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SRI M. G. RAJARAM, I. A. S.,
Secretary to Government, Food & Agriculture Department, Madras.

WELCOME

We welcome the appointment of Sri. M. G. Rajaram, I. A. S., as Secretary to Government, Food and Agriculture Department, Madras. Born in 1918, Sri. Rajaram had his under-graduate course in Presidency College, Madras and took his B. Sc. (Ag.), degree course at the Agricultural College, Coimbatore from 1937–'40. He pursued post-graduate course at the Indian Dairy Institute, Bangalore taking the associateship but could not pursue further for his Ph. D. due to war conditions. He joined the Indian Army and was commissioned as Second Lieutenant in 1942. He was in active war service in the Fifth Mahratta Light Infantry and served in Persia, Iraq, Lebanon, Syria, Palestine, Egypt and Italy having been mentioned twice in despatches for gallantry and devotion to duty in the Italian War Theatre. He rose to the substantive post of Major by 1945.

Released from War Service, Sri. Rajaram was selected for I. C. S., but was appointed to the I. A. S., after declaration of Independence in 1947. In the I. A. S., cadre he served as Assistant Collector and Magistrate, Nellore and later as Sub Collector and Joint Magistrate, Gudur. During 1949–'51, he was Assistant Settlement Officer, Nellore. Between 1951 to 1954 he served as Deputy Commissioner and Chief Commissioner successively of Nicobar and Andaman Islands. Later he was District Collector of S. Kanara and as Inspection Officer for Laccadives and Amindivi Islands, he wrote up a report for the development of the Islands which we learn, is under implementation.

During 1956 to 1959 and prior to his present assignment, Sri. Rajaram was Secretary to Government, Planning and Development and Additional Development Commissioner, in charge of Community Development and National Extension Service in this State.

This is the first time, we are proud to record, that an Indian Agricultural Graduate is appointed as Secretary to Government, Food and Agriculture Department of the Madras State, nay in India itself. It is very appropriate that an Agricultural Graduate is in charge of the portfolio of Food and Agriculture, especially when large scale plans are being drawn up for increased food and other Agricultural Production under the National Plans.

It is also a matter for pride for the Madras Agricultural Students' Union and the Agricultural College and Research Institute that Sri. Rajaram, an old boy of the Agricultural College, Coimbatore, is now a Secretary to Government, Madras.

We hope and trust, that Sri. Rajaram who has seen varied aspects of life and service while yet young will acquit himself extraordinarily well in his new post and justify the choice of the Madras Government.

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Editorial

Madras City Milk Problem: To solve the problem of Bombay City milk supply and to remove the cattle maintained by the Gowalas outside the City to maintain hygienic conditions, the Arey Milk Colony was started in Bombay State. With a similar objective and with the help of those persons experienced in Arey Milk Colony, the Madras city milk problem was examined and the establishment of the Madhavaram Milk Colony in the suburbs of the City is the result. The first unit, out of a total of 8 units, to house in all 4,000 milk cattle was inaugurated on 8th October 1959 by Sri S. K. Patil, Union Minister for Agriculture. Even when the colony is fully developed only a fifth of the existing milch cows in the city can be housed in the colony. Without removing all milch cows from the city limits the objective of supply of wholesome milk or maintenance of hygenic conditions in the city will not be fulfilled. So there is urgent need to explore the possibilities of suitable sites for milk colonies, not necessarily in the outskirts of the city but at a reasonable distance, where sufficient area could be obtained. The soils, though not fertile should not be low lying subject to water logging and there should be scope for raising fodder crops with or without the aid of sewage. The colonies should be made attractive to milkmen to live in and carry on their avocation, In the initial stages, special concessions in respect of cattle feeds and fodders may be given. Instead of the contemplated legislation for evacuation of cows from the city, strict application of rules for maintenance of cattle in hygenic conditions and against letting cattle loose on city roads and lanes and frequent check for adulteration, may be enforced, so that the milkmen do not find it economic to carry on their business within the city limits.

The proposal to start a central dairy in the Madhavaram Milk Colony with a capacity to process 200,000 lbs., of milk per day with the aid of the New Zealand Government, for which foundation stone also laid is a very welcome and timely one. There is provision

also for expanding the capacity by fifty per cent. The milk processed will be partly drawn from the colony and partly from rural areas around the Madras City. Great care is necessary in handling milk both while assembling and distribution. On the assembling side, the raw milk in a pure form has to be quickly transported for processing. After processing the distribution has to be done equally, if not much more, quickly. Any inadvertent carelessness in these will result in spoilage of milk resulting in loss of customers - suppliers or consumers. Great caution is especially necessary in a hot climate like ours where microbiological activity is very rapid. Pasteurised milk is stated to lose the beneficial effects of pasteurisation, due to a few hours of delay in distribution to consumers. People in cities as in rural areas also, are averse to stale milk and efforts should be directed to process and distribute each day's collection of milk to satisfy the demand for fresh milk.

Cattle : Though the cow is regarded with veneration by Hindus in India and cattle are considered as wealth by agriculturists and animal husbandry men, yet the cow and cattle are not cared for to the extent deserved. In the cattle shows held in this country there is evidence of existence of very good types from work and milk point of view and the few good specimens exhibited indicate that still a few take great interest in cattle wealth. The problem of cattle improvement is formidable as it involves improvement of our 300 crores of head of cattle in the country. The improvement by breeding alone will not solve the problem as feeding is equally, if not, more important because even the best animal fails to show its best under poor feeding. The development of ley farming or alternate husbandry, where grass farming is practised in arable lands in rotation with crops, is unthinkable in a thickly populated country as ours where land for food is considered insufficient. The only solution is to develop the waste lands and scrub jungles into grass lands and also adopt mixed farming. In this context, the closing down of the cattle improvement scheme (I. C. A. R.) of Palayakottai is to be highly regretted.

A review of the progress in the evolution of Karunganni cotton strains resulting in the release of K. 6 (Pandyan) and scope for further improvement in Madras State.

by

P. V. MARAPPAN and V. D. GURUSWAMY RAJA

(Department of Agriculture, Madras).

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Introduction : With a view to tackle the Agricultural problems of the black soil tract in the districts of Tirunelveli, Ramanathapuram and Madurai, the Agricultural Research Station at Kovilpatti was established in Tirunelveli district during 1901. Of the three major crops of this tract viz., desi cotton known in trade as "Tinnevellies and Karunganni', *Cumbu (Pennisetum typhoides)* and fodder cholam *(Sorghum dochna)*, the former which covers about 3·95 lakh acres in the tract, received foremost attention for improvement, as a cash crop of commercial value. Therefore, breeding and agronomic experiments on cotton formed an important programme of work among the various activities of the Station, since its inception. The results of the agronomic experiments have been reviewed elsewhere by Neelakantan and Guruswamy Raja (1958). The salient features of the breeding investigations carried out on this station and the progress in the evolution of improved Karunganni strains indicating scope for further improvement are summarised in this paper.

Early History of Breeding : Introduction and acclimatisation of varieties from outside with the object of replacing the local cotton were the first lines of work to start with, in cotton improvement work by breeding methods at this Station. Accordingly, a large number of varieties including extra-state, Asiatic and American types were tested for several seasons, but with negative results.

As attempts to acclimatise proved a total failure, systematic studies of the local cotton known as 'Tinnies' were taken up. The 'Tinnies' cotton is a mixture of two different botanical species viz., G. *arboreum* (Karunganni) and G. *herbaceum* (Uppam). From a systematic study of these two components of 'Tinnies' it was observed that Karunganni was the better of the two with medium staple (26/32" to 27/32"), higher ginning percent and spinning capacity of 20–30 counts. Uppam on the other hand was short stapled with 22/32" and below, coarse linted and spinning upto 14 counts. It was also observed that the former possessed greater

range of variability for effecting selection than Uppam, which was believed to be drought resistant and suited well for the late sown conditions in the tract.

Improvement in Karunganni was, therefore, first sought through 'mass selection' which aimed at collective selective or bulk selection of heavy bearing plants in the field. The results were immediate and spectacular but not lasting due to lack of combination of all the desired characters in the same plant.

Later, the more laborious and time consuming method of 'single plant selection' was resorted to, for further work. This method was adopted not only in the field bulks but also in artificially created '*inter se*' hybrid populations secured by crosses effected as given below.

1.	Uppam x Karunganni	Allogamic
2.	Karunganni x Uppam	
3.	Karunganni x Karunganni	Xenogamic
4.	Uppam x Uppam	

The above crosses were effected in 1906. Of these, only in the case of the progenies from the cross Karunganni x Karunganni a wealth variability was obtaind. In these progenies, four types of plant habits were recognised as detailed below.

Type A : An early type with no side branches but only carrying boll bearing branches (sympodials) on the main stem. It resembled *Uppam* in habit but was not productive.

Type B : Well shaped plant, freely branching with boll bearing branches on primary branches. It showed greater vigour and size of body than the ordinary Karunganni plant.

Type C : Intermediate between type A and B. It had well developed branches, chiefly from the base of the main stem. Main as well as the side branches developed boll bearing branches each carrying 5–7 bolls. Bolls came to ripening within a shorter and much more evenly.

Type D : It resembled type B, but was much larger in plant body. Late in maturity and not a desirable type for further work.

Release of Company Strains : Line selection work continued in the progenies of the above said types, resulted in the isolation of strains Company–2 (Coy–2) and Company–3 (Coy–3). The former was a C. type plant known to mature earlier than A. type to which strain Company–3 belonged. Of these, Company–3 was released for general cultivation in 1912–13 while Company–3 was released for cultivation in 1914–15. Company–3 gave higher ginning percent than Company–2. These two strains were adjudged to spin 18–20's warp counts as against 14's for 'local bulk'. Field observations showed that there was scope for further improvement by selection. But the sub-strains viz. Coy–2A and Coy–3A developed from Coy–2 and Coy–3 respectively did not give spectacular results, as to warrant their multiplication for extension.

