virginian tobacco, about 60% is exported to England mainly and 40% to cigarette factories in India at Bangalore, Calcutta, Bombay etc. The value of foreign exports alone ranges from 50 to 60 lakhs of rupees annually and the total exports of the Presidency to about a crore of rupees.

Although Madras produces a large quantity of cigarette tobacco, it has no prominent place as a manufacturing centre. If we consider the total consumption of manufactured products, the position of Madras is as follows:—

Kind.	Local manufac- ture.	Imports Indian and Foreign.	Re-exports and Exports Indian and Foreign.	Net Con- sumption (gross weight).	Value in 000 rupees.
Cigarette	30	5,500	1,368	4,132	7,617
Beedies	24,600	213	1,726	23,087	10,990
Cheroots	89,600	...	99	89,501	27,959
Superior Cigars	400	...	269	131	193
Pipe Tobacco	...	22	...	22	44
Snuff	3,001	1	333	2,668	5,398

To this may be added, a nett consumption of chewing tobacco of 53.9 million pounds. The per capita consumption of tobacco for the Presidency is estimated to be a little over four pounds annually.

Internally the demand for cheroot tobacco is in the Circars and *Telugu* districts; for Coimbatore chewing tobacco in the West Coast, Travancore and Cochin; and for tobacco of southern districts locally and in the Straits Settlements and Federated Malay States. For the cigar trade, however, tobacco of Salem and Trichinopoly districts is mainly useful, especially as fillers for cigars, the outer covering or wrapper being supplied by the fine leaves of Sumatra, Borneo, Havana etc., of which we import annually from 40 to 80 thousand pounds of value 50 to 140 thousand rupees. It has not been possible to acclimatise fine wrapper tobacco of this type in Madras yet. For the beedies trade, our province depends almost entirely on supplies from Bombay and Mysore provinces, a small proportion being got from locally grown dry tobaccos in some districts or scraps of Virginia from Guntur district. Madras beedies are exported to Ceylon, Federated Malay States and Burma. In general, it can be stated that the demand for cigarettes has been increasing in the past few years, of beedies slightly declining, while that of cigars has considerably gone down and of chewing tobacco practically steady. There was a good export trade in cigars to England some 20 years back, but the imposition of an increasingly high duty which now stands at 14 s. 2 d. per pound, has killed the Indian export trade in competition with other imported cigars which proportionately on value pay a much lower duty than Indian ones.

The most noteworthy feature of tobacco cultivation and marketing during the past decade is the large extension of Virginia tobacco at Guntur. On the

manufacturer's side, the most marked feature is that the venue of cigarette manufacture has changed from England to India, and the premier manufacturers are making their own brands in this country using Guntur tobacco largely. The erection of a number of factories in North India, manufacturing particularly cheap cigarettes is also a feature of recent years and is reflected in the decline in foreign imports of cigarettes.

In its preparation for markets, tobacco undergoes various processes before finally it reaches the manufacturer. For cigarette tobacco of Virginian origin, the trade has received a great impetus by the introduction of flue curing methods, which mainly by the adjustment of temperatures during the various stages are able to shorten the period of curing, while fixing the colour of leaf, which is the chief consideration in cigarette tobacco. There are about 2,000 flue curing barns scattered over the growing areas of the Guntur district for this purpose. After flue curing, tobacco undergoes some further bulking and shifting at the hands of buying exporters. The more progressive exporters have also introduced redrying plants, which condition the moisture content of the leaf and render it better fitted for keeping in export. The re-drying plant has brought to the exporter more margins of profit and it will be a marked step of improvement, if facilities for redrying are extended to the whole of exported Virginian tobacco of the Guntur district. In the export trade to England, the tobacco has generally to be freed from the midrib, as only strips are in demand in England, due to the high import duty levied in that country.

In regard to prices, the largest buyers of Virginian tobacco at Guntur, namely the Indian Leaf Tobacco Development Company, purchase directly from the grower in five specified grades and pay for them at  $9\frac{1}{2}$ ,  $7\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $3\frac{1}{2}$  and  $1\frac{1}{2}$  annas per pound. Other buyers, however, buy tobacco on the quality of each individual bundle. For the first arrivals of best flue cured Virginia, prices ranged from Rs. 140 to Rs. 160 per candy of 500 lbs. in the past three years, but during 1937 prices rose considerably due to competition in the market from 180 to 200 rupees per candy, sometimes Rs. 220. This was the best period of best prices for Virginian tobacco. Prices decline for later arrivals according to quality from Rs. 60 to Rs. 120 per candy even, and the average prices for Virginia paid to growers range from 4 to 5 annas per pound. For Guntur country tobacco prices range from Rs. 25 to Rs. 30 per candy for dark inferior tobacco, Rs. 40 to Rs. 50 for medium quality and to Rs. 70 to Rs. 80 for the best quality. The price realised in London for the best Virginia was 1 s. 2 d. per pound but hardly 5% of the crop falls under this quality. For other types, prices range according to quality from 4 d. to 12 d. per pound. During 1937, prices were 2 to 4 d. higher per pound in England due to the shortage of Rhodesian supplies. Country tobacco fetches from 4 to 8 d. per pound in England according to quality. Prices for chewing and cheroot tobacco depend largely on the quality of consignments. The characteristic flavours of such famous tobacco as the Sivapuri and Meenampalayam in chewing tobacco, of Cherbrole tobacco for cheroots and Mustabad tobacco for snuff are known more by destinations and experience, as recognised grades and standards do not exist. At the Madras market, the best snuff tobacco of Mustabad sell from Rs. 190 to Rs. 200 per candy of 500 lbs. and ordinary chewing and cheroot tobacco at Rs. 70 to Rs. 100 per candy. At Cocañada, Lankas tobacco sells in three qualities according to size, the prices being respectively Rs 120 to Rs. 150 per candy for the first quality, and decline to Rs. 70 to Rs. 90 for inferior stuff. At the Palghat market, Meenampalayam chewing tobacco sells in three rates, the prices per candy range from Rs. 200 to Rs. 250 for first quality, and Rs. 110 to Rs. 140 for the second sorts. At Mangalore the wholesale price per maund of 28 lbs. of snuff and chewing tobacco sell from Rs. 9 during 1931 to Rs. 6 during 1937 for best quality, and the fall in prices is partly associated with the

