

305

The Madras Agricultural
Journal

1950 - December

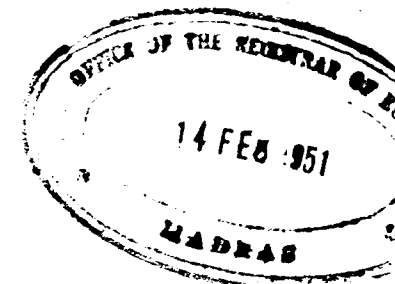
VOL. 37. NO. 12.



JL
Jm 211, N13
NSO. 37. 12
94682

556

egd. No. M. 5155



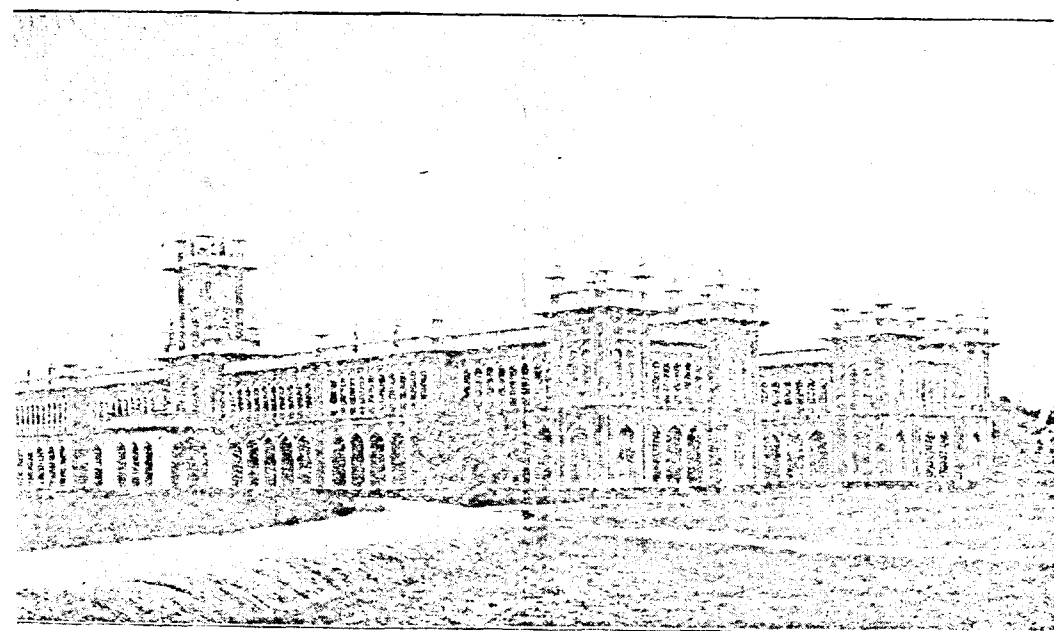
THE
MADRAS AGRICULTURAL JOURNAL

XXXVII

December 1950

305

No. 12



AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, COIMBATORE.

Published by
THE MADRAS AGRICULTURAL STUDENTS' UNION,
AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE,
COIMBATORE, S. INDIA.

Annual Subscription:

Inland Rs. 6—0—0

Foreign Rs. 7—0—0

Single Copy
As. 8

The Madras Agricultural Students' Union.

PATRONS.

1. Sri V. Arumugam Pillai, Sundaikamuthur, Coimbatore District
2. Dewan Bahadur C. Arunachala Mudaliar, Zamindar of Chunampet,
Chingleput District
3. Raja Sri Krishnachandra Gajapathi Narayana Dev, Maharaja of Parlakimidi,
Ganjam District
4. Raja Sri V. Madhava Rajah of Kollengode, Malabar District
5. Sri T. A. Ramalingam Chettiar, Coimbatore
6. Sir C. P. Ramaswami Ayyar, Trivandrum
7. Dewan Bahadur C. S. Rathnasabapathi Mudaliar, Coimbatore
8. Sri R. Jeevandass, Varnasi, Parlakimidi
9. G. R. Hilson Esq., Norwich, England
10. Sri Ramachandra Ananga Bhima Dev, Kesari Gajapathi,
Raja Saheb of Budokhemidi, Berhampore, Ganjam
11. Rao Bahadur K. T. Alwa, Mangalore
12. Sri Gurdial Singh Sidhu, C/o Sri S. Sant Singh Sidhu, Algom Khurd,
Lahore, Punjab
13. Sri R. K. Kandaswamy, "Brindavan", Tiruchi Road, Coimbatore
14. " G. D. Naidu, "Gopal Bagh", Avanashi Road, Coimbatore
15. " K. Tiruvankata Mudaliar, Munniyur, Andankarai Post,
(via) Alattambadi, S. I. R.
16. " S. Ramamurthy Iyer of Kunnam, Land-Holder and Secretary,
South Rajan Mirasdars' Association, "Vibrajee", Alangad
17. " G. Karuthiruman, Nanjai Pulimpatti, Thukkanaickanpalayam,
(via) Bhavani
18. " K. Kandaswami Naidu, B. A., B. L., Gopalapuram, Coimbatore

OFFICE-BEARERS FOR 1950-'51.

- | | |
|---|---|
| <p>94682</p> <p>Council (16 Members)</p> <p>President
President Vice-President
Editor
Secretary</p> <p>Ex-officio Vice-Presidents</p> <p>V. T. Subbaiah Mudaliar
S. N. Venkataraman
D. Viswanatha Reddy</p> <p>Ex-officio Members</p> <p>K. Ramaswami
P. C. Sahadevan
M. R. Balakrishnan
K. Rama Rao</p> <p>Resident Members</p> <p>D. Maruda Rajan
S. Ramachandran
K. C. Thomas
M. Sundaram, Secretary,
Students' Club (ex-officio)
C. D. Samuel (Student)</p> | <p>Managing Committee (10 Members)</p> <p>Resident Vice-President
Editor
Secretary
M. Vaidyanathan (Manager)
K. Kupparamuthu (Treasurer)
K. Meenakshisundaram, Member
U. Achutha Warier
G. Rangaswami
M. Sundaram, Secretary,
Students' Club (ex-officio)
L. Robinson (Student)</p> <p>Editorial Board (8 Members)</p> <p>Editor
Secretary
Manager
Dr. N. Krishnaswami
S. Sampath
C. Balasubramaniam
M. Sundaram, Secretary,
Students' Club (ex-officio)
J. Chandra Mohan (Student)</p> |
|---|---|

"MARUT" FOOT PUMP

A ONE-MAN OPERATED FOOT PUMP WITH A HUNDRED AND ONE USES

FOR

Spraying Disinfectants in houses and stables, on cattle and poultry.

High-pressure wash motor cars and trucks.

Cleaning Windows.

Spraying Insecticides on gardens, standing crops, fruit trees, coconut and arecanut trees, etc.

Spray lime-washing and distempering Walls.

Watering Gardens.

Spraying long distances or high altitudes according to length of hose attached.

Continuous spraying without refilling and without moving from place to place.

AN IDEAL FIRE-FIGHTING EQUIPMENT.

Fitted with an adjustable tripple-action nozzle for a Fog Spray, Coarse Spray or Long Distance Solid Jet.

ALL SPARE PARTS ALWAYS AVAILABLE.

Manufacturers:
American Spring & Pressing Works,
GHODBUNDER ROAD, SANTA CRUZ,
BOMBAY-23.

Sole Distributors:
Agri-Orient Industries, Limited,
NAGINDAS CHAMBERS, FRERE ROAD,
FORT, BOMBAY-1.

When answering our advertisers, please mention 'The Madras Agricultural Journal'



JOE :- I am getting married again, Bill.

BILL:- But, I thought you never committed the same mistake twice.

DO NOT ALLOW THIS OVERTAKE YOU.

You need the right machines for the right job.

LET THE EXPERTS ADVISE YOU FREE:

GARLICK & COMPANY LTD.,

(ESTD. 1878)

MECHANICAL & SANITARY ENGINEERS,

Importers, Stockists & Representative of Foreign Manufacturers,

26, ERRABALU CHETTY STREET, MADRAS-1.

Head Office:

Jacob Circle, BOMBAY - 11.

Branch:

Cox Street, COIMBATORE.

The Madras Agricultural Journal

Vol. XXXVII

DECEMBER 1950

No. 12

CONTENTS.

PAGE.

Editorial	...	...	473
<i>Original Articles :</i>			
1. Rainfall and crop yields in Madras State — A preliminary study	...	...	475
By M. B. V. Narasinga Rao, C. Balasubramaniam and M. V. Jayaraman			
2. On the Tuber Development of four Important Varieties of Potato in the Nilgiris ...	...	...	484
By P. Uttaman and M. D. Azariah			
3. The Araku Valley Scheme	...	...	487
By K. Bhushanam			
4. Fasciated Pedicels in a Variety of Capsicum annum L.	...	...	495
By J. Saktharam Rao			
5. Floral Abnormalities in Jack	...	...	497
By P. C. Sahadevan, A. Abdul Samad and K. C. P. Menon			
6. Storage of Gur in Madras	...	...	499
By S. V. Parthasarathy and M. Lakshmikantham			
Weather Review	...	...	503
Departmental Notifications	...	...	505
Library	...	...	507

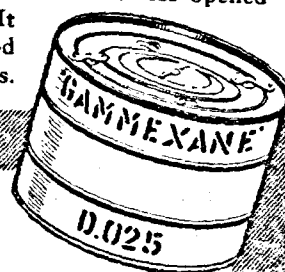


farmers' ally

THE earth is turned by the plough, later the fields become green with new crops. Yet the farmer is worried—worried by Rice Hispa, one of the most common pests of paddy in India. Rice Hispa attacks the paddy plants in their early growth. 'Gammexane' D.025 has opened

up an entirely new sphere in plant protection. It is a great asset in these difficult days when food supplies are one of our greatest problems.

Simple in application yet inexpensive, 'Gammexane' D.025 should be dusted over the crop as soon as the first signs of the insect are detected in the field. 'Gammexane' D.025 at 15 to 20 lbs. per acre, broadcast by hand, will give complete control.



'GAMMEXANE'
DUST D.025
CONTROLS RICE HISPA

Price details and technical advice from

IMPERIAL CHEMICAL INDUSTRIES (INDIA) LTD.

Calcutta Bombay Madras Kanpur New Delhi Cochin

G-3/2 ED

When answering our advertisers, please mention 'The Madras Agricultural Journal'

The Madras Agricultural Journal

Vol. XXXVII

December 1950

No. 12

Editorial

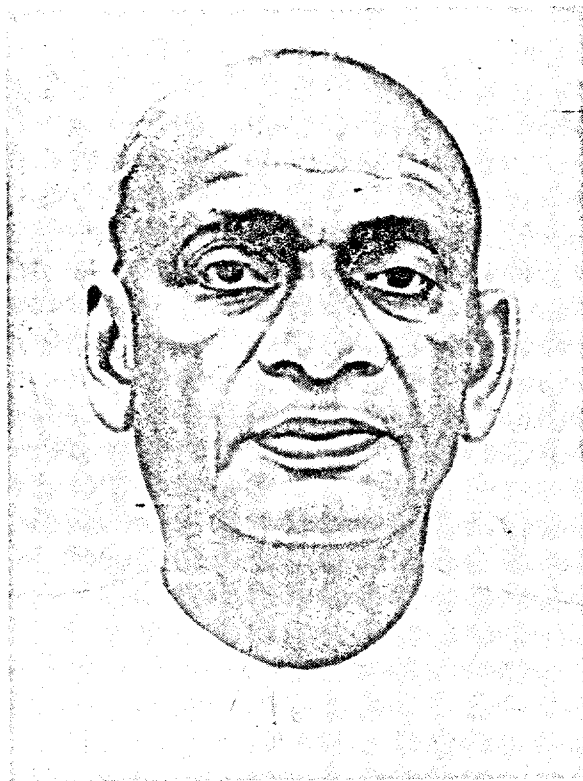
Conflicting Doctrines about soils: This is the title of a recent publication by Charles Kellog, reprinted under the auspices of the Food and Agriculture Organisation of the United Nations, which sets out in a vigorous, thought-provoking manner, the complexities that surround our conception of soils and the hidden fallacies that lurk in most of them.

Long ago, four wise men of the East, who happened to be also blind, set out to fulfil a long-felt desire to find out what an elephant was like. When led up to the animal, each began to build up his mental concept of the beast by passing his hands over the portion nearest his reach. One, who got the trunk, said the elephant was exactly like a huge snake; another, who felt the tusk, shouted that the elephant was hard and smooth and pointed like a spear; the third who felt the flanks, said it was like a wall, while the fourth wise man, who got only the tail, concluded it was none of these things but was just like a rope, with some bristles at one end.

In the present state of knowledge, our concepts about soils are almost on a par with this. Though for centuries immemorial, man has been a son of the soil, tilling, toiling and sweating over it, the fundamental questions, as to what exactly soils are, why they vary so much from place to place, in appearance, properties and in productivity, why some soils remain good and fertile for centuries, while others deteriorate within a short period, these still remain as questions, for which adequate answers are yet to be found.

One of the earliest and most popular of concepts is the one promulgated by the great German chemist, von Liebig, more than a century ago, which visualises the soil as a storage bin of plant nutrients. The merit of this view was its straightforward explanation in terms of chemistry of the source of plant nutrient elements. Liebig maintained that crops grew in direct proportion to the increase or diminution of nutrient elements in the soil. Being so simple and seemingly so reasonable, this theory had, and still has, a very wide vogue though Liebig himself once became very unhappy over his theory when he found in the Danube valley, soils which should have been sterile long ago, but which were actually producing better crops than before, without any fertilisers. Even today many people, even those scientifically trained, believe that the soil is just like a bank, where one should put in what is taken out in the shape of crops.

This storage bin concept of soils received support from the early geologists as well, to whom soils were merely pulverised rocks. With the advance of biological knowledge, micro-organisms and organic matter were added to this concept, but without any radical



SARDAR VALLABHAI PATEL

Architect of India's Unity.

Born: 31—10—1875.

Died: 15—12—1950.