In 1924–25, comparative studies of the aforesaid four plant types revealed that type–A and type–C were promising for yield of *kapas*. Thus, four types viz., A–4, A–5, A–8 and A–10 from A–types and five viz., C–4, C–5, C–6, C–7 and C–8 from C–types were developed and tested for yield. The result showed that C–7 and A–10 were the best in the matter of yield with spinning capacity from 24–26's warp counts. These two new strains were first distributed in 1925–26 withdrawing the Company strains in view of the limited range of adoptability for Coy–strains. Strain C–7 was well suited for deep black soils while A–10 fared well on lighter soils. Of these, A–10 first fell out of cultivation on account of its erratic performance.

Evolution of K. 1 : In view of the limited range of adaptability for C–7 and A–10, further work was continued to evolve a cosmopolitan strain by effecting reselections in C–7. As a result, strain 2622, a reselection from C–7 was developed in 1928–29 and tested for its performance. It was an early strain resistant to drought and gave 12 percent more yield than local. The results of the district trials with this new strain along with C–7 under distribution indicated that this strain was suited to the whole of Karunganni area, excepting the eastern taluks of the tract where *Uppam* was usally, sown either pure or as a mixture with Karunganni. It was, therefore, released for general cultivation, christened as K. 1 during 1934–35. It soon became very popular and spread to cover nearly 2·7 lakh acres during the years 1942–45. However, the area declained slowly in subsequent seasons and it was found to be susceptible to heavy shedding of buds and bolls, if heavy rains were received in February. It was, therefore, thought necessary to

improve upon this strain K. 1 and mitigate the above defects. The need became all the more greater in view of its rapid deterioration due to admixture and contamination with the local bulk.

Release of K. 2: As further work of reselection from strain K. 1 did not yield fruitful results for improvement, attention was directed towards breeding methods involving hybridisation, with a view to create a greater range of variability for further exploitation. Work in this direction was started by about 1934–35 and the earlier hybrid progenies of Karunganni with the extrastate arboreum types like Verum, Jarilla, Bani and a few others did not prove useful. Hence, a large number of inter-racial hybrid derivatives of *arboreum* crosses were obtained from the Madras Herbaceum Scheme, Coimbatore, during 1936–37 and vigorous selection work was persued under Kovilpatti conditions. As a result, a reselection viz., 4706 was effected in 1937–38 from culture N. 3–2/13 and isolated as a true breeding strain in 1940–41. The culture N. 3–2/13 was one derived in its turn in F_6 of a cross involving indicum 49 x (indicum N. 14 x cernuum). The new strain 4706 gave on an average 20 percent more yield and was adjudged to spin 30's warp counts as against 28's for K. 1. Besides, it was found to be more cosmopolitan than K. 1 and capable of withstanding or recovering from the ill effects of heavy untimely rains in February. It was, therefore, distributed for general cultivation in the South zone of 'Tinnies and Karunganni' tract in 1947–48. By about 1950, it had spread to cover nearly 1,17,000 acres in the South zone. A similar strain K. 5 developed at Coimbatore as a reselection effected in 1935–36 in F_7 of a suspected natural cross involving indicum N. 14 x cernuum 99 and isolated as a true breeding strain in the year 1937–38. After repeated trials in the districts, this strain was released for general cultivation in 1944–45 and covered about 80,000 acres in 1950 in the Coimbatore tract.

These two hybrid strains under general distribution had a mean ginning percent of 30–31 and gave a lint yield of about 100 lb per acre only. It was also felt at this stage that there was further scope for improvement in lint quality in the South Indian *arboreum* cottons. Besides, the cotton breeding policy in the State was switched over to the evolution of plastic strains suited for wider environmental diversities. In view of these considerations, an intensive breeding Scheme for the further improvement of Tinnevellies and Karunganni cotton in this State was launched in 1949–50 with the financial assistance of the Indian Central Cotton Committee.

Evolution of K. 6 (Pandyan): The breeding project known as Karunganni Improvement Scheme which commenced functioning in June 1949 had for its objects the evolution of a strain of Karunganni (G. *arboreum*) cotton with a staple length of 15/16" or more, a ginning percent of 34, spinning 40's H. S. C, reaching an yield level of 150 lb lint per acre and suitable for cultivation in the entire black soil stretch of Central and Southern districts of this State.

As a result of intensive breeding work carried out under this Scheme through selection and trial of a very large number of useful hybrid progenies built up earlier on this station and those obtained from Coimbatore, a new strain 6186–9 which is not only suitable for the two distinct zones of the tract by virtue of its plasticity, but which also excels the existing strains, K. 2 and K. 5, was evolved. This new strain was first isolated in the year 1947–48 in F_{11} of an inter strain cross involving the parentage of 52–2 x 1523–R. Culture 52–2 was in its turn derived from a cross involving cocanadas 49 *(arboreum* race *indicum)* and culture No. 114 E of the parentage indicum N. 14 x cernuum. The other constitutent parent strain viz., 1523–R had been isolated in a suspected natural cross involving indicum N. 14 x cernuum 99 and crossed with 52–2 in the year 1936–37. Thus the parentage of the strain 6186–9 K. 6 (Pandyan) may be represented as [indicum 49 x (indicum N. 14 x cernuum)] x [(indicum N. 14 x cernuum) x (?).]

An overall review of this new strain in 67 trials on cultivators' holdings during the last five seasons and 16 trials on the Agricultural Research Stations, Kovilpatti and Coimbatore during the past eight seasons confirmed its allround superiority viz., 21 percent increased yield of lint, 7 percent longer staple, 8 percent finer lint and 13 percent better yarn strength over the existing strains K. 2 and K. 5, supporting its extension for general cultivation in the tract, approved by the Indian Central Cotton Committee (Kesava Iyengar *et al*).

The seeds of the new strain 6186–9 christened as K. 6 (Pandyan) are being multiplied for distribution for general cultivation in the tract from 1956–57.

Further yield trials of this strain at the breeding centres, Kovilpatti and Coimbatore as also on 20 cultivators' holdings in the tract during 1957–58 revealed that it continued to maintain its allround superiority over the control strains K. 2 and K. 5 which it is to replace. The relevant data on its comparative performance with the control strains K. 2 and K. 5 are summarised below.

TABLE I

Mean yield, ginning percent and halo-length in trials on the Agricultural Research Stations (1957-58).

S. No.	Strain No.	Kapas yield lb/acre			Ginning percent			Halo-length in m. m.		
		Kovil-patti	Coim-batore	Mean	Kovil-patti	Coim-batore	Mean	Kovil-patti	Coim-batore	Mean
1.	K. 6 (Pandyan)	330	390	360	33·0	33·1	33·1	24·6	24·7	24·7
2.	K. 2	250	348	299	31·2	33 3	32 3	22·5	23·1	22·8
3.	K. 5	275	362	319	30·2	31·1	30·7	23·4	22·0	22·7

On the average, the new strain K. 6 (Pandyan) has recorded 20 percent increased yieid of *kapas* over K. 2 and 13 percent over K. 5. In ginning percent and halo-length, the superiority over K. 5 is more marked than that over K. 2.

TABLE II

Mean yield of kapas, ginning percent and halo-length in 20 trials on the cultivators' holdings (1957–58).

S. No.	Strain No.	Kapas yield lb acre			Ginning percent			Halo-length in m. m.		
		Tinnies Tract (12 trials)	Karun-ganni Tracts (8 trials)	Mean (20 trials)	Tinnies tract	Karun-ganni tract	Mean	Tinnies tract	Karun-ganni tract	Mean
1.	K. 6 (Pandyan)	245	504	349	33·6	35·0	34 1	25·4	25 3	25·4
2.	K. 2	211	..	303	32·5	..	32 6	22·4	..	23·2
3.	K. 5	..	442	..	..	32·8	..	..	23 7	..

The superiority of the new strain K. 6 (Pandyan) over the control strains K. 2 and K. 5 for all the three economic attributes is confirmed in the trials on the cultivators' holdings in the tract also.

Besides, it continued to maintain its better yarn strength (64 lb) over K. 2 control (54 lb) in mill tests (for nominal 26's) conducted for the third time in succession and fetched Rs. 190/- more per candy of 784 lb lint over K. 2.

Scope for further improvement: It may therefore be mentioned that the evolution of K. 6 (Pandyan) from inter-racial hybrids of G. *arboreum* is a land mark in Karunganni cotton improvement work

pointing towards the immense potentialities of hybrid materials built up on this Station under the auspices of the Karunganni Improvement Scheme, for further exploitation towards the newer stepped up objectives of evolving a Karunganni strain with a mean fibre length of 1-1/32" and above and a spinning value of 40's H. S. C. maintaining at the same time a ginning percent of 33 and yielding capacity of about 125 lb lint per acre of the new strain K. 6 (Pandyan).

It is therefore hoped that the large number of long stapled cultures undergoing tests in the various stages of breeding are likely to meet this stepped up objective.

Summary: The evolution of improved Karunganni (G. *arboreum*) strains and their progressive superiority in yield and quality achieved through systematic breeding work carried out intensively in various stages at the Agricultural Research Station, Kovilpatti since its inception in 1901 are discussed, indicating the scope for further improvement towards the newer stepped-up objectives for quality improvement.