high admixture of fine sand which is a common practice in this district, performed at different stages of growth and marketing.

The question of grading tobacco is particularly important for cigarette leaf where colour is the essential factor in determining quality. As the demand for the type of tobacco is increasing locally and in England, there is a great need to develop the marketing of Virginian tobacco. Manufacturers of cigarette require a commercial quality of uniform quality, and for this purpose, recognised grades are essential. The most superior leaf has a fine lemon yellow colour, free from blemish, well cured and with veins also yellow. As the blemishes increase to brown or green and veins become green, the tobacco is considered inferior in quality. Other countries like United States of America, Rhodesia, etc., have developed their export trade and maintained a high reputation for quality by adopting a defined system of grading leaf. Such a system not only provides a medium of understanding between buyer and seller, but it ensures quality. While the grower is enabled to understand what price to expect, the manufacturers can pick and choose the right grade and quality. Also any system of marketing intelligence of prices, stocks, arrivals etc., is best understood on the basis of a regulated system of grading.

In the Guntur district, exporters have been in the habit of grading tobacco according to arrivals, but grading varies with individuals and standards do not exist. The consequence was that much tobacco was sent to England that was not wanted there, and the general reputation of the trade suffered. In order to maintain quality and create a steady demand for Indian tobacco in England, the marketing section started work on grading of tobacco as the first step of development at Guntur. A conference of growers, merchants and manufacturers was held at Guntur in October 1936, wherein it was decided to form an association to draw up grades and standards for Indian Cigarette tobacco with a view to trading on the basis of these grades and to make other arrangements such as arbitration in the case of disputes abroad. Arrangements were made periodically to send standard samples to the High Commissioner, London, with a view to popularising them. Suitable by-laws were drawn up and an association called "The Indian Tobacco Association" was registered in January 1937 at Guntur. Simultaneously an act called the "Grading and Marketing Act 1937" was passed in the Central Legislature to regularise standards for agricultural commodities, and on the basis of the Act, seven grades in flue cured Virginia and five grades in sun cured types were provided for by the Association. The quotations based on the basis of samples sent to the High Commissioner were 20 to 30% higher than what were got last year from brokers in England. Altogether, over 350 bales of graded tobacco were sent by the Association under the Government of India grade designation mark called "AGMARK". The popularising of graded Indian tobacco in England is therefore well under way and the Indian Tobacco Association is also soon undertaking the work of supplying market intelligence to the grower in the form of a periodical bulletin setting forth the latest information from England and locally. Four leaflets dealing on improved cultivation methods, curing, grading and marketing, and a coloured illustration of the grades useful for producers and a monthly bulletin on crop forecasts, prices, supply and demand, intended for the trade are also in the course of preparation.

In marketing developments, the position of the grower and the margin of profits to several agencies in the trade are very important. In the case of Virginian Cigarette tobacco exported to England, the gross average price paid to the exporter varies from Rs. 100/- to Rs. 180/- per bale of 250 lbs. Of this amount, hardly Rs. 30/- to Rs. 90/- goes to the grower; i. e., from 30 to 50% on the average, the margin increasing with the quality. The situation in England is peculiar. The import duty on a pound of Indian tobacco costing 4 to 18

pence is so high as eight shillings. There is a preference ranging from 2½ to 3 pence per pound for Empire tobacco over foreign ones in the England market. For country tobacco, the grower realised only Rs. 20/— to Rs. 45/— per bale of 250 pounds on the average and this fetches from Rs. 70/— to Rs. 100/— at the London Market. For local chewing and cheroot tobacco of the Tamil districts, the grower gets from 50 to 60% only of the consumer's or manufacturer's price.

Broad lines of improvements in the direction of marketing are the standardisation of cigarette leaf for export trade and the provision of redrying facilities therefor. Steps have already been taken in this direction and export under standard grades is well under way. There is also need to stabilise our relations with Japan in respect of her requirements.

In the indigenous trade in tobacco, the financing of the grower on the strength of stock before marketing will be a step of improvement. Co-operative associations of growers can very well expand loan and sale work on tobacco. An imposition of an *ad valorem* import duty instead of on a weight basis on tobacco in England will be helpful to the export trade in Indian cigars. An efficient marketing service for publication of prices and dissemination of market intelligence will also be serviceable. It may be useful to regularise the trade mark laws on manufactured tobacco as frequent complaints are being received about their infringement especially in the Indian States. The control and organisation of wholesale commission markets and regularising market charges will also serve the needs of the grower. Certain items of development have already been taken up at Guntur by the Central and Provincial Marketing Staff and further work on development depend largely on the extent of finance which will be available with the Marketing Section for organisation and development work in Agricultural Marketing.