It is with great sorrow that we record the death of one of India's foremost national leaders, Sardar Vallabhai Patel, Deputy Prime Minister of India. He crowned a lifetime of arduous struggle in the fight for India's freedom, by the truly astonishing achievement of merging six hundred and odd semi-independent states, into the framework of the Indian Nation. May his soul rest in peace and may we prove worthy of the precious legacy of unity he has bequeathed us.

alteration of the central idea. It was left to the Russians to dig into the soil and see whether it was really like what it was assumed to be in the storage bin theory. They found that soils in nature were made up of a series of layers or "soil horizons" reaching from the surface to a depth of one foot or many feet. It was also realised that all sorts of soil types, varying widely in colour, chemical composition and productivity, were often found, derived from the same kind of parent rocks; in fact, soil types were found to be more closely related to the climate, rainfall and vegetation than to the kind of parent rock. Whereas rocks are distributed over the earth, more or less promiscuously, areas of individual soil types occur in an orderly geographic pattern. Each distinct combination of climate, vegetation, parent rock, relief and time known as the five "genetic factors" gives a soil type with a distinctive set of features and properties.

It has also to be recognised that soils are subject to ever-changing processes of denudation, accumulation and sometimes transportation as well. The surface is constantly being eroded away, and the upper portion of the layer next below the surface is gradually changed into the surface soil. Silt deposits in riverine tracts and in some places volcanic dust also constitute important soil-forming agencies. Rain brings down soluble materials from the air, the percolating water leaches out materials, and evaporation of soil water leaves a crust of various salts on the surface and so it goes on. These physical and chemical changes are further modified by plants, animals and micro-organisms.

As a sort of reaction against the storage bin concept, a number of biological theories have been put forward regarding soils. No doubt a greater recognition of the vital role of biological factors is desirable, but the advocates of the "organic school" go to the other extreme, insisting that organic matter is everything and that chemical fertilisers are downright poisons. They claim that the use of compost and farmyard manure confers special qualities to plants, that they are not only kept free of insects and diseases, but also make the persons who consume them more healthy. Within this organic group itself there are separate schools, some as adherents of Goethe and Rudolph Steiner, others like Howard who derived their views from experience in tropical countries. These organic faddists have made elaborate rituals out of compost making. Very fine shades of differences are magnified into vital differences and some have special "secret" concoctions for compost making, that are claimed to encourage special micro-organisms. To these faddists it is an unforgivable sin to add any chemical nitrogen such as ammonium sulphate or nitrate to compost. Rock phosphate is permissible, but superphosphate is tabooed, because a strong poison, sulphuric acid, enters into the making of it. By the same token, common salt should never be used at all, being the resultant of two strong poisons!

The organic theorists further claim that composts (made according to each particular faddist's ritual) furnish to plants, not only all the elements that the chemists say they need, but also a vital principle produced only by living matter and transmitted to growing plants through such organic manures.

Needless to say much of all this is pure speculation, but like many theories of a metaphysical nature, it is very difficult to prove them wrong. Such speculations are also unfortunate, because a great deal of what the "organic school" say is sound, even if the reasons they assign are unbelievable.

Such conflicting doctrines, however, serve one good purpose; they serve to make us pause and consider whether we really know all that is necessary to be known about soils. A realisation of ignorance is the best incentive to knowledge.

Rainfall and crop yields in Madras State— A preliminary study

By

M. B. V. NARASINGA RAO, B. A., B. SC. (Ag.), A. I. A. R. I.
(Paddy Specialist)

C. BALASUBRAMANIAM, B. A., B. SC. (Ag.)
(Agricultural Meteorologist)

and

M. V. JAYARAMAN, B. SC., B. SC. (Ag.)
(Assistant in Agricultural Meteorology)

(Received on 5—7—1950)

It is common knowledge that an intimate relation exists between rainfall and crop production. The quantity of rainfall received is as important as the nature of its distribution. "Unseasonal rain is as bad as untimely food". The unpredictable nature of distribution of rainfall is the reason for the oft-quoted saying that "Agriculture is a gamble with the monsoon."

In considering the influence of rainfall on yield, scientists refer to the "effective rainfall", which means that portion of the total precipitation, which gets actually soaked in the soil and thus becomes available for the nutrition of plants. The effective rainfall received at a place affects the texture of the soil, its nitrogen content and its pH value (iii & iv). Again the water-retaining capacity of the soil depends on its slope, internal structure and humus content. The amount and distribution of water in the soil influences not only every phase of soil formation but also the relationship between the soil and the growing plants (ii). Soils vary widely in their capacity to absorb moisture, particularly during rainy seasons. The important points to be borne in mind when we consider soil moisture in connection with crop growth are (i) the depth to which rain water gets soaked into the soil and (ii) its retention in a particular depth of the soil. Briggs and Shantz (i) found that the water required for the formation of one pound of dry plant material may vary from 250 to 1,000 lb., depending upon the crop in question. It becomes evident, therefore, that cultivated crops can give normal yields only when they get sufficient water from the soil to meet their nutritional demands. Lack of water during any portion of crop growth will be reflected in a lowering of yield. Plant tolerance to drought may be both natural and induced, but the basic needs of moisture must be available for the crop if normal yields are to result.

As the main source of supply of moisture in the soil is only rainfall, the study of the inter-relation between the annual rainfall of the Madras State and the yields of different crops was undertaken. The data of annual rainfall for the years 1902-1903 to 1947-1948 and the corresponding

data pertaining to the area and acre yield of different crops were culled from the "Season and Crop Reports", published by the Civil Supplies Branch of the Board of Revenue, Government of Madras. In regard to area, groups of crops like millets and oilseeds were taken into consideration. In the case of majority of crops yield data could be obtained only from 1917-1918 onwards.

It is well to remember that the yield per acre as given in the "Season and crop Reports" is based on "Normal yield" and "Anna value". The lack of exactitude of the definition of "Normal yield" (average yield on average soil in a year of average character) and the indefiniteness of the "Anna value", known otherwise as "Seasonal Factor" or "Condition Factor", assessed by eye-judgment by village officials, set a limit to the accuracy of the acre yield data. However it may be expected that the available data of yield per acre would give some indication of the influence of weather. (vi)

Method: Twenty-four total correlations were worked out, nine for areas under different groups of crops or individual crops and rainfall and the rest for acre-yields of individual crops and rainfall. In the case of unirrigated paddy, Malabar and South Kanara were treated separately as the rainfall is very high in these districts. In regard to tenai, the Ceded districts were considered as one unit, as 90 per cent of the total area of tenai in the State is in Ceded districts. All the nine correlations and relevant particulars related to area of unirrigated crops and rainfall are presented in Table I. The remaining fifteen correlations and details pertaining to the influence of rainfall on the yield of crops are also given in Table I.

Four graphs were prepared with rainfall and acre-yield data collected for paddy, millets, oil seeds and cotton.

Interpretation of the correlations and the graphs drawn in this connection:

(I). *Rainfall and area under cultivated crops:* None of the nine correlations worked out in this connection is significant. This apparently shows that the ryots do not anticipate failure of rains but sow the seeds in the available area in anticipation of good seasonal rainfall and are even prepared to take a risk before the season is lost.

(II) *Rainfall and acre-yield of cultivated crops:*— (i) *Paddy:* Separate correlations were worked out for the yield of paddy, irrigated and unirrigated, and the rainfall of the State. The yield of unirrigated paddy in Malabar and South Kanara districts was correlated separately with the annual rainfall of the State.

The yield of irrigated paddy of the State bears a significant correlation with the total rainfall of the State indicating that even irrigated paddy is influenced by rainfall, since our irrigation sources depend on rainfall for their freshes.

The yield of unirrigated paddy has also got a significant correlation with the rainfall of the State, showing that unirrigated paddy is benefited by increased rainfall. Untimely heavy falls do not seem to have any adverse effect as they are confined only to limited areas when compared to the size of the State.

The yield of rainfed paddy in the West Coast also bears a significant correlation with the rainfall of the State, while that in the other districts of the State bears a highly significant correlation with rainfall at ($P = .01$ level) even though a few large deviations were found in the "Goodness of fit" test.

The graph reveals that the yields of paddy, irrigated as well as unirrigated, were low in the years 1918-1919, 1920-1921, 1926-1927, 1934-1935, 1938-1939 and 1945-1946, mainly due to the low average rainfall of the State. In 1926-1927 the yields of paddy had not fallen as the "season was better than the previous three years on the West Coast" (v).

In 1934-1935 the yield of irrigated paddy maintained itself at the level of the previous year, in spite of the decrease in the rainfall. In 1945-1946, the yield of unirrigated paddy in Malabar and South Kanara districts and consequently that of the whole State increased in contrast to the rainfall of the State, because "the season was generally fair in South Kanara" (v).

In 1941-1942 even though the rainfall was below the average, the yield of dry paddy showed an increase while the yield of irrigated paddy did not change, but in 1942-1943 an increase in the rainfall of the State has depressed the yield of dry and wet paddy due to "inadequate and ill-distributed rainfall in both the monsoons" (v).

The increase in the yield of paddy was not proportionate to the increase of rainfall in the years 1931-1932, 1939-1940 and 1946-1947. "In 1931-1932 paddy was adversely affected by cyclone in the South-East of Madras". The year 1939-1940 had very ill-distributed rainfall in time as well as in space. In 1946-1947 also crops were affected by heavy rains in November and December.

That rainfall has a very striking effect on the yield of irrigated and unirrigated paddy is beyond question. Though the distribution is also important, it would appear that, if rains are adequate, the distribution also will be fair and the yields will be normal or above normal. Bad yields were mostly attributed to defective rainfall in the "Season and Crop Reports."

To verify the significance of the correlations obtained above, regression equations of the significant correlations were worked out. It is seen that the value of X^2 was somewhat higher due to a few extreme values. If these are not taken into consideration the value of P lies between 0.1 to 0.3 in most of the cases. Thus it may be stated that the linear regression does not fully explain the yield and rainfall correlation and other factors may be at work. Probably by working out correlation between yield and the rainfall during the season of a particular crop and working out partial correlations, taking into account critical periods of rainfall, a better picture of the correlation of yield and rains may be obtained. This will be taken up in subsequent publications.

Millets: (a) *Cholam*: (*Sorghum* spp.) There is no significant correlation between the acre yield of cholam and rainfall of the State. This shows that in years of drought the crop does not fail completely and in years of excess rainfall does not record bumper yields. This millet is sown mostly on black cotton soils after sufficient moisture is received, and hence the amount of rainfall does not interfere, unless there is a very bad drought for months. This is reflected in the absence of significant correlation between annual rainfall and yield of this millet.

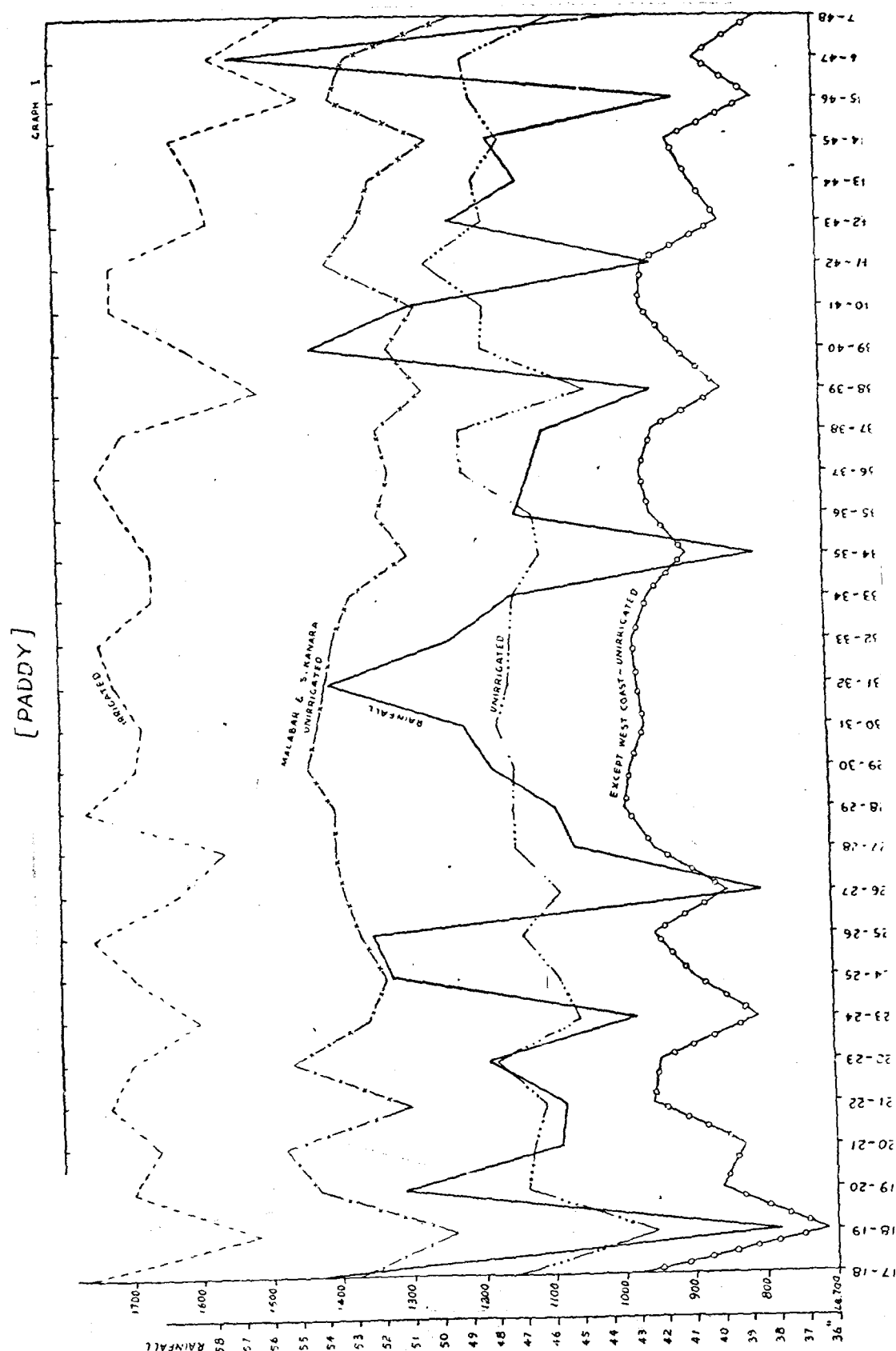
(b) *Tenai*: (*Setaria italica*) The correlation of acre yield of *Tenai* with the annual rainfall of the Ceded districts alone, where 90 per cent of the total area of the State under *Tenai* is concentrated, is significant. This may be due to the fact that *Tenai* is raised on lighter types of soil and hence heavier falls benefit the crop immensely.