Acknowledgment: The authors' thanks are due to the Cotton Specialist, Coimbatore and the Assistant Cotton Specialist, Karunganni Scheme, Agricultural Research Station, Kovilpatti for the encouragement given in writing up this note.

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Investigations into the control of the rice stem borer Schoenobius incertulas Wlk in Madras State

by

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Introduction : The stem borer - *Schoenobius incertulas* Wlk - is well recognised as one of the most serious insect pests of rice. In South India, the pest takes a heavy toll of the rice crop, year after year. The control of the pest is a difficult problem owing to the concealed existence of the larvae inside the stem. Various workers have attempted to evolve a suitable insecticidal way of controlling the pest in and outside India.

Iyatomi (1951) conducted investigations on the control of an allied species of a stem borer on rice in Japan and found that parathion (Folidol) was superior to systox in efficacy. In India, Santhanaraman (1952) has recorded BHC and Parathion (Exatox 20) as giving encouraging indications for control. Israel and Vedamoorthy (1954) found seed-soaking followed by irrigation with Folidol spray fluid at weekly intervals to be effective against the pest. Anantanarayanan et-al (1956) recommended two to three rounds of parathion (Folidol) sprayings coinciding with mass emergence of moths. Banerjee and Basu (1957) observed Tetrax-1, a systemic chemical, to be useful against the pest, in West Bengal. Nagaraja Rao (1958) tested some systemic insecticides and found systox and Folidol as potential chemicals.

The results of large scale field experiments conducted by the authors at the Agricultural Research Station, Aduthurai, in the Tanjore delta during 1954—'55 and in the Central Farm, Coimbatore from 1954 to 1957 are briefly furnished in this article.

Materials and methods : In all, three experiments were conducted at Aduthurai during 1954—'55 season when a severe out-break of the pest was experienced in the tract. Two of the experiments were conducted on variety Co. 25 and the third was confined to ADT. 25 which are among the worst affected varieties of paddy in the tract. The investigations were conducted on the second crop (Thaladi) on which the infestation is usually intense. In one experiment the insecticidal applications were timed at three stages, namely, (i) once in the nursery about a week prior to the transplanting of seedlings, (ii) a fortnight since planting and (iii) one month since planting.

The above timings were designed with a view to controlling the initial mild pest population that infests the crop in the nursery stage and to tackle the pest in the early post planting period when heavy emergence of moths, large scale oviposition and severe tiller damage are invariably experienced.

In the second experiment, the insecticides were applied at the following periods :—

(i) a fortnight since planting and

(ii) at the shot-blade stage of the crop.

The treatment at the nursery stage was eliminated in this experiment in view of the negligibly low incidence of the pest at this stage. Instead of two rounds in the early post planting period, only one round was given and a second round was timed at the shot-blade stage which coincides with a major emergence of moths that account for the white earhead formation.

The third experiment was conducted on variety ADT. 25 on methods similar to the second experiment, but with less number of variants.

The insecticides chosen for the first two experiment were sprays of endrin (hexa chloro epoxy octahydro endo-endodimethano naphthalene) at 0·04% and 0·02% dilutions, parathion (diethyl para nitophenyl thiophosphate - (Folidol E. 605) at 0·025% dilution) and dusts of BHC (benzene hexa chloride) 10% and mixture of BHC 10% and DDT (dichloro-diphenyl trichloro ethane) 5% in equal proportions. In the third experiment, endrin and isodrin (hexa chloro hexa hydroendo - endodimethano naphthalene) 0·02% spray and 2% dust alone were the insecticides tried. For each treatment, a large field of about 40 cents in extent was taken instead of small randomised and replicated plots. Although this method would not lend itself to statistical scrutiny of data, this was considered to be the best suited in view of the peculiarly scattered nature of infestation by the pest and the consequent chance of its non-incidence in small randomised plots, whether treated or not. The area for each treatment was divided into six equal subplots leaving a 3 feet border all around as outskirt. Six 2 feet square samples of areas were examined at random from each subplot, for taking borer infestation counts. Thus in all, 36 such samples were examined at periodical intervals. The counts were taken a month

after planting, six weeks after planting and at the shotblade stage for infested tillers and at the earhead stage for white earheads. The yield was similarly recorded from 36 random two feet square samples, taking six samples, from each subplot.

At Coimbatore, trials were conducted for three seasons from 1954—'55 to 1956—'57, the variety chosen being Co. 19. Besides endrin and parathion, BHC spray was also tried at this centre. The insecticides were applied in three stages, viz, at the nursery, a fortnight since planting and at the shotblade stage. During the two seasons 1954—'55 and 1955—'56, endrin was tried at a low dilution of 0·01% and subsequently, it was tried at 0·02% concentration.

A field of about 20 cents was taken for each treatment. The area under each treatment was divided into four equal subplots and five 2 feet square samples were examined from each subplot for infestation counts. Twenty such samples were thus examined under each treatment. Counts were taken twice, viz., once about six weeks after planting and again at the earhead stage. The yield of 20 similar samples was recorded from each treatment.

The data gathered are furnished under appendix.

Conclusions: From an examination of the data gathered from the experiments, it is seen that among the insecticides included in the trials, sprays of endrin 0·02%, parathion 0·025% and BHC 0·1% are effective in reducing infestation and increasing the yield. Isodrin also gave encouraging indications, but it was too costly for adoption. The Control of stem borer and a variety of other pests such as thrips *(Thrips oryzae)*, jassid *(Nephotettix bipunctatus* Fb*)* grasshoppers *(Oxya velox* F and *Hieroglyphus banian* F*)*, etc. would have contributed to the increased yields obtained.

No benefit seems to have accrued due to an additional treatment in the nursery stage and as such a nursery treatment is not essential under ordinary circumstances. One round of treatment is essential in about two weeks since planting as the heaviest damage is often experienced at this stage. The emergence of a major brood of the pest by about the shot-blade stage and damage caused to earheads warrant one round of spraying at this period. The cost of the chemical for treating one acre with endrin 0·02% (1 oz of 19·5% e. c. in 6¼ gallons), parathion (Folidol 1 oz. in 12½ gallons) and BHC 0·1% (1 lb. of 50% wettable powder in 6½ gallons) approximates

to Rs. 10:30, Rs. 12:75 and Rs. 21:54, respectively. The use of endrin or parathion is more economical; 60 gallons of the spray fluid will suffice to cover an acre in the early post planting stage and about 80 gallons at shot-blade stage. The quantity of actual endrin to be applied in two rounds works out to 0·28 lb. and that of parathion (Folidol) works out to 0·35 lb. per acre.

The insecticides are poisonous and should be handled with due care.

Acknowledgment: The authors' thanks are due to the Government Entomologist, Coimbatore for the guidance rendered in the investigations and to the Superintendents at the Agricultural Research Station, Aduthurai and Central Farm, Coimbatore for affording the required facilities for conducting the experiments.

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APPENDIX

Trials on control of rice stem borer at Aduthurai and Coimbatore.

Trials at Aduthurai	Endrin 0·04 % I	Endrin 0·02 % II	Parathion 0·25 % III	BHC 10 % IV	BHC 10 % & DDT 5% V	Control VI	Remarks
Experiment I.							
1. Average percentage of infestation ..	3·09	2·03	4·06	4·03	5·6	7·08	Variety Co. 25. *Planted :* 4 to 8-10-1954.
2. Calculated acre yield (based on yield from 36 two feet square samples) in lb.	5808	5445	5203	5203	4810	4931	Area under each treatment : 40 cents
3. Percentage on control ..	117·79	110·42	105·52	105·52	97·55	100	*Time of treatment :* 1. in the nursery, a week prior to planting. 2. a fortnight since planting. 3. a month since planting.
Experiment II.							
1. Average percentage of infestation ..	2 02	4·07	5·00	4·03	5·01	12·07	
2. Calculated acre yield in lb. ..	5869	6111	5233	4991	4840	5142	*Time of treatment :* 1. a fortnight since planting. 2. at the shot blade stage. other details same as above.
3. Percentage on control ..	114·14	118 84	101·77	97 06	94·13	100·00	

	Endrin 0·02 %	Isordin 0 02 %	Isordin 2 %	Control	
Experiment III.					
1. Average percentage of infestation ..	4·01	3·07	6·02	11·02	Variety : ADT 25 planted on 7 and 8-11-1954. Area under each
2. Calculated acre in lb. ..	4235	3781	3358	3025	Treatment : 40 cents. *Time of treatment :*
3. Percentage on control ..	140 00	124·99	111·01	100·	1. a fortnight since planting. 2. at the shot-blade stage.

APPENDIX *(Contd.)*

Trials at Coimbatore	Endrin 0·01 %	Parathion 0·025 %	BHC 0·01 %	Control	Remarks
Experiment IV.					
1. Average percentage of infestation ..	1·03	0·07	0·08	3·00	Variety : CO. 19. Planted on 30-10-1954 to 4-10-1954.
2. Calculated acre yield (based on yield from 20 random two feet square samples) in lb. ..	3755	4551	4418	3080	Area under each treatments : 2 cent. *Time of treatment :*
3. Percentage on control ..	121·91	149·76	143·44	100	as in experiment I.
Experiment V.					
1. Average percentage of infestation ..	0·07	0·04	0 05	4·01	Variety : Co. 19. Planted on 16 to 20-2-1955.
2. Calculated acre yield in lb. (as in experiment IV above) ..	2868	3377	3395	2530	Area under each treatment 20 cents.
3. Percentage of control ..	113·36 Endrin 0·02 %	133·48	134·19	100·	Other details as above.
Experiment VI.					
1. Average percentage of infestation ..	0·03	0·01	0·02	1 05	Variety : Co. 19. Planted on 30-10-1956 to 4-11-1956.
2. Calculated acre yield in lb. (as above) ..	4085	4820	4820	3970	Other details as above.
3. Percentage yield on control ..	107 78	129·82	104·75	100	,,
Experiment VII.					
1. Average percentage of infestation ..	0 05	0·05	Not included	1·64	Variety : Co. 19. Planted on 3 and 4-11-1956.
2. Calculated acre yield in lb. (as above) ..	3025	3250		2975	Other details as above.
3. Percentage yield on control ..	101·68	109·33		100	,,

Note : The infestation was very light at Coimbatore while it was fairly heavy at Aduthurai.