**Marketing Survey of Potatoes in the Madras Presidency.** The area under potatoes in the Madras Presidency has been steadily increasing from about 8,500 acres during 1923-30 to 13,000 acres at the present day. The factors that have led to the increased cultivation were the increasing application of artificial manures to the crop in places removed from villages, the development of the motor lorry trade for transport from the hills up to Mettupalayam, and last but not the least, the introduction by the Agricultural Department of popular varieties as Great Scot and Ben Crushan, which have established a reputation locally and in North India. The main growing district is the Nilgiris, in which Ootacamund taluk grew nearly 59% and Coonoor 39% of the total Madras crop of 1935-36. There are four seasons of sowing the crop at Nilgiris, the harvest periods corresponding to the months June to August, September—October, December—January, and May (irrigated crop), the glut period being from August to October. Production has increased from 1.113 million railway maunds in 1932 to 1.421 million railway maunds during 1936. The export by rail from the Nilgiris has increased from 5 lakhs of railway maunds in 1932 to 7.8 lakhs during 1936.

Of the production of the district in 1935-36, the quantity used for seed and that due to wastage and damage is estimated at about 4 lakhs of maunds, while imports amounted to about 165,000 railway maunds mainly by sea from Rangoon (91,000 maunds) and by rail from Mysore State (76,000 railway maunds). Exports amounted to 35,000 railway maunds to Ceylon, 11,000 railway maunds to Calcutta and Bombay by sea and about 162,000 railway maunds by rail to other provinces. This leaves a nett supply of about 900,000 railway maunds annually of value 1.65 million rupees available for consumption in the presidency.

The position of Madras province in the export trade is a prominent feature of potato marketing. Altogether 333,000 railway maunds or one-fourth of production or 40% of the total exportable surplus of Nilgiris district was exported

to other provinces during the calendar year 1936. The trend of export trade is definitely on the increase and rose from 148,000 railway maunds during 1932 to 333,000 in the year 1936.

The demand for potatoes in the Madras Presidency is met by local production as well as supplies from the Mysore State and Burma. In Madras city and in the districts of North Arcot, Nilgiris potatoes are in demand from July to January, and Mysore ones from January to May. The Ceded districts draw largely on Mysore supplies practically throughout the year, while the West Coast and Tamil districts draw similarly on Nilgiris potatoes. In the Circars, however, Rangoon potatoes dominate at Cocanada and Vizagapatam. Although the nett demand of the Madras Presidency is 9 lakhs of maunds, the Madras city accounts for nearly 2 lakhs of maunds including imported supplies. This is responsible for frequent gluts in that market. Quantitatively, there is much variation in the demand for Nilgiri potatoes in the different districts while Madras city accounts for 75 to 118 thousand railway maunds annually; the districts of Tanjore, Trichinopoly and Madura import from 35 to 40 thousand maunds; North and South Arcot, Ramnad and Malabar from 20 to 25 thousand maunds; Coimbatore, Salem and Tinnevely 15 to 20 thousand maunds; Circars and Nellore districts from 5 to 10 thousand maunds; while the Ceded districts account only for 1,000 railway maunds each. The demand for Burmese potatoes is distributed as follows:—

Madras city 44,000 maunds; Vizagapatam 28,000 maunds; Cocanada 15,000 maunds, and West Coast 2,500 maunds. The imports from Bangalore are received at Madras (50,000 to 75,000 railway maunds), North Arcot district (15,000 maunds), Ceded districts (10,000 maunds) and others (5,000 maunds). The per capita supply of potatoes of the province is 1·6 lbs. per year, but consumption is very variable. For Madras including Chingleput the *per capita* supply is about 10 lbs., while for Trichinopoly district it is 2·23; for Madura 1·93; East Godavari 1·55; Tanjore 1·37; Ceded districts 0·2 to 0·5; Chittoor and West Godavari 0·1 to 0·2; for other districts from 0·5 to 0·9 lbs. The above facts are sufficient to indicate that the distribution of Nilgiris potatoes can be improved by greater supplies to the poorly fed areas.

The export demand during 1936 was as follows in the several provinces: Bombay, 68,000 maunds, Ceylon 29,100, Bengal 74,100 maunds, Orissa 18,700 maunds, Central Provinces 86,700 maunds, Mysore 12,400 maunds, Nizam's State 30,000 maunds, Cochin 37,200, Travancore 7,100 maunds. It is seen that the demand is mainly in the chief city of each province. Of the export demand for Madras potatoes, the Calcutta demand is variable varying from nil in 1933, 17,000 maunds in 1934, 4,600 maunds in 1935 and 74,100 in 1936. Rangoon supplies Calcutta annually about 8 lakhs of railway maunds. The demand at Bombay is more steady varying from 50 to 65 thousand maunds. Bombay imports also freely from Italy, Japan and South Africa to a total of about 1½ lakhs of railway maunds annually; but the supplies from Italy are also meant for seed purposes. The exports to Hyderabad varied from 25 to 30 thousand maunds and that to Central Provinces has increased from 4,000 railway maunds in 1932 to 36,700 maunds in 1936. The demand for Nilgiris potatoes at Ceylon is somewhat variable ranging from 19,000 maunds in 1932 to 35,000 maunds during 1934 and 1935, and 29,100 maunds during 1936. The demand during the several months of the year from other provinces is from August to September in most provinces, September—October in Calcutta and January—February in Ceylon. Qualitatively, round tubers of Great Scot variety of white colour are required at Bombay; large kidney tubers in Bengal, Colombo and North India; mixtures of all kinds at Madras.

