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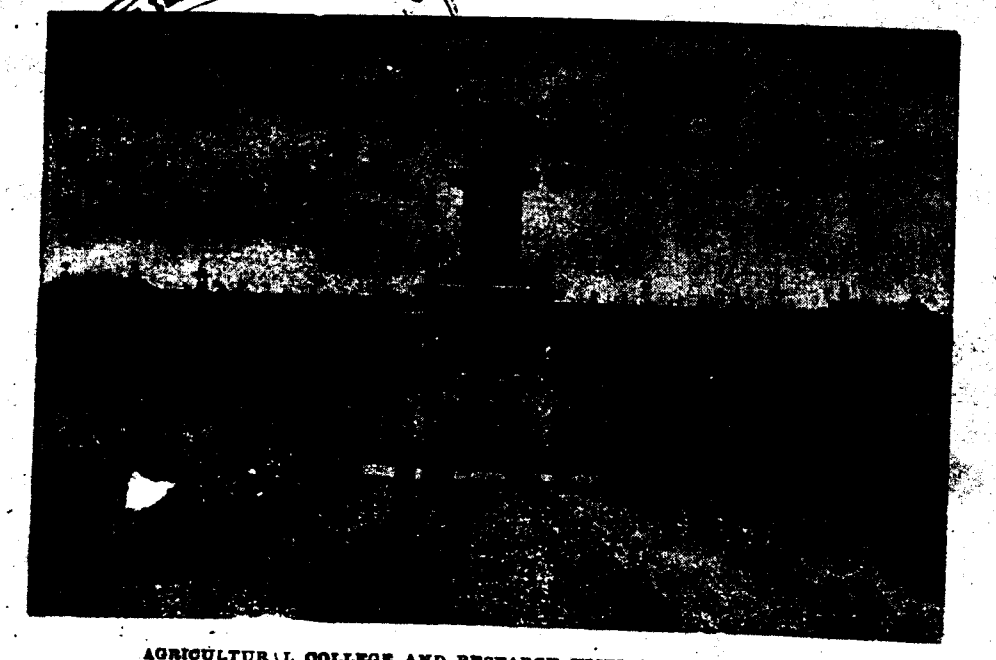

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Announcement

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THE RAMASASTRULU MUNAGALA PRIZE, 1957

1. The prize will be awarded during the College Day and Conference in 1957.

2. The prize will be in the form of a medal and will be awarded to the member of the Union who submits the best account of research or enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages, typewritten on one side.

4. Intending competitors should notify to the Secretary of the Madras Agricultural Students' Union with a covering letter giving the full name and address of the competitor. The author's name should not be shown on the paper, but should be entered as a *nom-de-plume*.

5. Four typewritten copies of the paper should be sent.

6. The name of the successful competitor will be announced and the prize awarded at the time of the College Day and Conference.

7. Paper or papers accepted will become the property of the Union, and the Union reserves to itself the right to publish all or any of the papers.

8. All references in the papers to published books, reports or papers by other workers must be acknowledged.

9. The last for receipt of papers is extended upto 15th July [illegible]

K. S. Shetty,
Secretary.

ANNOUNCEMENT

The Annual College Day and Conference is tentatively programmed for the second week of August 1957. The Golden Jubilee Celebrations of the founding of the Agricultural College and Research Institute at Coimbatore have also been proposed to be celebrated during the same week.

The subject for the Conference symposium is "Integration of Agricultural Research, Education and Propaganda". Contributors are requested to send in papers to reach the Secretary by 1st August 1957.

SECRETARY,
MADRAS AGRICULTURAL STUDENTS' UNION.

JUBILEE SHIELD FOR CHEMISTRY

The Golden Jubilee rolling shield of the Chemistry Section to be awarded during the College Day and Conference to the best scientific workers in the field of Agricultural Chemistry.

Rules and conditions for the award:

(1) The shield will be awarded to the best scientific worker in the field of Agricultural Chemistry. All Scientific workers and Research students of the chemistry section at the Agricultural College and Research Institute, Coimbatore as well as in the Department of Agriculture, Madras State will be eligible for the award.

(2) The shield is a rolling one and will be awarded at the time of the Annual College Day and Conference of the Agricultural College and Research Institute every year.

(3) A committee to adjudge the best worker for the award shall comprise.

  (1) The Principal (Chairman — Ex-Officio)

  (2) The Government Agricultural Chemist (Ex-Officio)

  (3) A senior officer of the Research Council elected by Research Council).

(4) The award will be made to the worker adjudged as the best on the basis of the reports or papers containing either (i) an account of original research in which the author's share is the maximum or (ii) a critical discussion or analysis of any subject related to agricultural chemistry, throwing new light on or adding new knowledge to the subject.

(5) A certificate will also be awarded to the winner of the rolling shield.

(6) The shield shall be returned to the Government Agricultural Chemist after the award for keeping in safe custody.

(7) The award will not be made more than once to the same person.

(8) The power to modify the rules to suit any situation that may arise at any time rests with the Government.