The Role of Agricultural Department in Community Development and National Extension Service

by

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Introduction : The Role of the Agricultural Department in the Community Development and National Extension Services is dealt in two parts viz. (1) Community Development and National Extension Services and (2) the role of the Agricultural Department, as a knowledge of the aims and objects of the former is necessary to understand the latter.

Community Development and National Extension Services : Before the advent of the British, Indian villagers were leading a peaceful life with common interests in all the varied aspects of the village, like health, wealth, education etc. With the British occupation, factions, self interest etc. gained ground in the villages and stood in the way of creation of common interests resulting in inequalities amongst the villagers and the economic exploitation of the villages at the time of attainment of independence.

During the political struggle for freedom individuals like Mahatma Gandhi, preached constructive problems for the uplift of the villagers. Organisations like Theosophical Society, Ramakrishna Mission, etc. made attempts in this direction but were not fruitful. Their programmes failed to reach that important section of the Rural Community (Agriculturists) which controls the family budget and can bring about a vital change in the mental outlook of the rural areas. The potentiality of the rural population engaged in Agriculture are very great. The only thing required is their awakening in the right direction.

With the attainment of independence the Republican Government realised that the progressive forces among the rural people should be made use of to chalk out the path for their progress. So came the Community Development and the National Extension Service as timely organisation. It attempts to instil into the villagers an ambition for higher standard of living and, a will and determination, to work for such standards and in a short period has succeeded in achieving the same. It aims and at the same time provides all facilities and assists them in their efforts to build a new life to make rural life a real one in the economic and social aspects.

The Role of Agricultural Department : The Community Development and National Extension Service has enlightened the villagers and brought in a progressive change in the rural areas. The Agricultural Department has a great part to play in the achievements of such a progressive organisation.

The Primary needs of our villagers are food, cloth, shelter and health. Adequate food supply is an essential basis for a balanced economy of all. Agriculture is the most important National Industry in our country. The local people can produce their daily necessities of food etc. but the aim is to increase their standard of living. The population of the country has been increasing at a rapid rate of 1·1 percent per year and the increased population has to be fed. The area cropped has almost remained stationary. The ryots practice Agriculture in the old traditional lines and the soils have been exhausted over thousands of years and acre yields are low. With the changing conditions and the increased needs, increased production not only to meet our requirements but a decent living standard is also to be assured. To achieve this end increased crop production is the main solution. The various scientific investigations in the field of Agronomy, Plant Breeding, Soil Science, Plant Pathology, and other Agricultural sciences, have to be made use of by transmitting them to the agriculturists in the field through extension methods.

The most important thing in the methods of extension is the proper contact with the people. When a contact is made one should be in a position to solve their problems. The problems in the field of agriculture are many, the most important of them being timeold cultural practices, requirement of manures, want of pure seeds, existence of pests and diseases, etc. The role of the Agricultural Department is then to solve these problems to the advantage of the cultivators.

For the successful solving of the problems and to achieve the targets fixed in the National Plans, the people should be convinced about the improvements suggested and their participation should grow progressively. This is possible with the educational efforts and influence of the staff engaged in the work. This has been better achieved by the Department by posting adequate men trained in scientific Agriculture to work in the Community Development and National Extension Service blocks. According to the fifth evaluation report on the working of the Community Development and National

Extension blocks there is one Agricultural Specialist appointed for a population of 59,000 or for about 7,000 cultivators household. This, to a great extent, made it possible for the Extension Officers to have more frequent contacts with the ryots, impress on them the advantages of improved methods of agriculture by adopting various extension methods and to introduce them in a large number of holdings. Even this proportion is too large for a single specialist to study the problems in the block and to personally contact all the cultivators. Still some agricultural item or other, is the most important activity in a block as per reports of the Evaluation Committee, which shows that the Department is functioning to the best advantage of the villagers and in the line chalked out by the Community Development and National Extension Service as indicated in the following paragraphs.

Cultural Practices: In the preparation of the fields and in the raising of crops improved cultural practices which result in reducing the cost of cultivation and help in the increased production have been successfully demonstrated and introduced by the Department. As a result, the demand for improved implements has been on the increase and to meet the heavy demand, proposals have been made to start the manufacturing of agricultural implements by a Government concern. Of the various cultural methods advocated and introduced, Japanese method of cultivation alone has accounted for 5 percent of increased yields. This is slowly gaining ground with the cultivators through the activivities of the Department and contributes to a great extent to the achievement of the Community Development and National Extension Service.

Manuring: Proper and judicious manuring is the main problem in the successful raising of crops. Organic matter is the most important factor of soil fertility but it declines rapidly than other factors. With intensive and extensive cultivation practices this problem became more and more serious. To maintain the soil fertility the department advocated very successfully the introduction and raising of green manure crops, growing trees of green leaf manure and the preparation of rural and urban composts. Together with these, the introduction of new fertilizers and the increased use of old fertilizers and chemical manures under proper guidance of the specialists, helped for the increased crop yields. The advantages of these manures have been well realised by the ryots and the demand for the chemical manures and fertilisers has increased so much that the full demand could not be met with at present.

Improved Seeds: Improved seed accounts for 10--15 percent of increased yields of crops. Its value has been established and ryots have taken to the use of improved seeds. It is considered to be the most important achievement and the multiplication and distribution of improved seeds, occupies the highest place in the activities of the Agricultural Department in the Community Development and National Extension Service blocks. To augment the local sources of supply of improved seeds State Seed farms have been established under the supervision of the Department in the block areas. Seeds from these are further multiplied in the Village Seed Farms for distribution to the cultivators. The position now with regard to the supply of improved seeds is more favourable.

Control of Pests and Diseases: This is one of the most important of all the items of Agricultural Extension Service. All developments and efforts, in other lines however successful they are, will be of no use if this problem is not solved by the Department and properly attended to by the cultivators. Hence special attention is paid by the department to educate the ryots to adopt all preventive and control measure against pests and diseases. Suitable pesticides and fungicides are stocked in the Agricultural Depots and distributed to the ryots. They are supplied at concession rates in pest declared areas. Co-operative Societies and big land owners are advised to own their own sprayers and dusters. There is a separate staff to attend to calls and give technical advice in addition to the staff in the block.

Thus the object of the Community Development and National Extension Service to increase the food production which is the basis for a higher economic and social life in villages, has been achieved to a great extent by the Agricultural Department in the Community Development and National Extension Service.

New Irrigation Techniques in the U. S. S. R.

by

M. PAVLOV

During the next seven years, the land under irrigation in the Soviet Union will be increased by 1·9, million hectares (a hectare is equal to 2·5 acres). This increase alone is almost twice the irrigated area of a country like Iran. But the development of irrigation in the U. S. S. R. is not limited to this alone. The plan calls for

watering nearly 80 million hectares of pasture lands in desert and semi-desert zones. At the same time drainage in areas with superfluous moisture will be carried out on 3·6 million hectares of swampy and marshy land.

The irrigation and land melioration programme of the Soviet Union is being carried out, in such a way as makes it possible to introduce advanced methods of work, progressive technology, and mechanization of production processes.

The following can serve as an example of how this is being put into practice.

Co-operation of Advanced Science and Practice: State Farm No. 4 occupies 10,400 hectares of newly-developed virgin land in the Hungry Steppe of Kazakhstan. The project of Soviet scientists and melioration specialists envisages the creation of a technically perfect system of irrigation here to facilitate the achievement of high economic indices with minimum expenditure of labour.

In drawing up the project, the configuration of the ground and soil conditions have been taken fully into account. The state farm's area has been divided into five sections, each of which will have its own irrigation pattern. In order to cut down wastage of water due to filtration, beds of large canals will be compressed with ground compressing machines, and will also be covered with concrete. With the same aim in view, a closed distributive irrigation network on a considerable tract is to be replaced by an open one. Special asbestos and cement pipes will be laid. They will be placed at a distance of 600 metres from one another, and hydrants, installed 120 metres apart, will supply water to temporary ditches. In one of the sections, where the relief prevents the flow of water by gravity, the pipeline system will be reinforced by a pumping station. It will guarantee the needed water pressure.

The technique of watering farm crops is also being changed. Spray irrigation, with machines produced in Soviet factories, is being introduced on a considerable part of the land. The spray machines will be of both stationery and mobile (tractor) types. From the results already obtained, it is clear that spray irrigation increases labour productivity several times, as compared with ordinary furrow irrigation.

The remaining part of the state farm will be irrigated from open concrete-covered canals, but with the aid of portable pipes, which are briefly described below.

Mechanization of Watering: In the Soviet Union, furrow irrigation is usually employed for cotton and other row crops. The backward and old flooding irrigation method has been abondoned. At present one man, depending on the relief of the land, can irrigate from 0·5 to 1·2 hectares of crop land a day. Such labour productivity can hardly satisfy any large farm. The Soviet specialists have, therefore introduced, in various irrigation areas of the country, a new method involving the use of flexible, portable pipes made from plastics or cotton fabrics. impregnated in an appropriate solution. Such pipes take the place of temporary irrigation ditches and distributive furrows. The pipes have openings from which water is supplied to the furrows.