The prices paid to the grower during the past few years in the main season September—October ranged from Rs. 2—8—0 to 3—8—0 per Imperial maund for kidney sort, but prices increase from Rs. 3—8—0 to 5—0—0 during the scarce months in May—June. Prices have declined from 1934 to 1936. Every year there is a rise of prices in the summer months, a steep fall in September—October, a smaller rise in November—December and a slight decline again in February. The fall in prices is associated with periods of high supplies in the maximum producing season and with the coming of the Mysore crop in February, at Madras. There is a close correspondence between the rise and fall of prices at Madras and Mettupalayam. Among the different varieties, the variety Great Scot fetches the best price per maund to the grower.

In the assembly of potatoes for marketing, the usual practice is for the grower to export directly from the field to the godown of purchasing merchants at Mettupalayam. Direct exports by grower to consuming areas is rare, while the exports from hill stations directly to consuming areas ranged from 10 to 15% of the total exports. On arrival at Mettupalayam, small tubers (podi) and rejected ones are sorted out and the arrivals are classed into common sorts called Round, Kidney, Medium, Rasi and Podi and paid according to market rates and the proportion of the several sorts. The merchants further sort the potatoes during storage and despatch it on orders to Bombay and Central Provinces and on commission to Madras and Calcutta and usually on orders to the smaller consuming areas. Whatever cannot be disposed of in other markets is sent on commission to Madras, during the main season, creating periods of glut in the city market.

The lot of the grower under present conditions is pretty bad. He is usually indebted to merchants or manure men, pays a heavy bill of nearly Rs. 100 per acre for manure and hardly gets enough returns from the crop to meet his expenses. Growers' indebtedness has been increasing markedly in the past few years. The grower usually gets 40 to 50% on the average of the consumer's price at Madras city, retailer about 12%, Railway 15%, lorry 8%, handling and commission at Madras 4%, and nett profit to Mettupalayam merchants about 9%. By sale on orders, the merchants' profit is slightly more, especially through the Bombay market.

Improvements in the marketing of potatoes can be directed in various ways. On the grower's end, the indebtedness of the grower can be relieved by a system of financing the grower for supply of manure through co-operative agencies, but for work to be more effective, the sale of crop should also be undertaken by such agencies. On the research side, intensive work should be conducted in regard to storage of potatoes on the hills and a technique should be perfected on the type of godown, period of storage and special methods to be adopted. The work of introduction of improved varieties by the Agricultural department has met with considerable success, and a large proportion of the area is now under improved type like the Great Scot and Ben Crushan. On the consumer's side the most obvious defect is defective distribution. The Madras market is often glutted, and the *Telugu* districts ill supplied. Instead of allowing wagon rate concessions to a few places only, as at present, a concession on a maund rate to places in the Ceded Districts, Guntur, Nellore and Circars will help to increase consumption and improve returns to the grower and trade, and increase railway traffic in potatoes within the province. Some form of control of commission markets dealing in potatoes will also be a useful step in order to ensure fair returns to the exporters and regularise market charges.

The marketing section in co-operation with the co-operative department has already started some lines of work in improvement of potatoes. A co-operative sale society exists in the Nilgiris district and arrangements have been made to

finance the grower for supply of manure. The opening up of godowns in suitable areas in the hill stations as at Kotagiri, Ootacamund, Keti etc. to help the grower is also under consideration. Arrangements for sale of produce of society through the Provincial Marketing Society at Madras is well under way.

The export trade in potatoes outside the province which is a profitable line of advance has received considerable attention and the help of marketing officers in Bombay and other places has been requisitioned for sale of the coming season's crop. Considerable information on the requirements and state of markets in other provinces has been supplied to growers and co-operative societies for the expansion of export trade. The question of specified grades to establish a continuous and steady demand according to the varying needs of different markets which is a question to be decided along with the Agricultural Marketing Adviser to the Government of India will also receive consideration in due course. The railway authorities have also been advised on the need for providing greater facilities for movement of Nilgiris potatoes. The main improvement in marketing of potatoes is the provision of easy finance to the grower to relieve him of his chronic state of indebtedness, and the success of societies in improved methods of marketing will depend largely on the strength of finance and extent of organisation they are able to command.

## Review.

**Handbook of Coefficients and Equivalents: A Statistical Publication of the International Institute of Agriculture.** *The International Institute of Agriculture* has just published a completely reset edition of its handbook of coefficients and equivalents. (*Recueil de coefficients et d'équivalences.*)

This small volume was originally produced for the use of the Statistical Bureau of the Institute in the conversion into metric units and vice versa of the data expressed in other measures, for the calculation of gold prices and similar purposes. Its usefulness proved much more general and it met with a cordial reception from statisticians and economists throughout the world, with the result that three subsequent editions, the last dating from 1922, were called for. The numerous changes in measures and monetary units, due not least to the unstable conditions in this field in the last decade, since then have made it necessary once again to bring the volume up to date. The opportunity has been taken not only to carry out a revision but to make a number of additions, both in the general information published and in the conversion tables.