(c) *Cumbu*: (*Pennisetum typhoides*) The acre yield of *cumbu* bears a significant correlation with the annual rainfall of the State. This indicates that *Cumbu* responds well to higher rainfall.

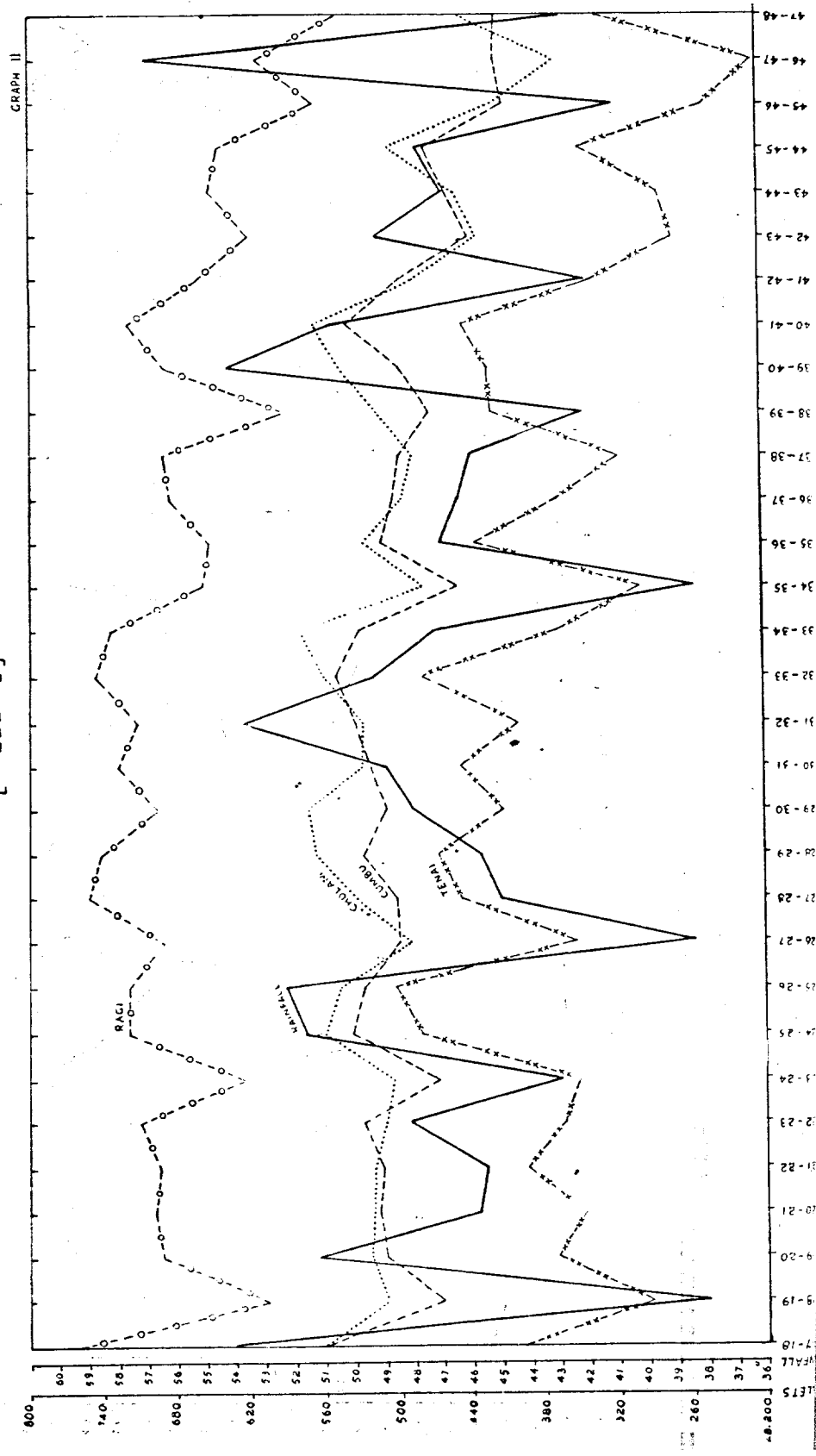
(d) *Ragi*: (*Eleusine coracana*) *Ragi* is generally grown under irrigated conditions in rich soils. But it is grown also under unirrigated conditions to the tune of about eight lakhs of acres in this State. The yield of *Ragi* has got a significant correlation with rainfall, indicating thereby that *Ragi* is benefited by higher rainfalls.

Incidentally the following observations may be recorded. The normal yield of *Ragi* (unirrigated) is 678 lbs. per acre while that of *cumbu* is only 498 lbs. per acre. Therefore, in portions of Chittoor and Salem districts where nearly 1,46,000 and 2,79,000 acres are grown under rainfed *cumbu*, it may be advisable to substitute *ragi* for *cumbu*, taking into consideration soil fertility factors. As a matter of fact, certain ryots in Chittoor district have already taken to this change over.

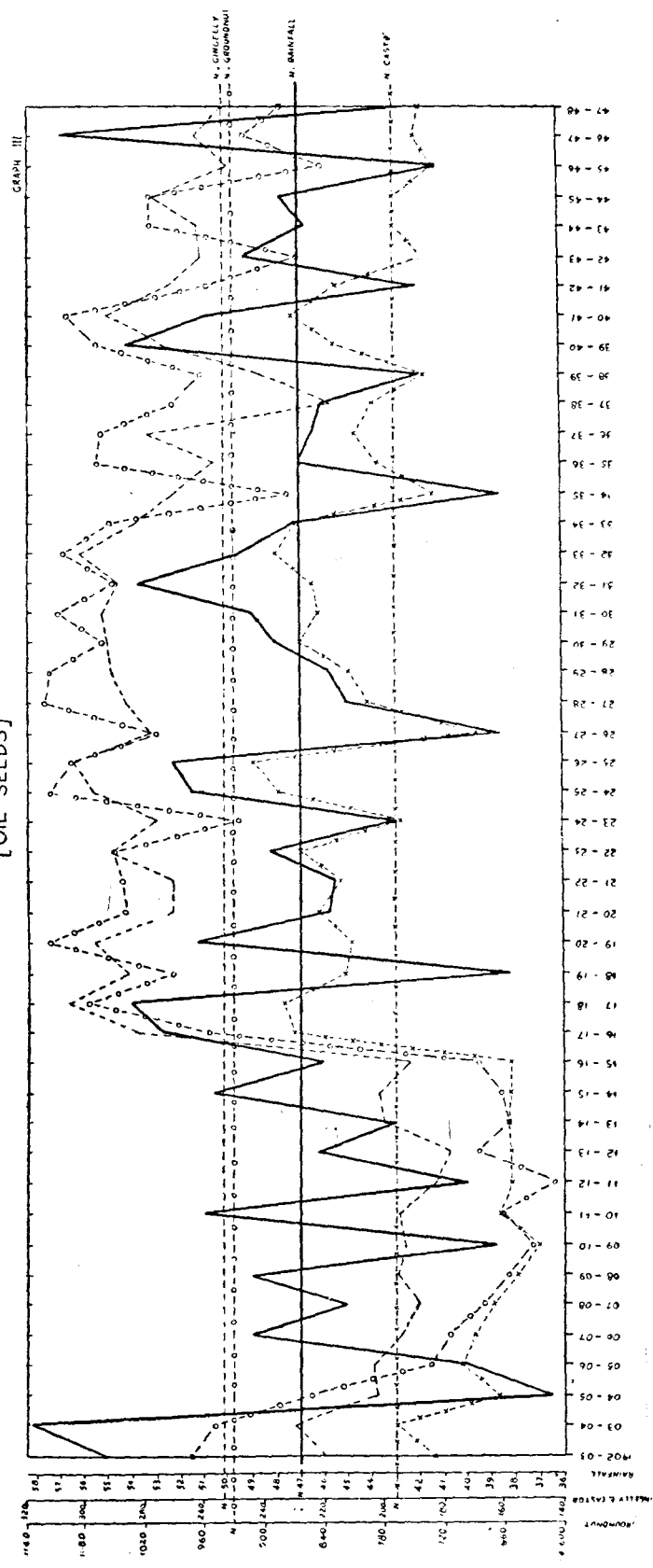
The graph reveals that there is a general fall in the yield of all the crops in the years 1918-1919, 1923-1924, 1926-1927, 1934-1935, 1941-1942, 1942-1943 and 1945-1946. In all these years except

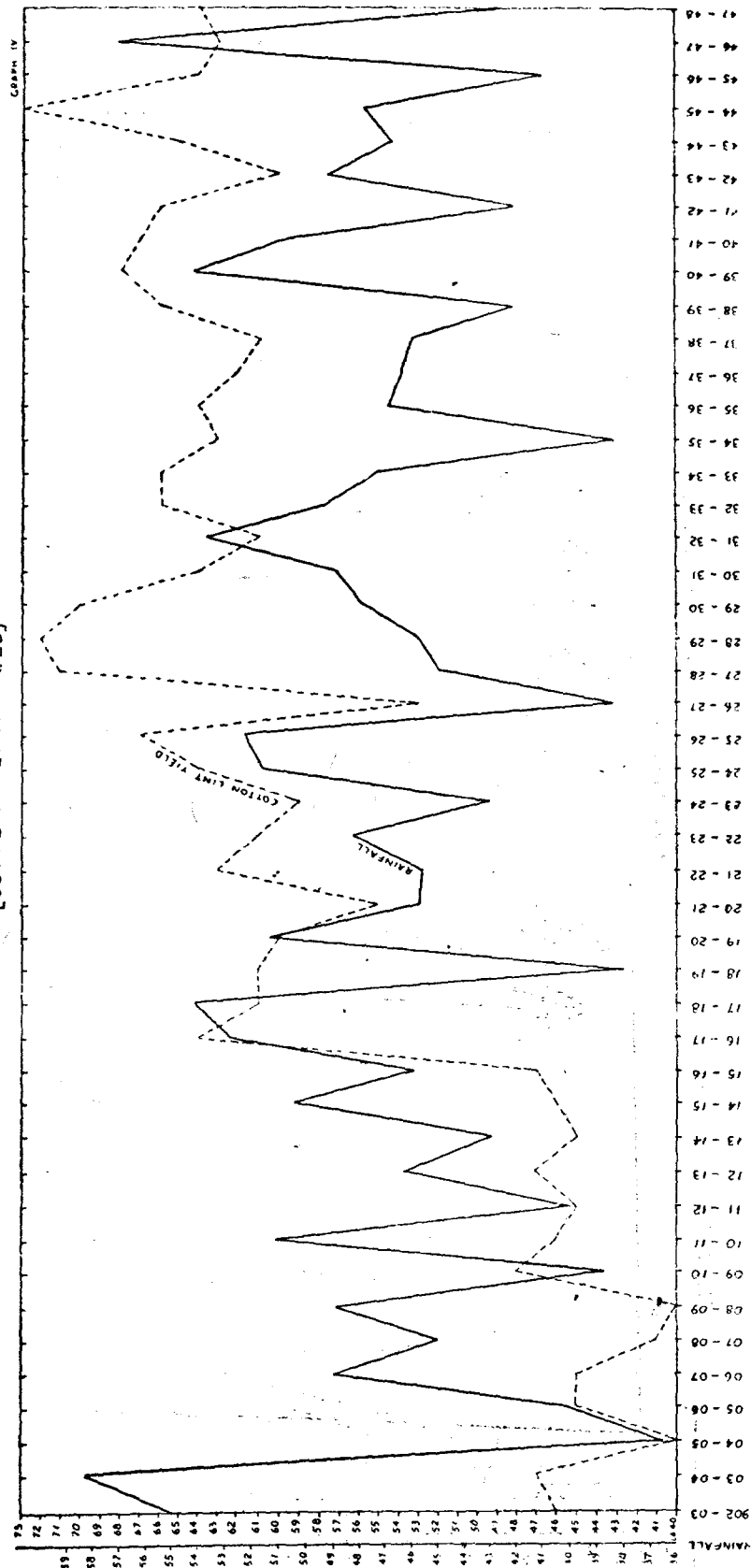


MADRAS PROVINCE - RAINFALL AND ACRE YIELD [MILLETS]



MADRAS PROVINCE - RAINFALL AND ACRE YIELD [OIL SEEDS]



MADRAS PROVINCE - RAINFALL AND ACRE YIELD
[COTTON - LINT YIELD]

1942-1943 the fall in the yield may be due to low rain-fall of the State. In the year 1942-1943, even though the rainfall of the State was above normal by 2 inches, the yields of millets were low. This has been attributed, in the Season and Crop Report of that year, to the untimely rainfall which affected *cumbu* in Madhurai, Ramanathapuram and Tirunelveli districts.

As in the case of paddy, in millets also, there was a downward trend of yield after 1940-1941 owing to unfavourable seasons in 1941-1942, 1945-1946 and 1947-1948 and untimely heavy and ill-distributed rainfall, favouring incidence of insect pests and diseases in the rest of the years.

(III) *Oilseeds*: The annual rainfall of the State was correlated separately with the yields per acre of gingelly, groundnut and castor, for forty-one years from 1902-1903 to 1947-1948.

(a) *Gingelly*: The yield of gingelly has no significant correlation with the total annual rainfall. This, in part, may be due to the fact that the gingelly crop requires very limited moisture, and that too only at particular periods. Correlation of yield with seasonal rainfall may show some significance. This will be attempted in a later paper.

(b) *Groundnut*: The yield per acre of groundnut has got a positive significant correlation of 0.3116 ± 0.1432 , showing that, inspite of its being a weak one, the yield of groundnut is influenced by the rainfall received during the year. This is because groundnut is grown generally from July-August to November-December when the South-West monsoon and North-East monsoon are active. Further, the soils in which groundnut is grown are of a light type and this makes it all the more obvious, that groundnut requires rainfall in abundance during its growing season and for the successful penetration of the gynophore into the soil.

Though untimely heavy fall, such as the one received soon after sowing and during the flowering phase may adversely affect the yield, such incidence is negligible when the whole State is taken into consideration.

(c) *Castor*: The acre yield of castor also has got a positive significant correlation with the rainfall of the State. This may be explained by the fact that as castor is generally grown in poor soils and occupies the ground for almost the whole year, it gets the full benefit of rainfall received during the year.