Special water installations have been set up, which include soft pipes 350–440 millimetres in diameter and up to 1,000 metres in length for delivering the water. To these are attached pipes, 190–350 millimetres in diameter and 200-350 metres in length, with frequent outlets.

Of importance, too, is the fact that pevices have been worked out for tractors, which have made it possible to mechanize the laying of thin pipes. A set consisting of three sections of soft pipes can irrigate 24 hectares in 24 hours, consuming 200 litres of water per second.

The state farm plans to make extensive use of the soft pipes in supplying moisture to its crops. It has been estimated that the introduction of technically perfect irrigation systems will make it possible to increase the efficiency of the irrigation network from 0.63 to 0·90. Economy of water, as compared with the existing irrigation technique, will amount to 330 cubic metres per hectare.

It should also be noted that in this state farm, as in other irrigated areas of the U. S. S. R. a drainage system is being introduced for draining subsoil waters and preventing soil salinity. The total length of the closed drains in the state farm will come to some 223 kilometres. Besides, the project envisages the development of 253 kilometres of shelter belts. They will fringe fields, canals and roads helping to prevent the evaporation of moisture.

Our experience shows that the new irrigation method described above makes it possible to increase the irrigated area by 5 to 6 times inasmuch as it eliminates the necessity of cutting irrigation ditches. It yields also a big economy in water-consumption and increases labour productivity by 3 to 5 times. There is no doubt that the new method will help raise the technical level of Soviet agriculture.

(From the Information Officer, U. S. S. R. Embassy in India)

Spray Irrigation in the U. S. S. R.

by

Z. METELSKY

Spraying as a method of irrigation of crops has been most developed in the U. S. S. R. in the so-called regions of unstable water-supply, where irrigation is supplementary to natural precipitations and is usually taken recourse to in the hot and droughty seasons.

Spraying is used there for the irrigation of horticultural, potato and fodder crops and certain other cultivations.

Spray irrigation has turned out to be especially effective on flood-lands, the fertile soils of which are most suitable for many valuable moisture-loving plants. The unevenness of these lands makes surface irrigation difficult but is no obstacle for spraying. The proximity of water makes it possible to supply it with the least expenditure.

In recent years spray irrigation has also come into use in the main regions of irrigated land where it is being used to water cotton crops, lucerne, horticultural crops, tea and other plantations.

Small plots of land are watered with short and medium range sprinkling devices made up of light sectional pipelines with special spray nozzles attached to them.

For areas between 75 to 125 acres more powerful long-range machines are used which are powered from a tractor power take off shaft. Water is supplied to these machines through temporary irrigation canals cut by a ditcher at 90 to 100 yards metre intervals. These machines supply up to 100 cubic yards metres of water per hour to the fields and can irrigate 100 to 125 acres during a season.

Well planned areas of 150–250 and more acres are irrigated by high-duty double-bar sprinkling machines designed by the All-Union Hydraulics and Melioration Scientific Research Institute. These machines are equipped with centrifugal pumps and take water from an irrigation ditch (either a permanent or temporary one) and spray it evenly over a 134 yards wide strip.

The capacity of the double-bar machines's pump is 80 cubic gallons per hour. The machine is mounted on a medium-power caterpillar tractor and is manned by one person. Another person

is needed to every one or two of these machines to regulate the water supply in the irrigation ditches. During a season each machine can irrigate 250 to 300 acres of crops.

In the Pakhta-Aral (Uzbek S. S. R.) state farm, double-bar sprinkling machines are used to irrigate cotton fields and lucerne. The yield of raw cotton on spray-irrigated fields was more than 55 maunds per hectare. As compared with the irrigation of cotton-fields through furrows, in spray irrigation great economy in water expenditure is achieved. To ensure complete utilisation of equipment and water supplies, the fields are watered day and night. Night watering cuts down loss of water through evaporation.

In the central regions of the U. S. S. R. spraying is done with comparatively small quantities of water. In more southern regions spraying in small quantities is used rarely, mainly to accelerate germination of shallow-sown seeds. The usual rate of watering in these regions is above the average (40–60 and more millimetres to each watering).

On fields where the land is uneven, water is supplied to the sprinkling machines through a system of pipelines made up, as a rule, of asbocement pipes. For branchings and water outlets cast iron and ferro-concrete fittings are used.

If the fields lie close to sources of water, mobile pump stations are used and the water is pumped through a system of light thin-walled piping which can be assembled very quickly. The diameter of the pipes are 100–250 and more millimetres. Water from shallow rivers, ponds or canals is pumped by mounted or trailer pumps, powered from a tractor cardan shaft. On large bodies of water floating pump works are used.

Collective farms readily buy sprinkling machines, the cost of which is soon returned by incresed agricultural production. Besides, the State supplies sprinkling plants to the collective farms on advantageous terms.

Extensive scientific research work is being conducted in the Soviet Union to facilitate the development of spray irrigation which, undoubtedly, has a great future.

(From the information Officer, U. S. S. R. Embassy in India)

Ammonium Chloride and Urea as Fertilizer for Rice

Among the nitrogenous fertilizers, ammonium sulphate is the best known while ammonium chloride and urea are two other fertilizers which have the prospect of being produced in large quantities, the former as industrial by-product in the alkali industry. The manurial value of these two fertilizers have to be assessed by systematic trials before recommending them to ryots. Cheng et all have reported that in Formosa the efficiency of ammonium chloride was 98 per cent for a second crop of rice as against 100 of ammonium sulphate and both were superior to urea and ammonium nitrate (1952(1). In Japan ammonium chloride is being used on a large scale by rice growers. It is being substituted for ammonium sulphate, the reason being that the soils in Japan having deteriorated owing to prolonged usage and the mineral fertilizers containing sulphate are unable to show their good effects in such soils. Ammonium chloride or non-sulphate fertilizers are able to counteract such deleterious effects and that is why the use of ammonium chloride in Japan increased from 500 tons in 1949 to 46,855 tons in 1954 (Desai; 1956 (2). The findings reported by Russell (1950(3) go to show that ammonium chloride has been found to be better than ammonium sulphate in respect of crops like barley and buck wheat.

With a view to assess the relative efficacy of ammonium chloride and urea compared to ammonium sulphate as nitrogenous manure for swamp paddy a randomised and replicated experiment with four levels of nitrogen viz., 15 lb. N, 30 lb. N, 45 lb. N & 60 lb. N over a basal dressing of 5,000 lb. of green leaf *(Sesbania speciosa)* and 30 lb. P_2O_5 as superphosphate was initiated during 1956—57 Samba season (August to January) in the main single crop fields at the Agricultural Research Station, Aduturai and the study was pursued for a period of three years in succession in the same area. The size of each experimental plot was about one cent and planting was done 6" apart using two seedlings per hole. Strain Co. 25 (blast resistant) was grown in this experiment. The three nitrogenous fertilizers at four levels of N were topdressed 45 days after transplantation. The particulars showing the average grain yield per acre, percentage on control (average) and the net profit at various levels of N over control are furnished in Table I.

The differences in yield due to application of the three different forms of nitrogenous fertilizers viz., ammonium sulphate, ammonium chloride and urea at four levels of nitrogen were not significant during the first two years (1956—57 and 1957—58) while they were significant during the third year of trial (1958—59). All the three fertilizers were equally efficacious and recorded higher yields than control. Under the

soil conditions existing at Aduturai Farm, it was also found that over a basal dressing of 5,000 lb. of green leaf and 30 lb. P_2O_5 in the shape of superphosphate, application of 15 lb. N in the form of any inorganic fertilizer was the optimum dose to obtain the maximum yield. Among the three nitrogenous fertilizers, it was observed that ammonium sulphate application at four levels recorded comparatively greater marginal returns than ammonium chloride and urea.

Agricultural Research Station, Aduturai,
Date: 25th April, 1959.

V. SRINIVASAN.
K. M. BALASUBRAMANIAM.

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TABLE I

Ammonium Sulphate, Ammonium Chloride and Urea Experiment.

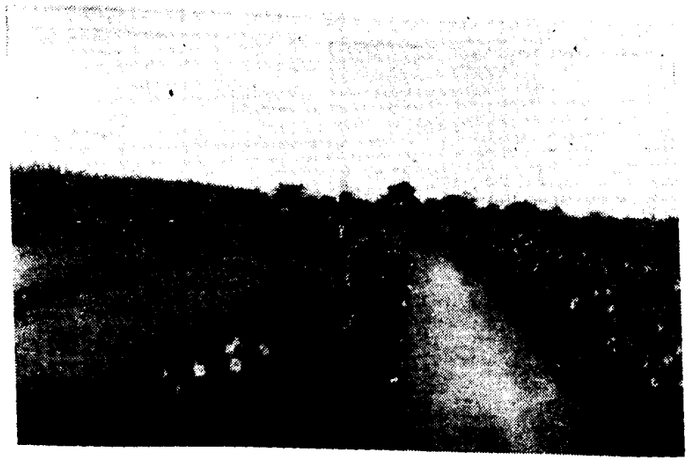
Particulars of grain yield per acre (average of three years) percentage on control (average) and net profit over control of different variants.