The new edition, which has been completely reset and considerably enlarged, comprises 295 pages (*Recueil de coefficients et d'équivalences*, 295 pp., Roma, International Institute of Agriculture, 1937. Small 8°).

The first part gives the units of measure and their metric equivalents, monetary units, parities and approximate indication of actual exchanges for 116 countries. The second part comprises 96 tables of equivalents for metric measures in British and American units, and auxiliary tables for the conversion of sterling and rupee prices.

The material is preceded by an introduction indicating the rules to be followed in making reductions, calculating percentages, indices, etc. and is followed by an analytical table and alphabetical index.

In this new form the *Recueil de coefficients et d'équivalences* published by the International Institute of Agriculture is a very valuable tool for statisticians and economists throughout the world. (*Information communicated by the I. I. A.*)

# Crop & Trade Reports.

**Wheat sowings and the World Wheat outlook.** *The International Institute of Agriculture* considers, on the basis of the information received up to mid-February, that the area sown to winter wheat in the northern hemisphere is almost as large as that sown last year which was the largest recorded. The institute also reports that the sown area is particularly extensive, with few exceptions in the surplus producing countries, including, in particular, the United States, the U. S. S. R. and the Danube countries. The area of winter sowings in this group of countries is apparently at least as large as the second area of last year and much above the average of the years 1932 to 1936.

Reviewing the position of sowings and the present market situation, the I. I. A. considers that if the spring area in North America and the U. S. S. R. and the sowings in the southern hemisphere are not considerably smaller, a very unlikely result, and if the average yield is not substantially below normal, the coming commercial year will be marked by rather considerable over production and an unstable position on the world wheat market.

At present all that can be said on the outlook, is that the condition of the winter crops is rather uneven in the United States, but generally satisfactory in Europe, the U. S. S. R., India and North Africa.

**World Sugar Production and Markets** *The International Institute of Agriculture* gives the following information on world sugar production and markets.

The production of beet-sugar, which is centred almost entirely in Europe, the Soviet Union and North America, appeared larger and larger as the manufacturing season advanced. The season is now almost finished and it may be stated that the production of beet-sugar in 1937—38 is the largest since the War, with the exception of 1930—31. The Soviet Union has a record production of about 2.5 millions metric tons of raw sugar, or 85 per cent. larger than the average of the five years 1931 to 1935. The other European countries have for the most part shown increases ranging up to 50 or even 100 per cent. above the average. In spite of the rather unsatisfactory results in certain countries, the most important of which are France and Great Britain, the total European production of raw sugar is a million metric tons or 16 per cent. higher than the average of 1931 to 1935. This result is due essentially to a heavy increase in beet production in the largest producing countries except France, namely in Germany, Czechoslovakia, Poland, and also to some extent to increases in certain minor European producers. The production of the two North American producing countries, United States and Canada, is very slightly below the average. The total world production of beet-sugar including the Soviet Union, this year should exceed 11 million metric tons. This figure is 0.9 million or 9 per cent. larger than last year, 25 per cent. above the average of 1931—1935, and within 0.4 millions of the record of 1930. In addition to this very large production of beet-sugar, it seems certain that there will also be an abundant production of cane-sugar. This year's production should be almost equal to last year's and exceed that of all earlier years.

In short, the total production of beet and cane sugar in the 1937—38 season seems to be equal to or higher than the maximum reached in 1930—31. This production may well disturb the world sugar market. Already a decline in sugar prices is reported, which is especially serious on the New York market, but was also appreciable in London and Prague at the end of 1937. Quotations of Cuban sugar on the New York Exchange fell in December 1937 to the average level of

1935; though prices were better maintained on other markets and were even at times high, the drop of American prices represents a serious symptom, which might reasonably cause fears of another crisis on the world sugar market. Since May 1937, however, there has existed an agreement concluded at London between the great majority of producing countries, which aims at fixing the export quotas of producing countries for a period of five years; it also covers the regulation of the free market between certain importing countries and their colonies or dependencies, and is designed in principle to maintain the equilibrium between the world supply and demand of sugar. (*Information communicated by the I. I. A.*)

**Groundnut—1938—First Report.** The area sown with the summer or irrigated crop of groundnut during the three months January to March 1938 is estimated at 51,400 acres. When compared with the estimated area of 45,500 acres for the corresponding period of last year, there is an increase of 13 per cent.

2. Figures by districts are given below :

District	Estimate of area sown with irrigated groundnut from January to March		Increase (+) or decrease (-) of the area in column (2) as compared with the area in column (3)
	1938	1937	
(1)	(2)	(3)	(4)
	Acres.	Acres.	Acres.
Anantapur	300	200	+ 100
Cuddapah	2,000	3,000	- 1,000
Nellore	100	100	Nil.
Chingleput	12,000	6,000	+ 6,000
South Arcot	20,000	22,000	- 2,000
Chittoor	6,000	5,500	+ 500
North Arcot	1,500	2,000	- 500
Trichinopoly	1,000	1,500	- 500
Tanjore	1,500	1,500	Nil.
Madura	5,000	2,500	+ 2,500
Ramnad	2,000	1,200	+ 800
Total	51,400	45,500	+ 5,900

3. The wholesale price of groundnut (shelled) per imperial maund of 82½ lb. (equivalent to 3,200 tolas) as reported from important market centres on 4th April 1938 was Rs. 3-12-0 in Vizianagaram and Guntur, Rs. 3-5-0 in Vellore and Anantapur, Rs. 3-3-0 in Cuddapah, Rs. 3-2-0 in Adoni, Hindupur and Tadpatri, Rs. 3-0-0 in Nandyal and Bellary. When compared with the prices published in the report for the corresponding period of the previous year i. e. those which prevailed on 5th April 1937, these prices reveal a fall of about 44 per cent. in Nandyal and Bellary, 43 per cent. in Cuddapah, 40 per cent. in Adoni and Vellore, 39 per cent. in Guntur and 38 per cent. in Vizagapatam.