The graph reveals that there was a progressive deterioration in the yield per acre of groundnut from 1902-1903 to 1909-1910 irrespective of the fluctuations of rainfall during the same period. From 1916-1917 onwards there was a general increase in yield of all the crops viz. gingelly, castor and groundnut. This was mainly due to a revision of policy by the

Board of Revenue in estimating crop yields. The yield of groundnut, thereafter, fluctuates almost in the same manner as rainfall except in the years 1929-1930, 1931-1932 and 1942.

(IV) *Cotton*: The yield of lint per acre of rainfed cotton was correlated with the rainfall of the State for the period of 46 years from 1902-1903 to 1947-1948. The yield has a positive correlation with rainfall but it is not significant. This indicates that the yield of cotton is influenced also by factors other than the rainfall of the State. Cotton is very easily susceptible to pests and diseases.

The study of the graph reveals that depressions in rainfall have caused similar reductions in cotton yields in the years 1904-1905, 1911-1912, 1923-1924, 1926-1927, 1934-1935 and 1945-1946. In 1934-1935 the yield of cotton did not fall so low as the rainfall of the year. There had been an increase in the yield of cotton in the years 1909-1910 and 1918-1919 in spite of low rainfall. There had also been decrease of yields in the years 1931-1932, 1942-1943 and 1947-1948 in contrast to the increase of rainfall, mainly due to adverse weather conditions.

V. *Sugarcane*: The acre yield of jaggery from sugarcane, was correlated with the rainfall of the State for 46 years. The correlation, though positive, is not significant. This is because sugarcane is mainly grown under irrigated conditions and the yield is also more influenced by manuring, cultural operations and varieties than by rainfall.

Summary and Conclusions

(a) *Paddy*: Though in paddy fields water stands always to a depth of 2 inches the crop responds well to timely monsoonic showers. Paddy, which is by nature a water-loving plant, is significantly influenced by rainfall, when raised under purely rainfed conditions.

(b) *Millets*: (i) *Cholam*: In years of drought the crop does not fail completely and in years of excess rainfall does not give a bumper yield. It requires only optimum amount of timely rains.

(ii) *Tenai*: The total rainfall influences the yield of *Tenai* of the Ceded districts.

(iii) *Cumbu*: It responds well to higher rainfall and requires more soil moisture than cholam.

(iv) *Ragi*: In heavy rainfall years *ragi* records higher yields.

(c) *Oilseeds*: (i) *Gingelly*: In view of its varying sowing seasons in different districts in the State, its short life-period in the field, high

susceptibility to pests and diseases and sensitiveness to adverse weather conditions, it is not possible to record from the available data, as to whether the crop responds well or ill to the rainfall received.

(ii) *Groundnut*: The yield of groundnut is directly proportional to the rainfall received during its growth period. Yield depends on the successful penetration of the gynophore, which, in turn, mainly depends on optimum soil moisture conditions.

(iii) *Castor*: Though drought-resistant by nature, this crop responds well to higher rainfall. By virtue of its long span of life in the field of nearly one year, it gets the maximum benefit from the rainfall received in any year.

(d) *Cotton*: Besides rainfall, there are other factors also that determine the yield of cotton. Rainfall has an appreciable, though not a decisive influence on cotton yields.

(e) *Sugarcane*: Nothing definite can be said in regard to this crop since it is seldom cultivated under purely rainfed conditions, except perhaps in South Kanara where it is grown under very favourable rainfall conditions.

Conclusion: It is to be mentioned that more revealing information of the effects of rainfall on the yield of crops will be obtained if multiple correlations between rainfall at different periods and the yields are worked out. As yield is also dependent upon other climatic factors such as sunshine, humidity etc., partial correlations between yield and different elements of weather may throw more light on the problem of yield. It is hoped that these aspects will be dealt with in later publications.

Acknowledgment: The authors are grateful to the Director of Agriculture for his encouragement to write up this note and to the Senior Lecturer in Agriculture, Coimbatore for his help in part compilation of the data.

REFERENCES.

- (i) Briggs L. J. and Shantz, H. L. 1914. Relative Water Requirements of Plants—Journal of Agricultural Research—3: 1-64.
- (ii) Climate and man:— Year Book of Agriculture, 1941, United States Department of Agriculture, Washington.
- (iii) Jenny, Hano. 1935. The clay content of the soil as related to climatic factors, particularly temperature. Soil Science, 40: 111, 128.
- (iv) and Leonard, Chester D. 1934, Functional Relationship between Soil Properties and Rainfall, Soil Science, 38: 363-381.
- (v) Season and Crop Report of the Madras Province, Published Annually for the Agricultural years 1902-'03 to 1947-'48.
- (vi) L. A. Ramdas and R. J. Kalamkar, 1938, Statistical Investigation on "Crop Weather Relationships in India" Sankhya Vol. 3, Part 3.

TABLE I.

S. No.	Details of Correlation	Correlation Co-efficient r.	Significant or not	Regression equations for significant correlations *Where Y is the expected yield in lbs. and X is annual rainfall for the State
1.	Rainfall and area under paddy (unirrigated) in Malabar and South Kanara	- 0.0612 ± 0.1505	Not	...
2.	Rainfall and area under (unirrigated) paddy in the whole State	+ 0.0002 ± 0.1857	Not	...
3.	Rainfall and area of <i>Cholam</i> (unirrigated) in the whole State	- 0.1181 ± 0.1497	Not	...
4.	Rainfall and area of <i>Ragi</i> (unirrigated) in the whole State	+ 0.0086 ± 0.1857	Not	...
5.	Rainfall and area of <i>Tenai</i> (unirrigated) in the Ceded districts	+ 0.2412 ± 0.1802	Not	...
6.	Rainfall and area of <i>Tenai</i> in the whole State	+ 0.0350 ± 0.1856	Not	...
7.	Rainfall and area of <i>Cumbu</i> (unirrigated) in the whole State	+ 0.1213 ± 0.1844	Not	...
8.	Rainfall and area under Oil Seeds (Castor, Groundnut, and gingelly) in the whole State	+ 0.0835 ± 0.1502	Not	...
9.	Rainfall and area under Cotton (unirrigated) in the whole State	+ 0.0188 ± 0.1856	Not	...
10.	Rainfall and acre yield of Paddy (irrigated) in the whole State	+ 0.4011 ± 0.1701	Significant	$Y = 7.2804 X + 1309$
11.	Rainfall and acre yield of Paddy (unirrigated) in the whole State	+ 0.4281 ± 0.1678	Significant	$Y = 5.3830 X + 889$
12.	Rainfall and acre yield of Paddy in Malabar and South Kanara for thirty one years	+ 0.2486 ± 0.1799	Not	...

S. No.	Details of Correlation	Correlation Co-efficient r.	Significant or not	Regression equations for significant correlations *Where Y is the expected yield in lbs. and X is annual rainfall for the State
13.	Rainfall and acre yield of Paddy in Malabar and South Kanara for forty six years	+ 0.3324 ± 0.1422	Significant	$Y = 6.5504 X + 1000$
14.	Rainfall and acre yield of paddy (unirrigated) in the whole State except Malabar and South Kanara Districts	+ 0.4892 ± 0.1620	Significant	$Y = 7.1284 X + 569$
15.	Rainfall and acre yield of <i>Cholam</i> (unirrigated) in the whole State	+ 0.1900 ± 0.1824	Not	...
16.	Rainfall and acre yield of <i>Cumbu</i> (unirrigated) in the whole State	+ 0.3779 ± 0.1719	Significant	$Y = 3.1733 X + 349$
17.	Rainfall and acre yield of <i>Ragi</i> (unirrigated) in the whole State	+ 0.4174 ± 0.1688	Significant	$Y = 4.8053 X + 452$
18.	Rainfall and acre yield of <i>Tenai</i> (unirrigated) in the whole State	+ 0.2962 ± 0.1773	Not	...
19.	Rainfall in Ceded districts alone and acre yield of <i>tenai</i> in Ceded districts	+ 0.4764 ± 0.1633	Significant	$*Y = 8.0684 X + 146$
20.	Rainfall and acre yield of gingelly in the whole State	+ 0.2471 ± 0.1461	Not	...
21.	Rainfall and acre yield of castor in the whole State	+ 0.4072 ± 0.1377	Significant	$Y = 2.1223 X + 96$
22.	Rainfall and acre yield of groundnut in the whole State	+ 0.3116 ± 0.1432	Significant	$Y = 9.7133 X + 473$
23.	Rainfall and acre yield of sugarcane (irrigated) in the whole State	+ 0.1615 ± 0.1488	Not	...
24.	Rainfall and acre yield of cotton (unirrigated) in the whole State	+ 0.1481 ± 0.1491	Not	...

Note:— * Rainfall of Ceded districts alone to be taken as value of (X)

On the Tuber Development of four Important Varieties of Potato in the Nilgiris

By

P. UTTAMAN, B. sc., (Ag.) M. sc., (Md.) M. sc., (CORNELL)
Superintendent

and

M. D. AZARIAH, B. sc., (Ag.)
(Farm Manager, Agricultural Research Station, Nanjanad)
(Received 6—11—1950)

Introduction: In the State of Madras, the Nilgiris district enjoys a cool, equable climate and is well suited for potato cultivation. No less than three crops are raised in a year. When there is demand in the market the ryots harvest their crop even before the haulms have dried up. With a view to find out the correct stage of harvest to secure maximum yield, a study of the tuber development in four of the more important commercial varieties of potato that come up well in the Nilgiris was undertaken.

The literature giving information on tuber development in potato is very scanty. Werner (1917) working at the North Dakota Station, U. S. A. found that tubers of the variety Green Mountain harvested in August 10, 20 and 30 and in September 8 and 11 showed a daily increase of 2.34 bushels during the last 3-day interval. The total yield secured in August 10 was 121.6 bushels per acre, as compared against 220 bushels secured in September 11. Kohler (1909) experimenting with the variety Early Ohios at the Minnesota University Farm, by digging tubers at 7-day intervals from July 31 to August 30 obtained a daily increase of marketable potatoes at the rate of 7.18 bushels per acre. The daily gain near the end of the period was lower as the foliage died.

Material and Methods: The four varieties studied included Great Scot, Royal Kidney, Duke of York and President. These were planted in the summer of 1949. Uniform seed tubers weighing 2 ounces were used. The plot received a basal dressing of farm yard manure and the modified Nanjanad manure mixture at the usual rate.

The sprouts emerged from the soil after three weeks from planting. Tubers from 10 plants were dug out and their weights recorded at 10-day intervals, beginning from the 50th day after planting as the tuber formation is known normally to start from the 45th to the 50th day of planting.

Experimental Results: The average weight of tubers from a single plant calculated from 10 plants and the percentage of weight to the final weight for all the varieties under trial are furnished below:

TABLE-I.

	Great Scot (Duration 110 days)		Royal Kidney (Duration 110 days)		Duke of York (Duration 120 days)		President (Duration 120 days)	
	Weight in grams	% of weight to the final wt.	Weight in grams	% of weight to the final wt.	Weight in grams	% of weight to the final wt.	Weight in grams	% of weight to the final wt.
Harvested								
50 days								
after								
planting	0.03	0.006	0.4	0.10	0.14	0.02	3.9	0.87
do. 60 days	11.4	2.51	10.5	2.74	2.5	0.50	32.2	7.21
do. 70 days	40.0	8.81	22.0	5.74	20.0	4.03	3.91	8.75
do. 80 days	216.0	47.61	108.0	28.22	98.0	19.75	118.0	26.43
do. 90 days	354.4	78.13	368.6	96.31	290.6	58.57	297.7	66.67
do. 100 days	439.4	96.86	382.7	100.0	482.0	97.15	447.5	100.0
do. 110 days	453.6	100.0	382.7	...	496.1	100.0	446.5	...
do. 120 days	453.6	...	...	...	496.1	...	...	...

It will be seen from the table that the tuber development in all the varieties is slow till the 70th day of planting. The rate of development, is maximum by the 80th day of planting. This is more or less in agreement with the findings of Clark (1921) working on the conditions attending the development of potato tubers at the Colorado Potato Experimental Station at Greeley. Further it will be noticed, that the maximum rate of tuber development occurs between the 70th and the 90th day after planting in the case of Great Scot, between the 80th and the 90th day for Royal Kidney and between the 80 and the 100th day for Duke of York and President. Thus, assuming that an acre of potato crop yields 10,000 lbs. of tubers, the daily increase during the period of maximum production is 346 lbs. per acre in Great Scot, 681 lbs. per acre in Royal Kidney, 387 lbs. per acre in Duke of York and 368 lbs. per acre in President.

The duration of the varieties from the planting to the drying up of the haulms under Nanjanad conditions, were 110 days for Great Scot and Royal Kidney and 120 days for President and Duke of York. It was also noticed that whenever the tubers were dug out before the haulms dried up, there was profuse skin peeling in the tubers which lowers their market value.

Conclusion: In the Nilgiris, Great Scot is the chief commercial variety and the tuber development in this is complete when the haulms are just drying up (vide Table-I). If harvested before the haulms dry up there is loss of yield depending on the time of harvest. For example, in the case of Royal Kidney and President although tuber development is complete in 100 days the haulms do not dry up till after 10 days in the former and 20 days in the latter. There is no loss in the yield, however, if the crop is harvested when the haulms have completely dried down. In order to prevent skin peeling and to obtain maximum yields it is desirable to harvest the crop when the haulms have dried completely.

Summary: Four varieties namely Great Scot, Kidney, Duke of York and President were studied for tuber development.

Tuber development in all these varieties is slow till the 70th day after planting.

The duration and the time of commencement of the maximum rate of production and also the time of completion of the tuber development seem to vary with varieties and appear to bear no definite correlation with the vegetative duration of the crop from time of sprouting to the time of dryage of the vines.

The crop continues to remain green for sometime even after the completion of the tuber development in the case of Royal Kidney, Golden Wonder and President and hence harvesting of these at this stage does not affect the yield, but the tubers undergo skin peeling when a potato crop is harvested before the vines dry up and therefore affects the quality of the produce. To obtain maximum yield and good quality tubers it is desirable to harvest the crop when the haulms have completely dried.

REFERENCES:

1. Clark C. F. (1921) Development of Tubers in the Potato; U. S. Dep. Agri-Bull. No. 958, p. 27.
2. Kohler A. R. (1909) Potato Experiments and Studies at University Farm-Minnesota Agri-Exp. Stn-Bull. 118, p. 67-141.
3. Werner H. O. (1919) Potato Experiments-N. Dakota Agri. Exp. Stn-Bull. 129, p. 3-22.