No.	Particulars of Treatments	Grain yield per acre in lb.	Percentage on control	Net profit over control Rs.	nP.
1.	5,000 lb. green leaf (Sesbanis) + 30 lb. P_2O_5 as Superphosphate (control)	3322	100 0	..	
2.	As. 1 + 15 lb. N per acre as ammonium sulphate	3660	199 9	65	96
3.	As. 1 + 30 lb. N do	3631	108·9	60	28
4.	As. 1 + 45 lb. N do	3572	107 3	36	40
5.	As. 1 + 60 lb. N do	3439	102 7	34	18
6.	As. 1 + 15 lb. N per acre as ammonium chloride	3609	108 2	54	93
7.	As. 1 + 30 lb. N do	3382	101·6	12	52
8.	As. 1 + 45 lb. N do	3443	103·2	46	87
9.	As. 1 + 60 lb. N do	3347	100·5	11	20
10.	As. 1 + 15 lb. N per acre as urea	3618	108·8	49	02
11.	As. 1 + 30 lb. N do	3520	105·5	33	37
12.	As. 1 + 45 lb. N do	3484	104·4	21	98
13.	As. 1 + 60 lb. N do	3400	101·4	15	92

Border planting of Ipomoea carnea solves manurial needs in dry lands

Introduction: At the Agricultural Research Station, Koilpatti upto nearly eight miles length of *Ipomoea carnea* have been grown along the borders and path ways in the blacksoil block, which is purely rainfed. The planting was done in the year 1952 and the method of propagation was by planting cuttings during the rainy season, viz. October – November. The plants come up vigourously even in droughty seasons and withstand repeated cuttings every year. About four to five cuttings could be taken depending upon the quantum of rainfall in a year.

Compost preparation: The leaves have to be cut and composted in the usual manner, that is they are incorporated in a 16'×6'×3' pit in layers, each layer being normally 1 foot thick which should be well trampled. Sprinkling with cow-dung water and lightly covered with tank silt or ordinary earth whichever is available serves as a good starter. It takes only 4–5 months for a thorough decomposition. It was thus calculated that the leaves obtained in a year from the borders of a 5 acre field when composted in this manner would give a little over 25 cart loads of compost which is sufficient to manure 5 acre of land @ 5 cart loads per acre. Each cart load roughly weighs half a ton.



Border crop of Ipomoea Carnea in Rainfed Black soils of Koilpatti

Value of the compost: This method of preparing compost is very cheap and at the same time it is the easiest way of attaining self sufficiency with regard to organic manure needs especially in dry lands. Regarding the nutrients present in the compost it varies with different

samples varying in the method of making and one of the samples prepared at Agricultural Research Station, Koilpatti was found to contain 0·115% N, 0·120% P_2O_5 and 0·399% K_2O. However poor it may be as a source of Nitrogen, the value of Ipomoea compost, should be recognised because it is the only organic manure that can be prepared in dry lands with least difficulty and it improves the physical conditions of the soil.

Root effect of Ipomoea: Since Ipomoea is grown along the field borders also, its root effect on the main field crops is very pronounced resulting in the stunting of the main field crops to a considerable extent in the borders. Observations were made regarding the extent of root effect with the following results.

Crops.		Root effect of Ipomoea. (Breadth of the stunted crop strip in feet).		
		1955—'56	1956—'57	1957—'58
Karunganni Cotton	...	16	17	14
Irungu Cholam	...	14	14	13
Cumbu	...	12	13	12

Therefore trenches of more than 2 feet depth must be dug along the borders so that the root effect could be minimised.

Conclusions: Ipomoea carnea is a drought resistant plant coming up well in dry lands. Its value is more as an organic manure or soil improver rather than as a source of nitrogen. From the borders of every acre planted with Ipomoea roughly 3 tons of compost could be prepared which is sufficient, for that area under rainfed conditions. In the Agricultural Research Station, by border planting of Ipomoea in the 106 acres blacksoil block, 300 tons of compost are prepared every year thus meeting all the organic matter requirement of the block.

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G. RAMABHADRAN.

Population and Yield Studies in Hybrid X-3 Bajra (*Pennisetum typhoides*)

Bajra (*Pennisetum typhoides* S. & H.) is a naturally cross-fertilised crop and this character affords a great scope in the easy production of hybrid seeds. The vigour manifested in certain crosses has been successfully exploited and three hybrid strains X-1, X-2 and X-3 have been released for general cultivation. Hybrid X-3 released in the year 1958 is a cross between Kullan Cumbu of Salem District and Arisi Cumbu of Coimbatore and it matures in 85 days. Trials in the various districts have shown that the strain suits the entire State of Madras and can be grown both under rainfed and irrigated conditions. The hybrid yields upto 2500 lb. of grain per acre and has the additional advantage of easy threshability of grain from the earheads.

To assess the relative yield of the hybrid X-3 at various population levels, acre population of 25,000 and 75,000 plants were compared with 50,000 plants per acre (normal population) in observation plots. The nett area of each plot was one cent. The population was controlled by thinning out the extra seedlings when they were ten days old. Twenty plants were selected at random and number of tillers in four weeks old seedlings, plant height, length and breadth of earhead, thickness of peduncle and number of ears per plant were recorded. From the bulk seed, 5 samples of 100 seeds were chosen in all the three populations and their weights noted. Finally the yield per acre was also recorded. The results are given below.

	25,000 plants per acre	50,000 plants per acre	75,000 plants per acre
No. of tillers (when plants were 4 weeks old) ...	5·3 ± 1·59	1·9 ± 0·64	1·3 ± 0·66
Plant height in cm. ...	178·0 ± 15·99	155·7 ± 15·01	162·3 ± 18·09
Length of earhead in cm.	25·3 ± 2·87	21·3 ± 3·67	22·7 ± 2·77
Thickness of earhead in cm. ...	2·1 ± 0·22	1.8 ± 0·23	1·8 ± 0·21
Thickness of peduncle in cm. ...	0·48 ± 0 068	0·39 ± 0·065	0·41 ± 0·055
No. of earheads ...	7·5 ± 2·54	3·5 ± 2·01	3·5 ± 1·71
Weight of 100 grains in grams ...	0·69 ± 0·013	0·63 ± 0·007	0·58 ± 0·019
Yield of grain in lb. per acre ...	1706	1906	2168

The following conclusions have been deduced:

(a) There is a gradual reduction in the number of earhead and also effective tillers as the population increases.

(b) Although there is a tendency for increase in the yield of grain in the higher populated plots, the yield is not proportionate to the population.

(c) A tendency for the general reduction in vegetative vigour, size of earheads and grain weight is also observed as the population increases.

(d) The number of tillers is the highest in 25,000 plants plot and this indicates that there is a possible correlation between number of tillers and wider spacing. It is also seen that the crop makes up the total number of ears per acre by better tillering in the wider spaced plots.

Millet Breeding Station,
Coimbatore-3,
30—6—1959.

A. SUBRAMANIAM,
L. ANAVARADHAM.

REFERENCES

Millet Specialist, Madras 1955 Short notes on the items in the Agenda—Department of Agriculture, Madras. Proc. of the Conference of Workers on Millets. P. 75—85. 1955.

College and Estate News.

Foundation Lectures: Dr. Siddappa, Central Food Technology Research Institute, Mysore delivered lectures on

1. Canning practice and control on 29th September, 1959.
2. Fruit Juices concentrates and powders on 30th September, 1959.

Special lecture "on Agriculture in New Zealand" was delivered by Dr. J. C. Gibbs, Senior Lecturer in Botany, Victoria University, New Zealand on 17th October, 1959 to the members of the study group.

Tours: The Post-graduate trainees of the Horticultural Faculty went on an educational tour to Kodur, Madras and Aduthurai from 11—10—1959 to 21—10—1959 and the Soil Science and Agronomy faculties to Tindivanam, Madras, Cuddalore and Mettur from 11—10—1959 to 21—10—1959.

Khariff Campaign: Khariff campaign was inaugurated in the Agricultural College by Smt. Savithri Shanmugam, M. L. A., and the students of Final B. Sc., Ag. took part in the campaign from 14—10—1959 to 21—10—1959.

Madras Agricultural Upper Subordinates Association: The following office-bearers were elected at the General Body meeting of the Association held at Coimbatore on 7—10—1959.

1. President: M. V. Jayaraman
2. Secretary: K. Kaleel Ahmed
3. Joint Secretary: L. Robinson
4. Treasurer: G. S. Thangamuthu
5. Committee members:
   (i) S. Premsekhar (ii) M. Balachandran
   (iii) K. S. Ranganathan (iv) R. Kaliappa
   (v) Y. K. Chandrasekaran

Weather Review — for September, 1959.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1959
North	Madras (Meenambakkam)	3·8	— 0·8	15·3
	Tirurkuppam*	7·9	+ 2·9	22·3
	Vellore	6·0	— 0·9	19·5
	Gudiyatham*	4·2	+ 0·1	19·1
East Coast	Palur*	4·8	+ 1·3	16·7
	Tindivanam*	4·0	+ 0·5	15·2
	Cuddalore	3·4	— 1·9	14·6
	Nagapattinam	1·2	— 2·1	6·2
	Aduthurai*	2·6	— 2·4	9·2
	Pattukkottai*	4·5	+ 1·2	17·8
Central	Salem	7·0	+ 1·0	20·3
	Coimbatore (A. MO.)* ..	1·6	+ 0·2	17·3
	Coimbatore	1·3	— 0·3	14·0
	Tiruchirapalli	2·1	— 2·6	13·1
South	Mathurai	4·3	— 0·4	17·3
	Pamban	0·0	— 1·1	5·1
	Koilpatti*	5·7	+ 4·1	20·2
	Palayamcottai	0·4	— 0·9	14·2
	Ambasamudram*	0·2	— 0·5	14·6
	Nagercoil*	4·0	+ 1·7	42·4
Hills	Kodaikanal	10·5	+ 3·2	42·7
	Coonoor*	4·1	+ 0·7	28·0
	Ootacamund*	6·9	+ 3·3	36·6
	Nanjanad*	6·4	+ 0·7	61·8

* Meteorological Stations of the Madras Agricultural Department.