**Gingelly—1937-38—Fourth or final report.** The average of the areas under gingelly in the Madras Presidency during the five years ending 1935-36 has represented 15.2 per cent. of the total area under gingelly in India.

2. The area seen with gingelly in 1937-38 is estimated at 814,400 acres. When compared with the area of 783,000 acres estimated for the corresponding period of last year, it reveals an increase of four per cent. The present estimate also reveals an increase of 1.5 per cent. as compared with the finally recorded area of 802,143 acres last year. The area in an average year is estimated at 764,060 acres.

3. 268,000 acres have been reported as sown since the previous forecast report was issued in January as against 271,100 acres during the same period last year. These late sowings were mainly on wet lands in the Circars, South Arcot,

Trichinopoly and the South where gingelly was raised as a second crop after paddy.

4. As compared with the actual area sown last year, there has been an increase in area in Kurnool, Nellore, Central districts (Chittoor excepted), the South and the West Coast, partly counterbalanced by a decrease in the other districts. The estimated area in respect of Nellore, Salem, Coimbatore and Ramnad is the highest on record since 1923—24 whilst area in respect of East Godavari and Kistna is the lowest estimated since the same year.

5. The yield is estimated to be below normal except in Guntur, Cuddapah, Nellore, Salem, Ramnad and South Kanara where it is expected to be normal. The condition of the late sown crop is generally fair.

The seasonal factor for the Province works out to 90 per cent. of the average as against 91 per cent. according to the season and crop report of last year. On this basis the yield is estimated at 99,108 tons as against 100,050 tons according to the season and crop report of last year and an average yield of 104,020 tons.

6. The wholesale price of gingelly per imperial maund of 82½ lbs. (equivalent to 3,200 tolas) as reported from important markets on 4th April 1938 was Rs. 6-9-0 in Trichinopoly, Rs. 6-8-0 in Cocanada, Rs. 6-6-0 in Salem and Tinnevely, Rs. 6-4-0 in Vizianagaram, Rs. 6-1-0 in Ellore, Rs. 6-0-0 in Tuticorin and Rs. 5-9-0 in Rajahmundry. When compared with the prices published in the last report i. e., those which prevailed on 7th February 1938; these prices reveal a rise of 5 per cent. in Rajahmundry, 4 per cent. in Vizianagaram and 1 per cent. in Cocanada and a fall of 1 per cent. in Ellore, the prices remaining stationary in Salem, Trichinopoly and Tinnevely. (*Director of Industries, Madras*).

**Cotton Raw, in the Madras Presidency.** The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1938 to 15th April 1938 amounted to 90,233 bales of 400 lb. lint as against an estimate of 4,88,600 bales of the total crop of 1937—38. The receipts in the corresponding period of the previous year were 101,236 bales. 99,350 bales mainly of pressed cotton were received at spinning mills and 8,799 bales were exported by sea while 37,119 bales were imported by sea mainly from Karachi and Bombay.

(*Director of Agriculture, Madras*):

## College News and Notes.

**Students' Corner:**—The University examinations for the B. Sc. Ag. course commenced about the beginning of the month. The examination for the I part was completed on the 12th April, and for the II part on the 23rd.

**Officers' Club:**—As in previous years the Agricultural College Officers' Club conducted Open Table Tennis and Contract Bridge tournaments during the Easter holidays. The following were the prize winners in the events, to whom were presented silver cups:—

*Table Tennis:* Winner — V Sivaraman (Carnbuck),

Runner up — C. N. Raju, (Government officials party),  
Both of Madras.

*Contract Bridge:* Winners — Dr. T. V. S. Sastri (Trichy)

& Mr. A. David (District Munsiff, Deyacotta).

Runners up — Messrs Y. Doraiswami Iyer & Mani (Trichy).

**Honey Week:**—The second annual "Honey week and Exhibition" was inaugurated by Mr. M. A. T. Coelho, Additional Sessions Judge, Coimbatore, on 23rd April 1938, at 5-30 P. M. at the Insectary.

**Visitors.** Mr. K. Ramiah, Officiating Director, Institute of Plant Industry, Indore, was here from the 9th to 12th April.