The Araku Valley Scheme

By

SRI K. BHUSHANAM, B. Sc., (Ag.)
(Department of Agriculture, Madras.)
(Received 6-12-50.)

Introduction: Aruku Valley is a narrow strip of land about seven miles in length, two miles in width and is situated on the Visakhapatnam—Jeypore road at a distance of about 71 miles from Visakhapatnam. It has an altitude ranging from 2,500 to 5,000 feet. A stream called Pathalagedda which is a tributary of the Machkhund river, runs in the middle of the valley and the land slopes gently towards the stream from either side. The valley is 5,705 acres in extent, and is very thinly populated by hillmen. The annual rainfall is about 52 inches distributed as follows:—

Hot weather period (January to May)	9.78 inches (average of four years)
South-West Monsoon	
(June to September)	31.54 do.
North-West Monsoon	
(October to December)	11.15 do.
	<u>52.45</u>

There will be hailstorms in April—May, strong gales in May and October and frost in winter. The minimum and maximum temperatures range from about 36° F in winter to about 100° F in summer. The soils are poor, (sandy loam) with poor retentive power, and the holdings are scattered. ragi, samai, paddy (dry and wet) and niger are the principal crops grown in the valley.

2. **Work done (1944 to 1949)** In 1944, a scheme was sanctioned with the immediate object of growing potatoes, and exotic and indigenous vegetables for supply to the army at Visakhapatnam. The ultimate object was the development of the Agency tract. The Military supply scheme continued till the end of March 1946.

During 1946—1947, another scheme for the increased production of food crops under the *share cultivation system* was tried and the following were the details of the scheme. An area of 551 acres held by the Department was thrown open to the ryots for cultivating under the guidance and supervision of the department under share system i. e. the ryots were advanced free seed, manure and work cattle and in return half their gross produce were recovered by the Government. Food crops like ragi, wet and dry paddy, and samai were cultivated in these lands by 232 ryots jointly with individual responsibility over their holdings in 19 blocks of about 30 acres each in each village. A sum of Rs. 16,845/- was

spent towards the supply of manures, seeds and cattle and in return a sum of Rs. 8,752/- was recovered by the Department in the shape of half the gross yield. The crops did not give normal yields due to the failure of monsoons. The following are the details of cropping and yields obtained.

Name of crop	Area cultivated	Yield obtained in lb.	Half-share realised
Ragi	... 161.56 acres	1,01,742	50,871
Wet Paddy	... 14.00 "	19,176	9,588
Dry Paddy	... 54.38 "	34,332	17,166
Samai	... 222.86 "	82,700	41,350
Niger	... *109.51 "	5,054	2,527

*Party double-cropped after samai.

During the years 1945 to 1947, another scheme for the uplift of hillmen was run, and the details are furnished below:—

Hillmen Uplift Scheme: A scheme for the uplift of hillmen was sanctioned, its main objects being (1) Free distribution of improved seeds of food crops; (2) Free distribution of manures and fertilisers; (3) Free lending of work cattle and implements.

The scheme was actually put into operation from July 1945, and during this year 800 lb. of improved strains of ragi seed, and 4,000 lb. of improved strains of paddy seed were distributed to about 140 hillmen to cover an area of 82 acres. Distribution of manures was also arranged, and during this year a total quantity of 500 bags of groundnut cake (each bag weighing 160 lb.) and 250 maunds of ammonium sulphate were distributed to 226 hillmen in 20 villages and were applied to 500 acres of paddy and ragi. It was found that both wet and drylands responded well to manuring. The following figures will illustrate the fact.

		Yield per acre (grain in lb.)	
		Unmanured	Manured
Dry Paddy	...	600	1,000
Dry Ragi	...	800	1,000
Wet Paddy	...	1,000	1,800

The scheme continued during the subsequent two years also, i.e. 1946 and 1947. Besides the free distribution of seeds and manures, 30 pairs of work cattle and also implements e. g., ploughs, hoes etc. were lent free to hillmen to take up the cultivation of their lands. The following statement shows the quantities of seeds and manures distributed.

Year	Paddy seed	Ragi Seed	Potato	Ground-nut seed	Ammonium Sulphate	Ground-nut cake	Ammonium Phosphate
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1945—1946	4,000	800			6,250	8,000	
1946—1947	4,100	1,640	2,240	2,116	336	1,18,400	33,000
				Ordinary		Potassium	
				Super	672	Nitrate	326
1947—1948	4,566	1,640		1,000	782	782	

The total cost of the scheme during the three years was Rs. 1,01,498/-.

This free distribution enabled the hillmen to realise the advantages of better types of cattle and implements and regular cultivation instead of shifting cultivation (termed "Podu") and also helped them to realise the advantages of using better seed and intensive manuring. As a result of free lending of work cattle, an additional area of 192 acres was brought under cultivation. Formerly transplanting and manuring in wetlands were not being practised, but as a result of Departmental propaganda and demonstrations, transplanting was adopted and the yields were nearly doubled, as can be judged from the following figures:—

Yield per acre (grain in lb.)

	Ryots method (broadcasting, no weeding, no manuring)	Improved method (transplanting weeding, and manuring)
Ragi	800	1,650
Paddy	1,000	2,500

Colonisation scheme: In the year 1947, a comprehensive colonisation scheme on the lines of the Wynad colonisation scheme were as below:

The total area of the Araku Valley is 5,705 acres of which about 3,472 acres are under cultivation leaving about one-third fallow. There are about 500 land-holding ryot families and about 100 landless families of hillmen employed as farm labourers. Hence all the 600 hillmen families are cultivating an area of 3,472 acres. Still there is room for an additional population of atleast 100 families from the plains to settle as colonists. Thus it was proposed to develop the entire Araku Valley, and besides accepting all the hillmen in the valley as colonists i.e. 600 families, provision was made to select from plains 100 families with agricultural bias. Ex-servicemen were proposed to be selected to make up these 100 families. Thus 700 families were proposed to be settled on the land, and the proportion of the colonists was fixed as follows:—

Existing land-holding hillmen	...	72%
Existing landless hillmen	...	14%
Plainsmen and ex-servicemen	...	14%

It was proposed to allot to each hillmen colonist 6 acres of land (5 acres dryland and one acre of wetland) and to each colonist family from the plains 7 acres (five acres of dryland and 2 acres of wetland). The total area of the valley was purchased and an amount of Rs. 2,14,840—14—0 due to hillmen towards compensation was deposited in the Co-operative Central Bank, Vizianagaram. But when parcelling of lands into 5 acres dryland and one acre wetland was taken up by the Survey Department, practical difficulties arose on account of the uneven nature of the soil and the existing plots with well marked out contours had to be disturbed. Hence this item of work was given up. The colonisation scheme itself was finally dropped, and no colonist from the plains has been settled here.

Details of work on Departmental Farms: during the years 1944 to 1947, besides the cultivation of potatoes, exotic vegetables, other crops like paddy, ragi, samai, groundnut, plantains etc. were also tried getting improved strains of these crops from the plains. Regular cropping trials and experiments were started in the year 1947-48. A short resume of the work done so far is given below:—

3. RESEARCH

Cereals: *Work on Paddy (Wet):* Thirty-three varieties of paddy obtained from Agricultural Research Station, Anakapalle were tried, of which the following six i.e. Mtu. 1, S. S. 5, G. E. B. 24, B. G. 1 and Bellamõnji, which gave acre yields of above 3,000 lb. were compared in yield trials with local Tellasannam as control. Of these B. G. 1 and S. S. 5 have fared well and are already under distribution. S. R. 26 B paddy variety, was tried and found suitable for saline areas and is now spreading. Transplanting of paddy, manuring and weeding which were being done on the farm were copied by the ryots as a result of which their yields have almost doubled. Mass selection in the main local varieties was taken up and the seed was distributed.

The present programme consists of the growing of promising strains for seed multiplication and continuance of mass selection work in the local varieties.

Dry Paddy: Thirty varieties of paddy received from Agricultural Research Station, Anakapalle were tried along with ten varieties, among which the local variety Bhattadhan was the best. Hence mass selection in this local variety Bhattadhan was taken up, and the mass selected seed is under distribution to hillmen.

Ragi: Ragi is an important crop of this valley. Five strains of ragi got from the Agricultural Research Station, Anakapalli were compared with the local variety *Jagaralamandya* as control. The local proved better and mass selection work in this and in another popular local variety, *Muddaimuskal*, was taken up. AKP. 7 Ragi was however

found to yield well and it is now under distribution. The application of 10 cart-loads of cattle manure and two bags of groundnut cake per acre to ragi was found to give almost double the average yield.

The programme of work consists of mass-selection in the local varieties i.e. *Jagaralamandya* and *Muddaimuskal*, and growing the mass-selected crops on the farms and distribution of the seed.

Jonna: Among the three strains of Jonna tried, AKP. 1 and AKP. 2 were found to fare well and are being grown and multiplied on the farm.

Wheat: The glumed variety from Siruguppa seems to come up well and it is programmed to continue its trial.

Oilseeds: Niger and castor are grown in the locality, of which Niger occupies a very large area and is the principal money crop of the hillmen. Mass-selection work in this crop was taken up, and is being continued. Improved castor varieties from Tindivanam are introduced and they are spreading in the valley. Other oilseed crops like groundnut and gingelly which are new to the valley were also tried, of which groundnut came up very successfully while gingelly was a failure. The cultivation of groundnut has been taken up by the hillmen and it is spreading.

Pulses: Among the pulse crops, green gram, black gram, red gram and bengal gram were tried. Of these red gram was found to come up well in this locality though it was sometimes susceptible to frost attack during December–January.

Root Crops: *Potato:* The cultivation of potato has received special attention in this valley. About a dozen varieties from Mysore and Ooty were tried, and finally 'Mysore Rickets' or 'Maddigedda' was chosen as suitable to this tract. Potato was found to come up well as a rainfed crop (from June to September) and as an irrigated crop from November to February. The Summer crop i.e. from March to June was not very successful due to drought conditions during the period. The summer crop is stunted in growth and gave very low yields (just equalling the seed material put in). Gradual enriching of the soil with green manure and lime was found to increase the yields. Four manure mixtures suggested by the Agricultural Chemist of which one is Nanjanad mixture, are being tried on potato. The planting of whole tubers was found better than cut pieces. The crop yield at present is about three tons of good-sized tubers in both the seasons. But the limiting factors for extension of the potato area are: (1) Seed preservation during the summer months from March to May; (2) Market; (3) Availability of fertilisers and; (4) Availability of irrigation water for the winter crop. On account of the above limitations its cultivation has not spread in the valley.

The present programme consists of the following items of work:—

- (1) Growing the crop on a bulk scale in the monsoon and winter months.
- (2) Trial of manure mixtures.
- (3) Storage and preservation trial for seed material from the crop grown here.

Among the other root crops tried like sweet potato, ginger, turmeric, onions, tapioca, arrow root and colocasia, sweet potato was found to come up well in this locality and has given yields ranging from 10 to 15 thousand pounds per acre. Its cultivation has spread in the valley, but the limiting factor is again marketing. Seven Almora varieties are under trial and some of these are giving very big tubers about 8 to 10 lb. each with a high carotene content. Sweet potato is being grown on a bulk scale and the trial of Almora varieties is being continued.

Fibre crops: Seven types of perennial cottons received from the Cotton Specialist are under trial of which Barbados Type I and II are found promising and are under multiplication. Other fibre crops tried are gogu, sunnhemp and jute varieties.

Vegetables: Exotic: In the early years exotic vegetables like cabbage, cauliflower and knolkhol were successfully grown and supplied to the Military. The yields ranged from 10 to 15 thousand pounds per acre. The cultivation of these is now being taken up by hillmen.

Indigenous: Almost all indigenous vegetables were successfully grown on the farm, notable acre yields being, Brinjals: 21,685 lb. Tomato: 9,300 lb. Gourds: 11,080, Bendai: 4,675 lb. and Clusterbeans: 5,150 lb.

At present both exotic and indigenous vegetables are being grown on the farm periodically on an area of about 200 acres, and the produce supplied to the residents of the colony.

Bananas: Bananas are not cultivated in this valley on a field scale. Among the dozen varieties tried, Amruthapani and Sirumalai were found well suited for this tract, and they are being grown successfully under rainfed conditions. The suckers are being distributed to hillmen.

Sugarcane: Sugarcane Co. 419 has been introduced for the first time during 1948—'49. Ryots have taken to it, being used for chewing purposes. Co. 419 and Co. 527 are being grown on the farm for trying jaggery making.

Fodder and green manure crops: Fodder crops like fodder jonna, maize, Thin Napier grass, and lucerne and green manure crops like sunnhemp, indigo and wild indigo were tried, which gave respectively 20,000 lb., 21,000 lb., 25,000 lb., 4,000 lb. of fodder per acre, and 5,000 lb, 3,000 lb. and 1,500 lb. of green leaf per acre. At present Thin Napier grass and sunnhemp are being successfully grown on the farm.

Work on fruits: About 60 varieties of fruit trees of both hill and plains varieties and a few spices are being grown in an area of 18 acres since 1947. Among those, citrus, Annonas, Guavas, Sapota, Banana, Pomegranate, Pineapples, Papaya, Plums, Peaches, Pears, Apples, Tree-Tomato, Passion fruit, Cape-Goose-berry and Strawberry are coming up well. Among the lemons, Lucknow Seedless and Nepali Oblong and guava (Lucknow No. 49) have started bearing profusely and their layers are being distributed to hillmen. Pineapple suckers are being distributed free every year. Seedlings of Strawberry and Cape-Goose-berry, Tree-Tomato and Passion fruit are also under distribution. Sweet Oranges, Plums, Peaches and Apples have just started bearing.

4. WORK IN PROGRESS

(a) **Demonstration:** (i) *Growing of potatoes and exotic vegetables:* Ever since the inception of the scheme, potatoes and exotic vegetables were grown both on the farm and on ryots' holdings and were demonstrated to hillmen. If seed material, fertilisers, irrigation and marketing facilities are given, potato cultivation can also spread in the valley.

(ii) *Cattle manure preservation, and farm wastes compost making:* The soils of this tract are inherently poor and the cattle manure that can be got is quite insufficient. Hence special attention was paid in demonstrating better methods of preservation of cattle manure. Compost making is gaining popularity and almost every village is having nearly 20 pits.