At the beginning of the month, the axis of the monsoon lay north of Madras State and the monsoon trough extended to north-west Bay of Bengal with an associated cyclonic circulation. Light to moderate rain or thundershowers were received at a few places in the north, interior, coastal and hill regions of the State during the first seven days of the month. Later, the weather was mainly dry, in in the succeding nine days upto and inclusive of 16—9—'59. On 17—9—'59, a trough line passed through Bellary, Madurai and Baticola and persisted for three days, causing fairly widespread rainfall in the interior districts of Madras State. There was a lull of two days, when the monsoon current was generally weak over the country. On 22—9—'59, a trough line over the south Penninsula ran from Palghat to Kurnool. On 23—9—'59, an easterly wave was affecting the Bay islands. On the next day, a shallow depression existed in the Central Arabian Sea off the Konkan-Kanara coast and persisted till 26—9—'59. The monsoon had temporarily strenghtened over Kerala. The slight distrubances that followed brought about light rainfall at a number of places from 22—9—'59 till the end of the month in the entire State, without effecting any large change in the general

dry condition of the weather. Reviewing the general pattern of rainfall for the month, it was slightly above normal in the districts of the hill-regions and northern and coastal tracts of the State, while it was below normal in the rest of the area.

The day temperature showed deviation from normal ranging between - 1°F and 3°F.

Noteworthy rainfalls

S. No.	Date	Name of place	Rainfall in inches
1.	6—9—1959	Madurai	1·72″
2.	7—9—1959	Madras	1·68″
3.	19—9—1959	Coonoor	2·40″
4.	21—9—1259	Koilpatti	2·00″
5.	22—9—1959	Ootacamund	1·84″

Zonal rainfall (in inches)

Name of the Zone	Rainfall for September, 1959	Departure from normal	Remarks.
North	5·5″	+ 0·3	Just above normal
East Coast	3·4″	— 0·6	Just below normal
Central	3·0″	— 0·4	Just below normal
South	2·4″	+ 0·5	Just above normal
Hills	7·0″	+ 2·5	Far above normal

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore-3.
12th October, 1959.

C. B. M., & R. V.

Departmental Notifications

Gazetted Officers—Madras Agricultural Department

Postings and Transfers during the month of October 1959

Name and Designation	Posted or Transferred to
Sri C. S. Krishnan, Assistant Cotton Specialist (Karunganni Scheme), Koilpatti	Earned leave for 30 days from date of relief
,, V. D. Guruswamy Raja Assistant Cotton Specialist (K. 2 and Co. 4 Scheme), Koilpatti	To be in additional charge of Assistant Cotton Specialist, (Karunganni Scheme)
,, M. Damodara Prabhu, Additional Lecturer in Agriculture, A. C. & R. I.	Lecturer in Agriculture, A. C. & R. I.
,, G. Venkataramana	Additional Lecturer in Agriculture, A. C. & R. I.
,, V. Muthuperumal, Asst. Lecturer in Agriculture, A. C. & R. I.	Superintendent, Central Farm, Coimbatore
,, S. Muthusami, Superintendent, Central Farm, Coimbatore	Asst. Extension Specialist, Coimbatore

Upper Subordinates—Agricultural Department

Postings and Transfers during the month of October 1959.

Name and Designation	Posted or Transferred to
Sri A. Dhandapani, Soil Conservation Assistant, Maluchampatti Scheme, Coimbatore District	Soil Conservation Assistant, Tiruvellore
,, S. John, Soil Conservation Asst., Tiruvellore	Soil Conservation Asst. Maluchampatti Scheme, Coimbatore District
,, A. N. Ramalingam, Extension Officer for Agriculture, Poondi	Soil Conservation Assistant, Coonoor
,, Kumari Vasanthi David,	Assistant in Entomology, A. C. & R. I., Coimbatore
,, R. Subbarathnam	Assistant in Chemistry, Coimbatore
,, S. Pasupathy	Assistant in Chemistry, Analytical Asst., Coimbatore
,, H. Boominathan, Asst. in Cotton, Palur	Assistant in Cotton, Koilpatti

Review of market conditions of commercial crops in the notified areas of Madras State for the month of September, 1959.

Cotton: In this Section Cotton Kapas: Pothis of 280 lbs.
Lint: Candy of 784 lbs.

Coimbatore District: Season: The rains received during the month were beneficial to standing crops of cotton and cholam. Sowings of Cambodia cotton commenced in Dharapuram, Avanashi, Palladam taluks and sowings of Co. 4 and 9030 strains of cotton were nearing completion in Pollachi and Coimbatore taluks. The early sown cotton crop in Pollachi Taluk was reported to have been affected by aphids and necessary control were taken.

Arrivals and transaction: (a) *Lint:* The Tiruppur market started with an opening balance of 8965 candys of Cambodia and 1370 candys of Karunganni. The total arrivals during the months amounted to 9473 candys of Cambodia and 606 candys of Karunganni.

Despatches from Tiruppur market were 7773 candys of Cambodia and 876 candys of Karunganni lint. The month closed with a stock of 10665 candys of Cambodia and 1100 candys of Karunganni Lint in the commission mundies of Tiruppur market.

The Coimbatore Market opened with 171 candys of cambodia and 10 candys of Karunganni Lint. The arrivals during the month were 195 candys of Cambodia and 35 candys of Karunganni. The disposals were 50 candys of Cambodia lint only. The month closed with a stock of 316 candys of Cambodia and 45 candys of lint.

The Pollachi market opened with a stock of 637 candys of lint of Cambodia and 32 candys of Karunganni. The arrivals during the month were to the tune of 350 candys of Cambodia and 106 candys of Karunganni. The disposals at Pollachi market were 601 candys of Cambodia and 91 pothies of Karunganni.

(b) *Kapas:* The Tiruppur market opened with a stock of 22724 pothies of Cambodia and 2595 pothies of Karunganni. The total arrivals were 30674 pothies of cambodia and 2487 pothies of Karunganni. During the month 39487 pothies of cambodia and 4201 pothies of Karunganni kapas were sold leaving a closing balance of 13911 pothies of cambodia kapas and 881 pothies of Karunganni kapas.

The Pollachi market opened with a stock of 7388 pothis of Cambodia and 855 pothis of Karunganni. The arrivals in the market during the month were 1085 pothis of cambodia and 1275 pothis of Karunganni. The disposals were 3965 pothis of cambodia and 1490 pothies of Karunganni. The month closed with a stock of 4508 pothis of Cambodia and 640 pothis of Karunganni.

(c) *Prices:* The price ranges in Coimbatore district of Cambodia and Karunganni lint and kapas, during September 1959 as compared to that of previous month were as follows.

Lint. (Candy of 784 lbs.)	*September, 1959*	*August, 1959*
Cambodia Superior quality	Rs. 900 to 981	901 to 981
Cambodia Average quality	,, 800 to 885	810 to 885
Karunganni Superior quality	,, 807 to 871	800 to 856
Karunganni Average quality	,, 716 to 799	720 to 797
M. C. U. I.	,, 990 to 1200	990 to 1100
Kapas.		
Cambodia Superior quality	Rs. 126 to 142	125 to 140
Cambodia Average quality	,, 110 to 125	113 to 124—50
Karunganni Superior quality	,, 120 to 130	110 to 125
Karunganni Average quality	,, 82—50—107	90—97—105
M. C. U. I. Kapas.	,, 135 to 153	135 to 147

Ramanathapuram District: Season: Fairly good and wide spread rains were received during the 2nd half of the month. Sowings of Karunganni and other dry crops were in progress.

Arrivals and Transactions: The following were the arrivals disposals and closing stock of kapas and lint in the important markets in the District:

Name of Markets	Opening Balance	Arrivals	Disposals	Closing Balance
(a) *Kapas.*				
1. Virudhunagar	... 300	14,100	14,200	200
2. Sattur	... Nil	8,700	8,700	...
3. Rajapalayam	... 11,000	34,000	33,000	12,000
Total	... 11,300	56,800	55,900	12,200

(b) *Lint.*				
1. Virudhunagar	... 205	1,470	1,575	100
2. Sattur	... 20	870	890	Nil
3. Rajapalayam	... 1,590	2,600	1,600	2,590
Total	... 1,815	4,940	4,065	2,690

The arrivals and disposals of both Kapas and lint declined during the month at Sathur and Rajapalayam markets as compared to the previous month. At Virudhunagar market the arrivals and disposals during September 1959 were more or less at the previous month's level.

(c) *Prices:* The prices of lint, kapas and seed in the district during the month as compared to that of previous month were as follows:

Kapas. (Pothy of 280 lbs.)	*September, 1959.*	*August, 1959.*
Karunganni ...	Rs. 108 to 120	Rs. 108 to 113
Tinny Karunganni ...	,, 106 to 110	,, 95 to 106
Karunganni IInd crop ...	,, 100 to 110	,, 92 to 106
Tinny ...	,, 75 to 95	,, 80 to 95
Uganda Ist quality ...	,, 158 to 178	,, 150 to 174
,, IInd ,, ...	,, 116 to 150	,, 116 to 163
,, IIIrd ,, ...	,, 75 to 117	,, 92 to 137
Cambodia ...	,, 75 to 133	,, 100 to 137
Lint. (Candy of 784 lbs.)		
Karunganni ...	Rs. 826 to 866	Rs. 790 to 851
Tinny Karunganni ...	,, 770 to 801	,, 740 to 775
Karunganni IInd crop ...	,, 731 to 826	,, 725 to 765
Tinny ...	,, 690 to 826	,, 646 to 720
Uganda certified ...	,, 1,300 to 1,386	,, 1,250 to 1,350
Uganda uncertified ...	,, N. R.	,, 1,036 to 1,088
Cambodia Superior ...	,, 875 to 960	,, 870 to 960
Cambodia inferior ...	,, 720 to 731	,, 760
Cotton Seed. (per Standard maund)		
Karunganni ...	Rs. 14·83 to 15·27	Rs. 13·17 to 15·01
Tinny ...	,, 14·03 to 15·67	,, 14·03 to 15·67
Uganda ...	,, 10·76 to 18·55	,, 10·76 to 12·55
Cambodia ...	,, 10·44 to 11·90	,, 10·44 to 11·90

South Arcot District: Season: In this district fairly widespread and good showers were received in the third and fourth week of the month. The condition of the standing crop especially groundnut (winter) which had been affected by drought and insect pest improved on account of these rains.