# Weather Review—MARCH 1938.

## RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st	
Circars	Gopalpore	0.0	-0.5	1.1	South	Negapatam	1.9	+1.6	11.9	
	Calingapatam	0.0	-0.4	1.3		Aduthurai *	2.9	+1.6	5.1	
	Vizagapatam	0.0	-0.3	2.1		Madura	4.1	+3.6	4.5	
	Anakapalli *	0.0	-0.6	1.4		Pamban	6.2	+5.7	9.7	
	Samalkota*	...	...	0.0		Koilpatti*	4.6	+3.6	6.2	
	Maruteru *	...	...	0.0		Palamkottah	2.2	+1.2	8.8	
	Cocanada	0.3	-0.2	0.7		West Coast	Trivandrum	1.1	-0.5	6.0
	Masulipatam	...	-0.3	0.0			Cochin	0.6	-1.4	1.7
Guntur*	...	-0.1	0.0	Calicut	0.1		-0.4	0.1		
Ceded Dists.	Kurnool	0.3	0.0	0.6	Pattambi *		1.7	+0.8	2.0	
	Nandyal*	0.0	-0.2	0.1	Taliparamba *		...	...	...	
	Hagari *	0.4	+0.2	0.8	Kasargode *		...	-0.8	0.0	
	Bellary	0.8	+0.1	1.1	Nileshwar *		0.1	-0.2	0.1	
	Anantapur	0.3	+0.1	0.3	Mangalore		0.4	-0.3	0.4	
	Rentachintala	0.0	0.0	0.5	Mysore and Coorg	Chitaldrug	0.3	0.0	0.3	
	Cuddapah	0.0	0.1	0.0		Bangalore	0.2	-0.4	0.3	
	Anantharajupet *	0.1	0.0	0.1		Mysore	0.4	0.0	0.4	
Carnatic	Nellore	0.1	-0.1	0.1		Mercara	2.2	+1.6	3.5	
	Madras	1.5	+1.3	2.0		Hills	Kodaikanal	2.3	+0.3	5.2
	Palur *	2.1	+1.0	5.1			Coonoor	9.4	...	17.0
	Tindivanam *	0.3	+1.3	3.7			Ootacamund *	0.7	-0.3	0.9
Cuddalore	4.0	+3.8	5.3	Nanjanad *			2.2	+1.2	2.4	
Central	Vellore	0.0	-0.2	0.4	Hills	Coonoor	9.4	...	17.0	
	Salem	0.6	+0.1	1.0		Ootacamund *	0.7	-0.3	0.9	
	Hosur*	...	...	...		Nanjanad *	2.2	+1.2	2.4	
	Coimbatore	0.3	-0.2	0.6						
	Coimbatore									
	A. C. & R. I.*	0.3	-0.5	0.4						
Trichinopoly	1.3	+0.8	1.7							

\* Meteorological Stations of the Madras Agricultural Department.

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

The unsettled conditions which appeared on the 20th to the east of Ceylon, developed into a depression and caused wide-spread thundershowers in southeast Madras and later thunder storms in and near south Madras. It became less important on the 24th.

Local and scattered thundershowers were common in the extreme south of the Peninsula, South Madras, North Madras, Deccan and Mysore.

Rainfall was in excess in the South and the Carnatic while defective in other parts of the presidency.

*Chief falls:—* Coonoor 4.2"  
Madura 3.3"

**Weather Report for Research Institute, A. C. R. I.**

Report No. 3/38.

Absolute maximum	98°F.
Absolute minimum	63°F.
Mean Maximum	95.1°F.
Departure from normal	-0.1°F.
Mean minimum	69.9°F.
Departure from normal	+0.1
Total rainfall	0.30"
Departure from normal	-0.52"
Heaviest fall in 24 hours	0.29"
Number of rainy days	1 day.
Mean daily wind velocity	1.1 M. P. H.
Mean Humidity at 8 hrs.	68.6
Departure from normal.	-0.6

**Summary.** Except for a thundershower on the 24th, weather was dry. The mean maximum and the mean minimum were almost normal. There was a rise in humidity in the last week of the month though the mean humidity was in defect by 0.6%. The skies were generally clouded during the month.

P. V. R. &amp; P. G.

## Departmental Notifications.

### Promotion.

M. R. Ry. M. L. Narayana Reddy Avl, Assistant Agricultural Demonstrator, Palakonda from V to IV grade to take effect from 19th January 1938.

### Confirmations.

The following Upper Subordinates who are qualified for appointment in the respective research sections only and who have satisfactorily completed their periods of probation have been confirmed according to the dates of completion of probation, irrespective of the sections, as Upper Subordinates in the Agricultural Section with effect from 1-5-35: (i) M. R. Ry. S. V. Kuppuswami Avl., Assistant in Chemistry (Soil Physics), (ii) M. R. Ry. C. S. Balasubramanyam Avl., Assistant in Entomology, (iii) M. R. Ry. D. S. Rajabhooshanam Avl., Assistant in Millets, and (iv) M. R. Ry. P. Kunhirama Menon Avl., Assistant in Chemistry.

### Transfers.

Name of officers.	From	To
Mr. P. R. Subramania Ayyar	Farm Supdt., Middle School, Usilampatti	A. A. D. Ramnad.
„ P. V. Hanumantha Rao	A. D. Palladam	A. D. Koilpatti.
„ M. Kalimuthu	A. D. Koilpatti	Asst. L. A. Coimbatore.
„ S. Ananthan	A. D. Saidapet	A. R. S. Palur.
„ K. Kuppamuthu	F. M. A. R. S. Palur	Warehouse Officer, Cuddalore
„ M. P. Narasimha Rao	Asst. in Paddy, A. R. S. Maruteru	A. D. II Circle, Guntur.
„ M. B. V. Narasinga Rao	Asst. in Paddy, Coimbatore	Asst. in Paddy, A. R. S. Maruteru.