(iii) *Prevention of soil erosion:* Due to the sloping nature of the land and heavy rainfall there is much of soil erosion. To check this, demonstrations of contour bunding, by putting up earthen and stone embankments, gully-plugging and ploughing along the contours were done.

(iv) *Green manuring of fields:* Demonstrations are being conducted regarding growing of green manure crops like sunnhemp in wetlands and drylands and application of green leaf to wetlands to increase the fertility of soils.

(v) Tractor ploughing of lands was also demonstrated to hillmen, as a result of which 502.87 acres of land of hillmen was ploughed so far. The lending of tractors to hillmen for hire at half rates is being continued.

(b) **Propaganda:** Twenty villages of the valley are tackled for propaganda purposes, and the following are the main items of work tackled.

(1) Introduction of improved strains like B. G. 1, AKP. 7 paddy, T. M. V. 2 and 3 groundnut, Co. 419 sugarcane etc. and explaining the advantages of growing them.

(2) Improved cultural and manurial practices like transplanting, weeding, green manuring paddy and tractor ploughing.

(3) Improving soil fertility by the application of compost, checking soil erosion and growing green manure crops.

(4) Mass selection in important local crops like ragi, paddy, samai and niger every year.

(5) Cultivation of exotic vegetables like cabbages and growing fruit plants like guavas, lemons, plantains, pine-apples etc.

(6) Control of pests and diseases.

(7) Exchange of white Leghorn cockerels with the *desi* ones, to grade up the local stock.

Subsidiary Industries: (i) *Dairy:* A dairy unit with 19 she-buffaloes and one buffalo breeding bull was maintained and the milk sold to residents of the colony. The strength of the dairy herd is now increased to 25 she-buffaloes.

(ii) *Poultry:* A poultry unit with white Leghorn birds was started and the cockerels both hatched here and from the Agricultural Research Station, Anakapalle were exchanged with the local ones to grade up the local stock. As the supply of cockerels from Anakapalle is now stopped, eggs of Leghorn birds are being exchanged with the local ones.

(iii) *Sericulture:* The rearing of mulberry silk worms was first taken up by this Department in 1947. The worms were successfully reared and 17½ tolas of silk yarn was produced. This work was subsequently handed over to the Industries Department.

(iv) *Pisciculture:* Fingerlings of 'Mirror carp' variety of fish were first introduced in 1946 into one of the departmental ponds for rearing. To growth and development of the fish are very satisfactory, but the fish did not breed and multiply. Hundred and eighteen fingerlings were again introduced during this year.

(v) *Sheep breeding:* During 1949, 19 ewes and 2 rams of the Mandya breed sheep (woolly type) were got from Hosur. They are thriving well here and are multiplying; their strength is 2 rams, 15 ewes, and 24 lambs. One shearing was taken during 1949, and a total quantity of 25 lb. of wool was received. It is proposed to build up the stock to about 50 or 70 adults, and distribute them to the local hillmen.

(vi) *Cattle improvement:* A Murrah buffalo breeding bull was maintained on the farm for free service and grading the local scrub cattle.

Miscellaneous trials: (a) *Pyrethrum:* Pyrethrum which was tried here was not found to grow satisfactorily and its flowering was also poor.

(b) *Cinchona:* Cinchona is being tried at two places (Ananthagiri and Sunkarametta) in two acres at each place. The seedlings were planted in 1946—'47 and they have now come to flowering. But their growth is however not encouraging.

(c) Eucalyptus, Camphor, and Silver Oak plants are being grown as avenue plants in the colony.

Fasciated Pedicels in a Variety of *Capsicum annum*. L.

By

J. SAKHARAM RAO, B. sc.

(Botany Section, Agricultural Research Institute, Coimbatore)

The genus *Capsicum* comprises a wide range of forms varying in shape and pungency. Different degrees of importance have been attached to the morphological characters for taxonomical classification. The Index Kewensis recognises fiftyfour species, Roxburgh (1832) mentions six species, but modern systematists consider that there are only a few real species in the genus. Hooker (1885) recognises three species, namely *Capsicum minimum*, Roxb., *C. grossum*, Willd., and *C. frutescens*, L., and Irish (1898) has made it into two species namely *C. annum*, L.; and *C. frutescens*, L. Shaw and Rahman (1928) agree with Irish and maintain the two species in their monograph. Bailey (1923) and Erwin (1931) have further reduced it to a solitary species, namely *C. frutescens*, L. The shape of the fruit and the nature of the calyx are reliable characters but the

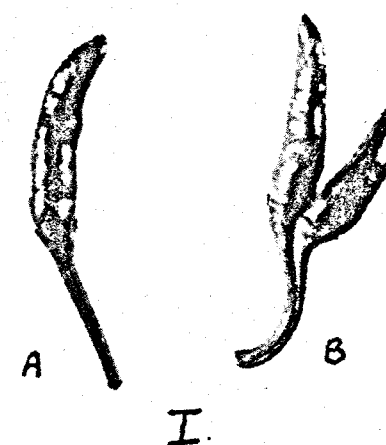
pendent or erect nature of the fruit seems to occur in both the species *C. annuum*, L., and *C. frutescens*, L. Shaw and Rahman (1928) have taken into consideration the number of pedicels in the axils as the main differentiating character in their classification and observe that plants with solitary pedicels are *C. annuum*, L., and those with more than one as *C. frutescens*, L.

In a variety of *C. annuum*, L., (var. *acuminata erecta*, described by Shaw and Rahman) two fruits with fasciated pedicels were noticed (fig. I. B.) wherein the fruits were completely free and the pedicels alone were joined. There were ten calyx lobes and in the transverse sections of the fruits both were bicarpellary, (fig. II. B.) thus confirming that the fruits had developed from two separate flowers. Transverse section of the fasciated pedicels revealed two distinct vascular rings. Normal fruits are medium in length, 4 to 6 cm., circular in cross section, erect, dark green with much purple colour and becoming red when mature.

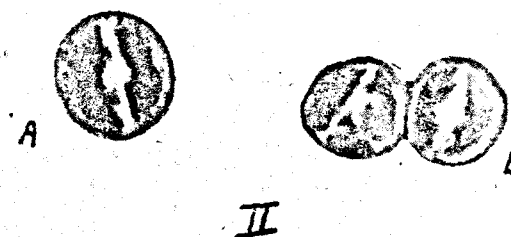
This phenomenon slightly disturbs the classification of Shaw and Rahman (1928) and suggests a possibility for the occurrence of more than one flower in the axils of *C. annuum*, L. also as in the case *C. frutescens*, L. The interesting abnormality seems to support the classification of Bailey (1923) and Erwin (1931) who advocated a single species namely *C. frutescens*, L. However, it appears that the number of flowers in the axils cannot be taken as a satisfactory differentiating character in identifying *C. annuum*, L. from *C. frutescens*, L.

REFERENCES

1. Roxburgh. W. (1832) Flora indica, P. 573, Allen & Co., London.
2. Hooker. J. D. (1885) Flora of British India, Vol. IV. p. 238—239, Reeve & Co., London,
3. Irish. H. C. (1898) A revision of the genus Capsicum, Missouri Bot. Gar. Annual Report, 9.
4. Shaw. F. J. F. and Rahman. S. A. (1928) Memoirs of the Department of Agriculture, Vol. 16, p. 59—82.
5. Bailey L. H. (1923) Gentes Herbarium, Vol. I. p. 128—129.
6. Erwin. A. T. (1931) Anthesis and pollination in Capsicum, Proceedings of the American Society for Horticultural Science, Vol. 27. p. 309—310.



A. Normal and B. Fasciated.



Transverse Sections of A. Normal and B. Fasciated Fruits.

Floral Abnormalities in Jack

By

P. C. SAHADEVAN, A. ABDUL SAMAD AND K. C. P. MENON
(Agricultural Research Station, Pattambi.)

(Received 24-11-1950)



Fig. 1

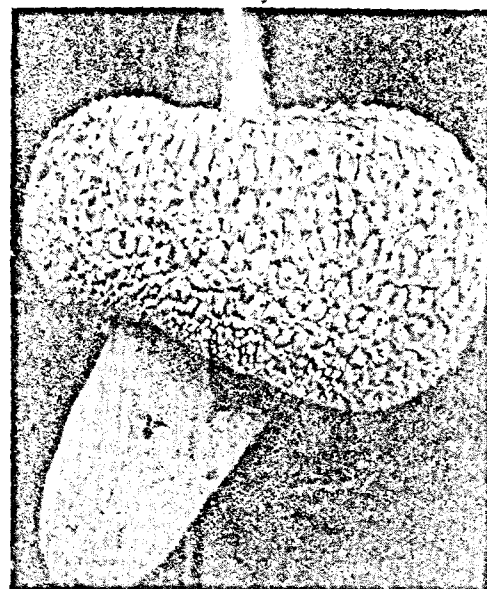


Fig. 2



Fig. 3



Fig. 4

The Jack tree (*Artocarpus integrifolia*, L.) is monoecious, bearing spikes of male and female flowers. The spikes are enclosed in stipules when young. Numerous male spikes are produced and within three weeks of its emergence from the stipule the male spike drops off, while the female develops into the so-called jack fruit. The latter as is well known, is a large multiple fruit with a spinescent appearance. Each spine represents the hardened apex of a perianth. These apices fuse together and form the spiny rind of the fruit. The female inflorescence has a number of fertile flowers and numerous sterile ones surrounding the fertile ones. The stigmas appear at the end of each spine. In a fertile flower the perianth enlarges, becoming succulent and enclosing a pericarp with a single seed. The unfertilised ones thicken out into flat ribbons and are often edible. An aborted seed and pericarp are found in these. The steriles develop into the whitish flakes filling up the intervening space. The colour of the edible flakes varies from pale yellow to reddish orange. At the Agricultural Research Station, Pattambi, a study is being conducted on this fruit plant, maintaining a collection of about 160 trees. The number of female spikes in a tree may vary from 3 to 40 per cent of all the spikes produced and they take 90 to 110 days to mature. A few abnormalities noted during the study are reported below.

1. **Spikes heterogamous:** The peduncle is thick as in the female spike. A portion of the spike towards the base bears female flowers and the rest towards the apex are male. Three such spikes were noted and all of them dropped off the tree within three weeks of their emergence. In rare cases they have grown larger, the female part developing the characteristic spines while the male portion of the spike is arrested in further growth (Figs. 1 and 2.)

2. **Malformed female spikes:** In a normally developed fruit the steriles form the highest percentage followed by the abortives while the edibles are below 25 per cent of all the flowers produced. The typical configuration of the jack fruit is more or less oval. The normal development of the fruit depends to a large extent on the proportion of male and female spikes in a tree, the extent of their fertility and environmental factors. Very often distortions in the development of the fruit, cracking of the rind of the mature fruit and fruits without any edible flakes are observed. What proved to be a rare abnormality is shown in figs. 3 and 4. Three such fruits were noted in one particular tree out of the entire

population of 160 trees. The fruits appear warty and tubercled, presenting a very ungainly appearance. This condition was found to be due to a partial arrest in the formation of the rind resulting in the exposure of the flakes and perianth. The inflorescence was found to produce numerous sterile flowers (87.9%) a smaller number of abortives (11.0%) and very few fertile flowers (1.1%). Compared to the normal ones the flowers are rather poorly developed. On fertilization the few fertile flowers enlarge fast while the abortives and sterile flowers hardly grow. Owing to the poor development of the rind the perianth is visible. A few of the sterile flakes enclosing the fertile perianth grow along with it. This causes the warty growth of the fruit. The seeds from this fruit are well-formed and viviparous as in the normal.

Paucity of male spikes often results in the production of distorted fruits but the rind will be normal. The very low percentage of fertilized flowers could not have been due to this cause since a large number of male spikes were formed. It may also be caused by partial sterility of flowers in either male or female or both spikes. Absence of the pollinating agent may result in improper development of the female flowers. Further investigations as to (1) whether the arrest of the rind formation is found in pre-fertilization stages or whether it is only a post-fertilization effect (2) whether there is partial sterility in this tree and (3) whether it is due to paucity of pollen, are being carried out at this station.

We are indebted to Dr. N. Krishnaswami, Cytogeneticist, Coimbatore for suggestions and help in this study. Our thanks are due to Sri. N. Hrishikeshan Nair, Research Student, Cytogenetic Section, for supplying the photograph of the heterogamous spike (Fig. 2) which was collected by him at Nagercoil. He informs us that in this tree the fruits are borne in bunches, of which one is very often heterogamous. The latter, however, drop off after some time while the normal ones develop further.

EXPLANATION OF FIGURES.

- Fig. 1. A heterogamous spike with female portion at the base and male towards the apex.
- Fig. 2. A heterogamous spike as in 1. but with considerable development of the female flowers.
- Fig. 3. An abnormal fruit showing incomplete formation of rind resulting in warty appearance and exposure of flakes and perianth.
- Fig. 4. An enlarged view of the specimen in fig. 3.

Storage of Gur in Madras

By

Sri S. V. PARTHASARATHY, M. Sc.

and

Sri M. LAKSHMIKANTHAM, B. Sc. (Ag.)

(Department of Agriculture, Madras)

(Received 16-11-1930)

Madras State produces annually 4½ lakhs of tons of *gur*. Most of this is produced during the months of January to April. Taking the local consumption to be more or less uniform throughout the year nearly three-fourths of the total *gur* produced has to be preserved for varying periods and the maximum duration may probably be eight months. Hence unless extremely careful steps are taken for storing this commodity, there is a likelihood of great loss occurring due to the *gur* softening and sticking to the receptacles or running into a viscous mass when stored for considerable periods. There are no means of estimating this loss but in view of the improper and imperfect methods adopted in most of the cane-growing districts for preserving *gur*, loss due to storage seems to be considerable and inevitable at the present time.

The monthly average price for *gur* is furnished in the table below. The prices increase from April—May to September—October and decline from November—December when fresh stocks arrive in the market. The depression from December to April is mainly due to the market being glutted with huge stocks. It is in the interest of the cane grower not to dispose of his entire produce in the peak manufacturing season when minimum prices prevail.