Arrivals and Transactions: During the month the arrivals of cotton were 1508 kapas in the district out of which the disposals were 1360 pothis to Coimbatore district. A stock of 467 pothis were left with the Trade at the end of the month.

Prices: The prices during the month in the important regulated markets for cotton were Rs. 116.90 per pothi of 280 lbs.

Groundnut: *South Arcot: General:* The arrivals of summer groundnut declined appreciably in most of the markets in the district. The maximum arrivals were at Villupuram and Panruti and minimum arrivals were at Ulundurpet and Kallakuruchi markets.

Arrivals and Transactions: The markets of South Arcot district started with an opening balance of 1105 tons of groundnut kernals. The arrivals 4590 totalled to 4433 tons from the district produce and 157 tons from other districts viz., North Arcot, Chinglepet and Tanjore. Despatches to Pondichery were 129 tons while despatches to neighbouring districts were to the tune of 2285 tons. The mills and chekhus consumed 2089 tons and wastages were calculated to be 260 tons. The month closed with a stock of 932 tons.

Prices: The prices during the month ranged from Rs. 175·95 to 195·47 per candy of 531 lbs of kernel as against Rs. 153·60 to Rs. 193·41 per candy during August 1959 according to the quality.

North Arcot District: Season: Rains received during the first fortnight of the month were scattered and it was fairly wide spread during the second fortnight. The standing crop was not encouraging and it is estimated that the yield may be below normal.

Arrivals and Transactions: The arrivals, disposals etc., in the district during the months were as follows:

	Opening Balance	Arrivals	Disposals	Closing Balance
Groundnut pods tons	258	131—741	173—272	
Groundnut kernels tons	135·949	333·219	369·000	

(O. B. = Opening Balance; C. B. = Closing Balance)

Prices: The price ranges in the regulated markets in the district for groundnut pods, groundnut kernels and groundnut oil during September 1959 as compared to August 1959 were as hereunder.

	September, 1959	*August, 1959*
Groundnut pods (bag of 80 lbs).	Rs. 19 to 22	20 to 27·50
Groundnut kernels (candy of 531 lbs.)	,, 182 to 207	190 to 197
Groundnut oil (candy of 500 lbs.)	,, 342 to 380	342 to 373

Ramanathapuram District: The arrivals and disposals of groundnut pods and kernels in Virudhunagar market with closing stock were as hereunder:

	Opening Balance	Arrivals	Disposals	Closing Balance
Groundnut pods (in tons)	Rs. ...	150	150	...
Kernels	,, Rs. ...	5650*	4,600	1050

* includes imports of 5200 tons from other districts.

Prices: The following were the prices that prevailed for groundnut pods, kernels oil and cake during September 1959 as compared to August 1959.

	September, 1959	*August, 1959*
Groundnut pods	N. A.	N. A.
Groundnut kernels (candy of 531 lbs.)	Rs. 180 to 210	Rs. 180 to 213
Groundnut oil (candy of 500 lbs.)	,, 364·20 to 375	,, 350 to 365
Groundnut oil cake (Md. of 82 2/7 lbs.)	,, 12·03 to 13·69	,, 12·03 to 15 05

Trichirapalli District: Season: Rains were wide spread during the month and were beneficial to the standing crops particularly groundnut. Some more area was brougt under groundnut during the month after rains.

Arrivals, Transactions and Prices: In the regulated markets in Tiruchirapalli district except the regulated market Jayankondan the other two markets at Karur and Alangudi received practically no arrivals. During the month the prices of groundnut kernels ruled very high. Mostly country chekku owners and the co-operative oil producers societies operated in the market. Kernels were quoted between Rs. 180 to Rs. 214 per candy.

Gingelly: (A bag of Gingelly: 168 lbs.)

South Arcot District: The market started with an opening balance of 502 bags and the arrivals were 300 bags out of the districts produce and 202 bags from neighbouring districts is and outside state like Tiruchirapalli etc. The mills and chekkus consumed 512 bags and 61 bags were despatched to outside places. The state with the trade at the end of the month 431 bags.

Prices during the month ruled at Rs. 55/27 per bag as against Rs. 65/96 per bag in the previous month.

Tobacco: (In this section candy of 500 lbs).

Coimbatore District: The month under report opened with a stock of 19850 candys of chewing and 3355 candies of cheroot tobacco. About 5175 candys of chewing and 2100 candys of cheroot tobacco were estimated to have been exported to other districts like Madurai, South Arcot, North Arcot, Salem, Tanjore, Thirunelveli and Ramanathapuram in this state and places in Andhra, Kerala, Bombay, Mysore, and Pondicherry states. Reports into the district were mainly from Tiruchy, Salem and this state and from Andhra and Mysore besides local production. The prices of tobacco during the month as compared and to that of previous month whereas follows:

Prices per candy of 500 lbs.

Veriety	I Grade		II Grade		III Grade	
	Sep. 59.	Aug. 59.	Sep. 59.	Aug. 59.	Sep. 59.	Aug. 59.
1. *Chewing* (Sun cured):						
(a) Meenampalayam	400–510	400–500	300–400	275–375	150–260	150–250
(b) Other varieties	340–430	320–420	240–325	280–320	175–240	175–240
2. *Chewing tobacco:*						
Pitcured grown in Palladam & Erode	250–325	250–300	150–230	150–230	80–145	80–145
3. *Cheroot tobacco* (Suncured):						
Grown in Erode and Bhavani taluks	330–400	330–400	250–320	250–320	160–290	160–240

Cardamom: *Madurai District:* During the months there were fair to good rains received in the plantation areas in Kerala State and Madurai District. Spraying, Dusting, picking and curing of fruits were in progress. The arrivals in important assembling markets in Madurai District from local produce as well as from the produce of Kerala State were appreciable. The despatches from Bodinaickanoor were to Bombay, Delhi, Culcutta, Kanpur etc.

The following were the stock position with the trade in important assembling markets of Madurai district and terminal market of Virudhunagar of Ramanathapuram District.

Names of Assembling Markets	Opening Balance	Arrivals	Disposals	Closing Balance
		(Quantity in lbs.)		
1. Bodinaickanoor	6,000	2,08,000	1,94,000	20,000
2. Thevaram	500	26,500	22,000	5,000
3. Pannaipuram	1,500	15,000	13,500	3,000
4. Kombai	2,000	12,000	11,500	2,500

Names of Assembling Markets	Opening Balance	Arrivals	Disposals	Closing Balance
5. Uthamapalayam	500	7,500	7,000	1,000
6. Cumbum	65,000	25,000	55,000	35,000
7. Gudalur	500	5,500	5,000	1,000
8. Pattiveeranpatti	100	21,400	20,500	1.000
9. Virudhunagar	14,000	32,000	31,000	15,000
Total	90,100	3,52,900	3,60,500	80,000

Prices: The following were the prices of cardamom that prevailed in some of the important assembling and terminal markets during September 1959.

		Rate per lb.
1. *Bodinaickanoor:*		
(1) Special	Rs..	10·53
(2) Superior Bulk	,,	9·50—10·49
(3) Medium Bulk	,,	9·00—10·00
(4) Inferior Bulk	,,	8·50— 9·40
2. *Pattiveeranpatti:*		
(1) Superior and Bold	,,	10·44—11·06
(2) Medium and Bulk	,,	9·62—10·82
(3) Inferior and small	,,	8·95— 9·92
(4) Seeds	,,	11·40—11·66
3. *Virudhunagar:*		
(1) Bold quality	,,	10·87—11·25
(2) Smalls	,,	9·00— 9·75
(3) Rice (Seeds)	,,	12·00

Review of administrative activities of Market Committees during September, 1959

The Market Committees of South Arcot, North Arcot, Coimbatore, and Trichirapalli continued to function briskly during the month under report. Efforts are being made to revive the Market Committees of Ramanathapuram and Tirunelveli.

Enforcement :

Name of Committee	Section 5 (1) A	Section 5 (1) B	Section 5 (3) A	Section 5 (3) B	Weighmen A	Weighmen B
South Arcot Market Committee	163	2035	121	1448	116	1332
Coimbatore Market Committee	123	1778	76	1368	25	662
North Arcot Market Committee	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.
Trichy Market Committee	262	809	239	662	205	435

A = Licences issued during the month.
B = ,, ,, up to the end of the month.
N. A. = Not Available.

Meetings : No meetings were held in any of the Market Committees during the month.

Quality Competition : Nil

Quality Analysis : Nil

Edited and published by T. Nataraj, B. A., B. Sc. (Ag.), for the Madras Agricultural Students' Union and printed by A. Subramaniam, at The Coimbatore Co-operative Printing Works, Ltd., Coimbatore.