Mr. K. Govinda Kurup	F. M. A. R. S. Pattambi	Asst. in Paddy, Coimbatore.
„ M. Venkataramayya	F. M. L. R. A. Hosur	A. D. II Circle, Guntur.
„ N. Ranganathachari	F. M. L. R. S. Hosur	A. D. Anantapur.
„ Bennet P. Masilamany	F. M. Kallar & Burliar Gardens, Mettuppalayam	A. D. Gurzla, Guntur.
„ K. Venkataswami	F. M. M. B. S. Coimbatore	Kavali, Nellore Dt.
„ M. Venkattamiah	F. M. L. R. S. Hosur	A. D. Nayudupet.
„ G. L. Narasimha Rao	A. A. D. Gannavaram	A. A. D. Kovur.
„ T. Gopalan Nayar	F. M. Nileshwar	A. D. Cannanore.
„ S. Kanakaraj David	Asst. in Chemistry, Coimbatore	A. D. Atmakur.
„ B. N. Padmanabha Ayyar	F. M. A. R. S. Maruteru	Dry Farming Station, Hagari.
„ K. Ramaswami Ayyar	Asst. L. A. Coimbatore	VI Circle, Madura.
„ K. B. Viswanadhan	F. M. A. R. S. Anakapalli	F. M. A. R. S. Maruteru.
„ N. H. V. Krishnamurthi	Asst. in Paddy, A. R. S. Maruteru	I Circle, Vizagapatam. Nileshwar.
„ K. M. Narayanan	F. M. Kasargod	A. D. Conjeevaram.
„ K. K. Raghavan	A. D. Warehouse (on leave)	A. D. Palani.
„ N. Ganesamurthi	A. D. Mudukulattur	A. R. S. Guntur.
„ B. Suryanarayana Murthi	A. D. Vuyyur	Mudukulattur (new Sub Circle).
„ S. V. Ramachandran	A. D. Palani (on leave)	Nungunery.
„ J. S. C. Antony	A. D. Ramnad (on leave)	Botanical Gardens, Ootacamund.
„ K. P. Sankunni Menon	A. D. Kasargod	A. D. Kasargod.
„ K. Krishna Hegde	Asst. F. M. Botanical Gardens, Ootacamund	A. D. Anantapur.
„ K. Rama Rao	A. D. Hospet	A. D. Cuddapah.
„ K. Jagannadha Rao	A. D. Anantapur	A. D. Rayachoti (New Sub Circle).
„ M. Subba Reddi	A. D. Cuddapah	

### Leave.

Name of officers.	Period of leave.
Mr. D. Achutha Rana Raju, A. D., Kandukur.	L. a. p. for 1 month and 12 days from 20-4-38.
„ S. V. Ramachandran, A. D., Palani.	L. a. p. for 6 weeks from 11-3-38 and Leave on M. C. for 1½ months from 22-4-38.
„ P. Subramaniam, Millets Assistant, A. R. S., Nandyal.	L. a. p. for 1 month from 20-4-38.
„ G. K. Subramania Iyer, A. D., Krishnagiri.	L. a. p. from c. for 2 months from 15-3-38.
„ A. R. Krishnamurthy Ayyar, A. D., Orthanad.	L. a. p. for 1 month from 19-4-38.
„ K. V. Gaurangamurthi, A. D., Atmakur.	L. a. p. for 2 months from 14-3-38.
„ T. G. Anantarama Iyer, F. M. Central Farm, Coimbatore.	L. a. p. for 1 month from 20-4-38.
„ C. Krishnan Nayar, Assistant in Mycology.	L. a. p. for 1 month from 20-4-38.

- Mr. Bennet P. Masilamany, A. D.,  
(on leave). L. a. p. for 2 months from 1—4—38.
- „ T. V. Ranganaswami, Asst. in  
Cotton, Coimbatore. L. a. p. for 2 months from 4—4—38.
- „ J. Suryanarayana, A. D., Kaikalur. L. a. p. for 2 months from 20—4—38.
- „ T. K. Balaji Rao, A. R. S., Aduturai. L. a. p. for 3 months from 20—4—38.
- „ C. S. Rajarathna Mudaliar,  
Mycology Section. L. a. p. for 27 days from 17—3—38.
- „ D. S. Subramaniya Ayyar, A. D.,  
Tinnevely. L. a. p. for 3 months from 1—4—38.
- „ S. Ananthan, A. D., Saidapet. L. a. p. for 2 months from 2—4—38.
- „ P. S. Venkushwami Ayyar, A. D.,  
Madurantakam. L. a. p. for 21 days from 20—4—38.
- „ P. Satyanarayana, A. D., Kadiri. L. a. p. for 2 months from 20—4—38.
- „ V. Panduranga Rao, Asst. in Plant  
Physiology, D. F. S., Hagari. L. a. p. for 1 month & 3 days from 29—3—38.
- „ A. Vencobachar, A. A. D.,  
Jammalamadugu. L. a. p. for 26 days from 21—4—38.
- 

## ANNOUNCEMENT

### Twenty-seventh College Day & Conference.

It has been proposed to hold the 27th College Day and Conference, under the auspices of the Madras Agricultural Students' Union, about the middle of July 1938. Persons desirous of reading papers at the Conference are requested to communicate to the Secretary. Members who intend moving propositions at the annual general body meeting are requested to give due notice to the Secretary, so as to reach him not later than 1st June 1938.

**Secretary,**

*The Madras Agricultural Students' Union.*