Monthly average price of *gur* in Madras State.
(per Imperial Maund)

Year	January	February	March	April	May	June
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1946	13-9-3	13-9-3	13-9-3	13-9-3	13-9-3	14-13-0
1947	15-10-0	15-10-0	15-10-0	15-10-0	15-10-0	15-10-0
1948	10-1-1	9-5-0	7-1-6	8-11-6	9-12-7	...
1949	12-9-4	13-11-6	14-15-7	15-7-0	15-15-3	19-7-1

Year	July	August	September	October	November	December
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1946	17-2-10	19-14-7	21-13-0	20-9-2	20-4-2	16-12-4
1947	15-10-0	15-10-0	15-10-0	15-10-0	15-10-0	12-5-0
1948	...	...	...	...	11-14-0	12-4-8
1949	22-8-0	20-8-0	20-15-4	28-3-7	32-2-1	25-10-8

Among the factors affecting storage of *gur* the chief one is its quality. Good quality *gur* hard in consistency, with a good crystalline structure, and with less of mineral matter, keeps best. Particular cane varieties like B. 208 are noted to yield *gur* of very good keeping quality. Excess liming of juice prior to *gur* manufacture is known to improve the keeping quality of the resulting *gur*. Varahalu (1937) indicated that an atmospheric humidity of 50 to 60% was ideal for preserving jaggery well. Excessive manuring of sugar cane with artificials like sulphate of ammonia is reported not only to interfere with the initial quality of the *gur* but also with its keeping quality. *Gur* from ill-drained lands, where swampy conditions prevail during the monsoonic months though apparently good at the time of manufacture deteriorates quickly on storage. Size and shape of the *gur* preserved will also interfere with its keeping quality.

Storage of *gur* on any considerable scale is done only by the merchants; most of the cane growers sell out their produce immediately after manufacture. Various methods are adopted for storing *gur* in this State and these are detailed below.

Southern Districts: In the Tiruchirapalli, Madhurai and Coimbatore districts small quantities of *gur* intended for domestic consumption are stored by house-holders in earthen pots closing their mouths with cane trash and plastering with cowdung and red earth,

Merchants stock *gur* in gunnies inlaid with palm-leaf mats. Each bag contains 140 lb. of *gur* and the bags are kept separately but not stacked one above the other. Rare cases of packing *gur* in dealwood boxes are also met with. Bulk storage of *gur* is done by spreading a layer of cane trash 6" to 8" thick on the floor of a pucca room on which *gur* cubes are spread evenly to a height of about 9" to 1 foot. Three layers of *gur* cubes alternating with trash layers are spread and *gur* is preserved for varying periods. Some merchants fill *gur* in ordinary gunny bags and keep them in godowns on the floors of which paddy husk or groundnut shell is spread to ward off dampness.

West Coast: In the South Kanara district, solid as well as semi-solid *gur* is prepared. Solid *gur* will be in the form of moulds each weighing 7-14 lb. These moulds are packed in leaves known locally as "mandakas" and stored in a place to which smoke from the kitchen or the hearths has access. This is reported to preserve *gur* well. Semi-solid *gur* is poured into galvanised iron tins of four gallon capacity, each tin holding about 56 lbs. of the stuff. These tins are stored in damp-proof godowns.

Central Districts: The methods adopted are practically the same as those followed in the Southern districts. Bagasse instead of trash is spread in layers for bulk storage as noted above. The gunny bags inlaid with mats are stacked one over the other and the stack is rearranged once

in three months to put the lowest bag above and bring the topmost to the bottom. When large quantities of *gur* are to be stored for an year or more, godowns are specially constructed. In a well-ventilated room, low cross-walls about 1½ feet in height from the floor and at 2 feet distance from each other are built. On these walls stone slabs are put and on this improvised platform walls are built allround leaving a corridor 2' wide between this inner structure and the outer room. In this inner room bagasse is spread on the floor and *gur* stored in ½ foot layers alternating with bagasse layers of equal thickness. At the top bagasse is spread and wooden planks are put above this layer to keep off moisture.

Ceded Districts: In the Hindupur taluk *gur* is prepared in the form of small pellets each weighing about two tolas. These are heaped on cemented floors to a height of four feet and turned over once in two months, alternately the pellets are filled into gunny bags and stored.

At Hospet *gur* is made into slabs. They are also broken into convenient slices and stored in double-walled bags of date-palm leaf and are kept in a dark room over wooden planks.

Northern Districts: In the Srikakulam district *gur* is put in small earthen pots. These pots are inverted one over the other and stored in a room. On the floor of this room sand is sprinkled.

In the Anakapalli tract, *gur* is prepared in the form of bucket-shaped moulds. These moulds are wrapped in a piece of hessian cloth whose sides are stitched together. These moulds are stored 5 to 6 deep in any vacant house. No extra precautions are taken with regard to flooring or ventilation of these storage houses.

In the East Godavari district and in parts of West Godavari, storage godowns are specially built for preserving *gur* over a long period. Godowns in the former district are of a better type and every precaution is taken to ward off moisture and attack by ants. Most of these godowns are found in the Ramachandrapur taluk of this district and a few are met with in Kakinada and Peddapuram taluks also. Except in a few cases almost all of these godowns are owned by merchants.

Gur is considered fit for storage only when manufactured from the end of January to the end of March. In the summer months it is rarely necessary to smoke the godowns. Usually one and occasionally two smokings are given during this period. During the monsoon months smoking may be necessary once every fortnight. In all fourteen to fifteen smokings are given during one year, each time about 5 bags of paddy husk being used for each compartment. If the godown is partly empty the amount of husk used is comparatively less than when it is full. Care is taken to store



the best quality *gur* on the topmost tier, for the chances of the smoke coming into contact with the *gur* are less than those in the lower tiers. Once the smoking is commenced it will not be possible to enter the godown till after six days, until the *gur* inside has cooled down. Thus the periodicity of smoking and the quantity of paddy husk necessary for smoking each time depends upon the discretion of the person in charge of the godown. It should be noted that in this godown it is possible to take out or put in more stocks without in any way lessening the keeping quality of the *gur* stored in it. This is the advantage the godown has over the permanently sealed, pucca godowns that may be found in the Central districts.

Smoking is a crude way of keeping off moisture from deleteriously affecting the keeping quality of *gur*. The technique of smoking is not standardised but is a matter of discretion of the person in charge of the godown. Barring these two defects the godowns in practice have turned out to be very effective store houses for *gur* in which the stuff could be kept undeteriorated for over a period of 12 months or over.

There is only a slight fading of the colour of the *gur* thus stored, consistency remaining practically the same. The owners of the godowns charge the people storing *gur* at the rate of 5 to 8 annas per basket for the entire season. It is estimated that about 3,25,000 imperial maunds of *gur* are preserved in such godowns each season and that the loss in storage in these godowns will be 1-2% on the weight of *gur* stored. In view of these advantages it is desirable to build such godowns either individually or on a co-operative basis throughout the State and arrange for the storage of *gur* in them. This will not only enable the cane growers to sell their produce at a time when the prices are ruling high but will also prevent the national loss involved in improper storage and handling of *gur*.

Summary and conclusions: Even though Madras is chiefly a *gur* producing state and *gur* is a commodity required for consumption throughout the year, effective measures for preserving it are not extensively in vogue. Specially designed and efficient godowns are to be met with in East Godavari district and these are well worth copying in the other parts of the State.

Adverse effects of wet weather are minimised by smoking in these godowns. It is necessary to devise a more hygienic and upto date method for this.

Weather Review—For November 1950

RAINFALL DATA

Division	Station	Total for the month in inches	Departure from normal in inches	Total since January 1st in inches	Division	Station	Total for the month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpur	8.9	+5.0	47.6	Central-Contd.	Coimbatore (C. B. S.)*	3.1	-1.9	20.5
	Calinga	4.4	+1.0	30.0		Coimbatore	2.4	-1.6	16.5
	patnam	4.3	-0.4	37.2		Tiruchirappalli	5.1	-1.9	25.4
	Vishakha.	4.8	+2.0	33.9		Nagapattinam	13.6	-3.9	44.3
	patnam	2.5	-2.0	41.2		Aduturai*	9.9	-2.6	32.7
	Anakapalle*	8.3	+2.7	41.9		Pattukottai*	7.0	-1.5	30.6
	Samalkot*	3.3	-0.4	52.1		Madhurai	0.3	-5.4	31.7
	Kakinada	3.9	+1.9	36.3		Pamban	8.7	-3.0	23.2
	Maruteru*	1.0	-1.2	31.5		Koilpatti*	1.2	-6.5	17.9
	Masulipatnam	3.5	-0.2	30.5		Palayamcottai	4.9	-2.5	22.8
Ceded Dist.	Guntur*	1.2	-0.7	22.8	West Coast.	Amba-samudram*	6.7	-4.9	26.8
	Agri. College, Bapatla*	0.2	-1.0	29.0		Trivandrum	3.5	-3.5	62.7
	Rentachintala	0.2	-1.1	25.7		Fort Cochin	4.3	-2.4	134.8
	Kurnool	3.0	+1.5	24.1		Pattambi*	5.3	+0.3	158.1
	Nandyal*	2.5	+12.0	28.7		Taliparamba*	4.8	-0.4	148.7
	Hagari*	1.0	-1.0	23.5		Nileshwar*	1.7	-4.4	172.4
	Siruguppa*	1.1	-2.4	20.3		Pilicode*	3.0	-2.5@	144.8
	Bellary	2.9	-7.2	22.6		Mangalore	2.8	-1.1	148.9
	Cuddapah	9.5	-2.2	52.9		Kankanady*	1.8	-2.0	150.4
	Kodur*	4.4	-9.7	39.1	Mysore & Coorg.	Chitaldrug	3.0	+0.6	24.8
Carnatic.	Nellore	6.3	-7.7	36.0		Bangalore	7.1	+4.4	31.5
	Buchireddipalem*	5.8	-6.6@	35.9		Mysore	4.2	+1.5	28.4
	Madras (Meenam-bakkam)	5.1	-9.9	34.3		Mercara	2.0	-1.0	134.5
	Tirurkuppam*	5.8	-2.8	25.6		Kodaikanal	2.4	-7.8	43.5
	Palur*	8.5	-7.0	29.2		Coonoor*	10.5	-4.8	43.3
	Tindivanam*	0.9	-6.8	19.2		Ootacamund*	3.7	-3.1	42.6
	Cuddalore	2.0	-3.1	15.3		Nanjanad*	3.3	-2.1	54.8
	Salem	2.0	-1.8	29.9					
	Coimbatore (A. C. R. I.)*	3.9	-0.8	21.9					

Note:—

- (1) * Meteorological Stations of the Madras Agricultural Department.
- (2) Average of ten years data is taken as the normal.
- (3) @ Average of seven years data for Tirurkuppam and eight years data for Pilicode is given as normal.
- (4) (a) Taluk office normal is 1.43" and rainfall is 2.42".

Weather Review for November, 1950

The month began with the seasonal trough of low pressure over the Bay of Bengal, which, on the next day, shifted south-westwards. This caused a marked strengthening of the North-east monsoon in the Madras State and Mysore.

On 3—11—1950 a trough of low pressure appeared in the east Arabian sea off the Kanara Coast and became less marked the next day. Three days hence the seasonal low was found re-establishing itself over the South Bay of Bengal and remained fairly well-marked for four days. On 15—11—1950 it became well-marked over the South-west Bay of Bengal. In association with it, the North-east monsoon became active over the Peninsula, south of latitude 14° North. On 16—11—1950 it concentrated into a depression. The rain-belt associated with the depression extended from East Pakistan to coastal Andhradesa on 17—11—1950. After two days the seasonal trough of low pressure re-established itself for the second time over the South Bay of Bengal. On 21—11—1950 a fresh low pressure wave was found moving westwards through the Gulf of Siam and this moved into the Andaman Sea the next day and remained in that region for three days.

The pressure distribution over the South Bay of Bengal and the South-east Arabian Sea became normal on 27—11—1950. The month ended with a well-marked anti-cyclonic circulation in the upper air over Burma.

There is nothing worth recording about the variation in day temperatures.

Night temperatures were below normal over the major portion of the region, particularly in the second half of the month. Ooty recorded the lowest minimum temperature of 36° F. on 26—11—1950.

Particulars about the zonal rainfall in the Madras State and noteworthy falls in the month are given below :—

S. No.	Name of the zone.	Total Precipitation.
1.	Orissa and Circars	Above Normal
2.	Ceded Districts	Below Normal
3.	Carnatic	Far Below Normal
4.	Central	Below Normal
5.	South	Far Below Normal
6.	West Coast	Below Normal
7.	Mysore and Coorg	Above Normal
8.	Hills	Below Normal

Except the Circars and the Mysore and Coorg regions the North-east Monsoon showers in the rest of the Madras State in November 1950 were disappointing.

Noteworthy Falls.

S. No.	Date.	Place.	Rainfall in inches in a period of 24 hours.
1.	3—11—50	Turaiyur (Trichy Dt.)	5.5
2.	4—11—50	Kakinada	3.2
3.	11—11—50	Pamban	3.7
4.	13—11—50	Nellore	6.3
5.	15—11—50	Nagapattinam	5.9
6.	15—11—50	Cuddalore	3.9
7.	16—11—50	Madras (Nungambakkam)	3.5
8.	17—11—50	Gopalpore	3.8

The weather in second half of the month was practically dry.

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore
Dated, 11—12—1950.

M. B. V. N., C. B. M. & M. V. J.

Departmental Notifications

GAZETTED SERVICE—POSTINGS AND TRANSFERS

Names	From	To
Sri John, C. M.	Principal, A. C. & R. I., Coimbatore,	Director - Cum Coconut Specialist, Kasaragod.
" Krishnamurthi, C.	Asst. Entomologist, on leave,	Asst. Entomologist, (Civil Supplies) Vijayawada.
" Kalyanasundaram, N. V.	Agronomist, Siruguppa,	Sugarcane Inspector, Mathurai.
" Krishnamurthi, R.	P.A. to D.A.O., Tanjore,	Asst., Cotton Extension Officer, Bellary.
" Raghavan, A.	Asst., Cotton Extension Officer, Bellary,	Asst., Cotton Specialist, Hagari.
" Rayappa Pillai, M.	Asst. in Paddy, Rice Research Station, Tirurkuppam,	Supdt. A. R. S., Samalkot.

SUBORDINATE SERVICE—POSTINGS AND TRANSFERS

Names	From	To
Sri Ali Hyder,	A. D., Kudligi,	P. A. to D. A. O., Bellary.
" Barthan, P.	P. P. A., (Entomology) Salem,	A. A. D., Namakal.
" Balraj, G. J.	Marketing Asst., (on leave)	A. D., Paramakudi.
" Banumurthi, N.	A. A. D., Vijayawada,	A. A. D., Rasipuram.
" Ganapathy, N. K.	A. A. D., Tirunelveli,	A. D., Srivaikuntam.
" Gopalan, S.	A. A. D., Kulitalai,	A. D., Parambalur.
" Krishna Rao, M.	P. P. A., Vijayawada,	A. A. D., Gobichetti-palayam.
" Krishnamurthi, K.	A. A. D., Patapatnam,	A. A. D., Devakottai.
" Krishnamurthi, P.	A. A. D., Chodavaram,	A. A. D., Dindigul.
" Kumaraswami, P.	A. A. D., Hospet,	A. D., Hospet.
" Krishnamurthi Rao, S.	P. A. to D. A. O., Bellary,	Special A. D., T. P. Scheme, Bellary.
" Krishnamurthi, B.	A. D., Madakasira,	A. D., Ooty.
" Krishnan, K.,	A. D., Kozhikode,	P. A. to D. A. O., Tanjore.
" Md. Baig,	A. D., Bhimavaram,	Paddy Seed Development Asst. Bhimavaram.
" Narasimhamurthi, V.	A. D., Vizayanagaram,	F. M., Dairy Cum Bull Farm, Vizayanagaram.
" Nataraja Iyer, V.	A. D., Pudukottai West,	A. D., Pudukottai East.
" Narasimhamurthi, H.	A. D., Hospet,	Special A. D., T. P. Scheme, Hospet.

Names	From	To
Sri Narayana Rao, T.	A. D., Harpanahalli,	Special A. D., T. P. Scheme,
„ Parthasarathi, V.	Asst. in Mycology,	Kampli.
„ Prahlada Rao, C.	Coimbatore,	F. M. Central Farm,
„ Padmanabha Raju, B.	A. A. D., Adoni,	Coimbatore.
„ Prabhakara Rao, C.	A. D., Rajampet,	A. D., Kudligi.
„ Periaswami, S.	A. D., Gannavaram,	A. D., Bhimavaram.
Sri Rangamannar, D.	Asst. in Entomology,	A. D., Kudligi.
„ Ramachandra	Shembaganur,	A. A. D., Attur.
Rao, A. V.	Asst. in Entomology,	Asst. in Cotton, Siruguppa.
„ Ramachandran, L.	Siruguppa,	A. A. D., Villipuram.
„ Raghava Rao, K. V.	A. D., Yellamanchilli,	A. D., Darsi,
„ Radhakrishnan, K. S.	A. D., Rapur,	A. D., Madakasira.
„ Suryanarayanaraju,	Asst. in Meteorology,	A. D., Nandigama.
R. V. S.	A. R. S., Hagari,	A. A. D., Hospet.
„ Srinivasa Rao, K.	A. A. D., Ramachandra-	A. A. D., Tiruchirapalli.
„ Sriramachandra-	puram,	A. A. D., Tirunelveli.
murthi, N.	A. A. D., Narasapur,	A. A. D., Ambasamudram.
„ Subba Rao, A.	A. A. D., Amalapuram,	A. A. D., Tirunelveli.
„ Sriramamurthi, G.	A. A. D., Nandigama,	A. D., Pattikonda.
„ Sheenappa, K.	A. A. D., Kakinada,	A. A. D., Tirumangalam.
„ Shanmugam, C.	Coconut Nursery Asst.,	Special A. D., Sugarcane,
„ Sitaramaswami, U. B.	Coimbatore,	Mangalore.
„ Surendranath, G.	A. A. D., Ambasamudram	A. D., Tenkasi.
„ Subramania Iyer, R.	F. M., Dairy - Cum Bull	A. D., Vijayanagaram.
„ Swaminathan, S.	Farm, Vizagapatam,	Asst. in Paddy, A. R. S.,
„ Swaminathan, K.	Chillies Asst., Lam Farm,	Pattambi.
„ Sethuraman, M. S.	Guntur,	A. D. Sattur.
„ Sriramachandran, K.,	Special A. D., Manure,	A. D., Pudukottai.
„ Suryanarayana, P. S.,	Musiri, (on leave)	A. A. D., Kulithalai.
„ Suryanarayana-	A. D., Perambalur,	P. P. A., (Entomology)
„ Veerabhadra Rao, V.	A. A. D., Tiruchirapalli,	Salem.
„ Venkataramaiah, C.	P. P. A., (Mycology)	Asst. in Mycology, Wynad.
„ Venkatanandhachari, G.	Ootacamund,	A. A. D., Namakkal,
„ Viswanathamurthi, K.	Asst. in Mycology,	A. A. D., Razole,
„ Venkateswara Rao, A.	Coimbatore,	A. A. D., Lalgudi.
„ Venkataraman, A.,	Asst. in Mycology,	F. M., Dairy - Cum Bull
	Coimbatore,	Farm, Vizagapatam.
	Asst. in Mycology,	A. D., Harpanahalli.
	Coimbatore,	Asst. in Paddy Deep Water,
	Asst. in Mycology,	Paddy Station, Pulla.
	Coimbatore,	A. D., Rapur.
	Asst. in Mycology,	Coconut Nursery Asst.
	Coimbatore,	Coimbatore.
	Asst. in Chemistry,	A. A. D., Nilakottai.

APPOINTMENTS

The following candidates are appointed in the Madras Agricultural subordinate Service and are posted in vacancies shown against each :—

Sri Damodaram Nambiar, M. (Malabar)	Asst., in Chemistry, Coimbatore.
„ Dharma Rao, C. (Kistna)	Asst., in Chemistry, Coimbatore.
„ James, K. I. (Cochin)	Asst., in Cotton, Coimbatore
„ Pandurangan, S. V. (Tanjore)	Seed Development Asst., (Millet)
„ Raman, K. (Madras)	Coimbatore.
„ Rajagopalan, C. K. (Malabar)	Asst., in Entomology, Shembaganur,
„ Radhakrishnan, T. (Madras)	Madura.
„ Ramaswami, A. N. (Madura)	Asst., in Entomology, Shembaganur,
„ Sivarama Shetty, K. (S. Kanara)	Madura.
„ Sekharan, K. V. (Malabar)	Asst., in Pulses, Coimbatore
„ Subramania Chetty, R. (N. Arcot)	Asst., in Chemistry, Coimbatore.
„ Subba Rao, S. V. (W. Godavari)	do.
„ Satyanarana Raju, G. (Vizag)	do.
„ Thyagarajan, N. M. (N. Arcot)	Asst., in Entomology, Coimbatore.
„ Thyagarajan, R. (S. Arcot)	A. A. D., Erode.
„ Vijayan, K. M. (Malabar)	Asst., in Entomology, Siruguppa.
	A. A. D., Tindivanam.
	Asst., in Chemistry, Coimbatore.
	Asst., in Chemistry, Coimbatore.
	Asst. in Mycology, Coimbatore.

Agricultural College and Research Institute, Coimbatore

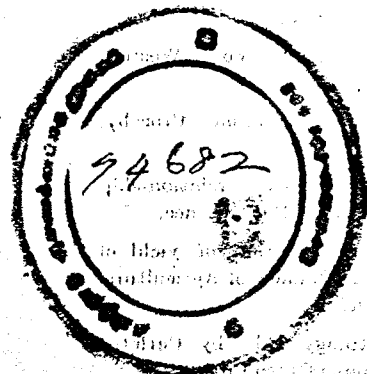
LIST OF ADDITIONS TO LIBRARY FOR DECEMBER, 1950.

- BRISTOL '20' Chart (1950) Ferguson Tractor Chart Farm Mechanisation.
- CENTRAL BUREAU VOOR SCHEME CULTURES
BAANN: (1950) List of cultures: Konniklike
..... Nedarlandse Academic Voor Western Schaappen.
- GAUMANN (E.): (1950) Principles of plant Infection; Crosby, Lockwood.
- KRAMER (Paul J.): (1949) Plant and soil water relation-ship
Mc Graw Hill Book Co., Bot. Science.
- Sample surveys for estimation of yield of food crops: Indian Council of Agricultural Research. New Delhi.
- SCHAFER: (1949) Essentials of histology Ed. by Carleton and Leach. Longmans Green Co.,

The Madras Agricultural Students' Union,
LAWLEY ROAD P. O.

Appeal

All members and subscribers of the Madras Agricultural Journal are earnestly requested to clear off all their arrears, if any. This would be a great help to the finances of the Union.



THE MADRAS AGRICULTURAL STUDENTS' UNION.

This is an association of the students, past and present, of the Madras Agricultural College, and of the officers of the Madras Agricultural Department, the Principal of the Agricultural College being the President, *ex-officio*. The Union conducts this Journal and celebrates annually the College Day, on which occasion it convenes an Agricultural Conference. The Association has Members, Associates, Honorary Members and Patrons. For detailed particulars apply to the Secretary.

THE MADRAS AGRICULTURAL JOURNAL

A Premier Agricultural Monthly in India.

EDITORIAL BOARD.

T. R. Narayanan, B. sc., (Ag.) M. A., (Cantab)
Dr. N. Krishnaswami, B. sc. Ph. D. (Kiel.) T. S. Lakshmana, B. sc., (Ag.)
S. Sampath, M. A. M. Vaidyanathan, B. sc., (Ag.)
C. Balasubramania Mudaliar, B. sc., (Ag.) M. sc. J. Chandra Mohan (Student)
M. Sundaram, Secretary, Students' Club (ex-officio).

A monthly Journal in English devoted to the study and development of Agricultural Science; contains articles of scientific as well as of general interest written in popular language. Review of agricultural publications and extracts from various Journals—both Indian and Foreign—a special feature. Commands a wide circulation and is an excellent medium therefore for advertisements.

Rates of Subscription:

Journal supplied *free* to Members, Associates and Patrons of the Union.

Annual subscription rates for others:

			Rs.	A.	P.
India and Ceylon	...	...	6	0	0
Foreign	...	...	7	0	0
Single number	...	...	0	8	0

Rates of Advertisement:

For Single insertion:

			Rs.	A.	P.
For full page	...	...	15	0	0
For half page	...	...	8	0	0
For quarter page	...	...	4	0	0

Inside cover pages 25 per cent extra.

Outside cover pages 50 per cent extra.

Preparation of blocks unless supplied by advertisers charged extra.

N. B.— All advertisements are subject to the approval of the M. A. S. U. Managing Committee before insertion. The charges are strictly payable in advance.

Contributions to the Journal:

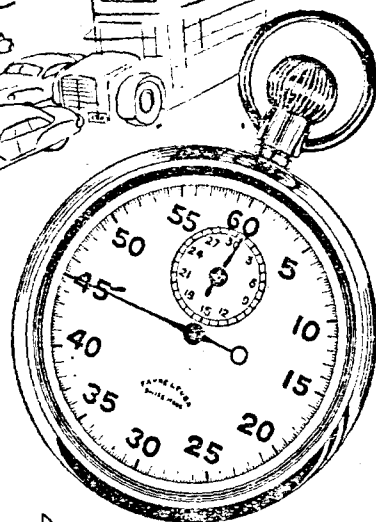
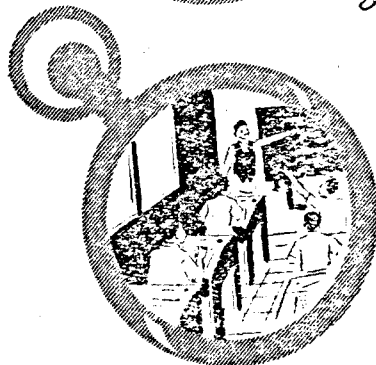
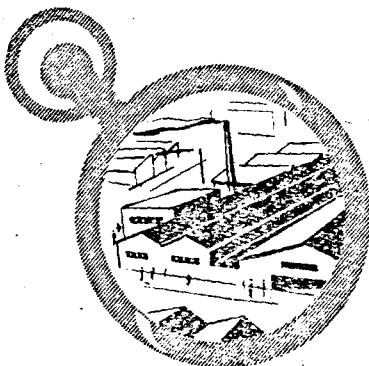
Contributions on Agricultural Science, subjects of agricultural interest or pertaining to rural economics and co-operation will be accepted for publication, subject to approval of the Editorial Board. Correspondence and queries on agricultural and allied subjects are invited. Manuscripts should be sent clearly written or typed on *one side of the paper* only.

Twenty-five copies of reprints of contributions will be presented to authors. *Extra copies and printed covers for reprints*, if required, can be supplied at actual cost if intimation is given when the manuscript is presented.

N. B.— The Editorial Board does not hold itself responsible for the opinions expressed by the contributors.

All communications should be addressed to:

The Secretary, M. A. S. Union,
Agricultural College, Lawley Road P. O., Coimbatore.



There are many vital industrial uses for these accurate Favre-Leuba Stop Watches. The timing of manufacturing processes is sometimes an important economic factor in the final cost of the product. Favre-Leuba Stop Watches help industrialists to keep a check on output and production.

There are many vital industrial uses for these accurate Favre-Leuba Stop Watches. The timing of manufacturing processes is sometimes an important economic factor in the final cost of the product. Favre-Leuba Stop Watches help industrialists to keep a check on output and production.

Science has for many years appreciated the value of accurate measurement. Finely adjusted balances and measures ensure the accuracy of formulas and Favre-Leuba Stop Watches ensure the accuracy of timing.

Science has for many years appreciated the value of accurate measurement. Finely adjusted balances and measures ensure the accuracy of formulas and Favre-Leuba Stop Watches ensure the accuracy of timing.

Instructional establishments and the teaching profession find many uses for an accurate Stop Watch.

Instructional establishments and the teaching profession find many uses for an accurate Stop Watch.

No. 5109. Registering fifths of seconds Rs. 84/-
No. 5129. Same as above but with split second allowing multiple observations Rs. 206/-
No. 5118. Registering tenths of seconds Rs. 87/-

No. 5129. Same as above but with split
second allowing multiple observations
R1. 206/-

No. 5119. Registering tenths of seconds Rs. 87/-

[illegible]

FAYRE-LEUBA & COMPANY LIMITED • Bombay • Calcutta
Sternachs

Edited and Published by T. R. Narayanan, B. Sc., (Ag.), M. A., (Cantab)
for The Madras Agricultural Students' Union and Printed by A. Subramaniam,
at The Coimbatore Co-operative Printing Works, Limited, Coimbatore.