Papers and reports etc. for the award are invited on or before the 15th of July 1957 by the undersigned.

A. Mariakulandai,
Government Agricultural Chemist.

Lawley Road P. O.

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Editorial 69

Soil is the physical basis of our agriculture. This soil has to be intelligently and wisely used by the people of our country so as to keep it permanently productive. The topsoil to a depth of about nine inches is the zone of intense activity in crop production that provides the food of man and his livestock, fibre for his clothing and even timber for building his house. Unfortunately this topsoil is the most unstable of nature's gifts to man. Wind and water are able to carry the soil away and man also, by a variety of negligent activities aids in the accelerated removal of soil, which is known as soil erosin.

Elsewhere in this issue, our readers are introduced to the gravity of the problem of soil erosion in the Nilgiris and what is being done there to transform the land to prevent the erosion losses. Nowhere has been the wasteful methods of farming been more flagrant in the use of agricultural land than in the Nilgiris. Many fundamental principles of sound land use have been grossly violated and thousands of acres of excessively steep land opened up indescriminately for potato cultivation. The clearance of natural forests for a variety of purposes has gone on all the time. It is recorded that several thousands of acres of land have already been ruined and the topsoil over a greater portion of the areas under cultivation has been completely lost and the yields are maintained with great difficulty through the application of high doses of fertilisers. The intensity of the soil loss is visible in the muddy waters of the Kallar and Coonoor rivers after every rain.

Apart from the Nilgiris, soil erosion is taking place slowly and seriously on most of the cultivated lands of the State resulting in a gradual loss of soil fertility. The whole

phenomenon is largely man made; lack of foresight and knowledge on the part of the ryots have created a land problem of tremendous implications. The situation is very grave as once the topsoil is lost it is irretrievable and cannot be replaced. Though no estimate is available of the losses of soil and nutrients, the quantity involved must be enormous.

Soil erosion is receiving world wide attention today, even though the recognition of the enormity of the losses was belated. Our department as early as the thirties assessed the magnitude of the problem as a result of which contour bunding was found very effective and recommended for wide adoption. Various other measures were simultaneously implemented by Goverfiment. Thousands of acres have already been effectively conserved against erosion through the adoption of wholesome farm practices. Research and experience are continually developing improved and new methods. Many economic difficulties are being solved through state aid. Even so, the fact that soil erosion is steadily undermining the physical basis of the nations agricultural resource is still not appreciated by many. It is as well that the magnitude of the problem is restated as there is an urgent need for public appreciation of the problem and of the methods of soil conservation. The Soil has to be saved for the people by the people.

Soil Erosion Problems in the Nilgiris

by

S. NARAYANASWAMY & N. D. REGE

Introduction: The Nilgiri district in the Madras State lies between latitude 11°—7′ and 11°—40′N and longitude 76°—15′ and 77° and has an area of 989 squire miles. It is bounded on the north and south by the rivers Moyar and Bhavani and by Coimbatore district on the east and Malabar—Wynaad on the west. The whole of the district has a very undulating topography with mostly very steep and long slope and was once covered with dense vegetation such as forest, grasses, bushes, etc. But the introduction of potato during the latter part of 19th century and leasing of Government lands for its cutivation led to extensive clearance of these areas. During the grow more food campagin, a large extent was still further brought under potato cultivation through the extensive destruction of the protective cover. During the last 40 years the area brought under cultivation has practically doubled. At present more than 1,20,000 acres are being cultivated with semi-permanent and annual crops.

This indiscriminate cutting of the luxurious vegetative growth and continuous cultivation have resulted in loss of a huge quantity of productive soil from vast areas. It has been observed that a greater portion of the areas under cultivation has lost top soil altogether and the yields obtained now are mainly through the application of high doses of fertilisers. In this present paper it is proposed to discuss these problems and suggest some ways and means to prevent the collosal loss of soil.

Soil Erosion Problems: Soil Erosion is influenced by many factors among which topography, climate, rainfall, soil ground cover, and present farming practices are of major importance. It is therefore necessary to study these factors before any remedial measures are suggested.

Topography: The entire district can be divided into tow major tracts; namely (1) The Nilgiris Plateau and (2) The South East Wynaad, having an average elevation of between 6,500 feet and 3,000 feet M. S. L. respectively; and consists of numerous hillocks of varied undulations with practically not even a square mile of flat land. The general slope varies from about 5% (1 in 20) along lower fringes of hillocks to over 100% (1 in 1) along high slope, while the length of

the slope varies from 300 feet to 1,000 feet and above. In view of this, most of the soil is washed down to the streams during heavy rainfall.

Climate and Rainfall: The climate on the higher elevation is fairly equitable, the average maximum temparature being 73·7°F while the average lowest being 45°F. At the lower elevation the summers are very hot. During November to January the higher elevation experiences heavy frost which cuts most of the vegetation very badly, thus leaving the areas bare and susceptible to erosion. During June — August the wind velocity is fairly high (over 40 miles per hour) but this does not give rise to wind erosion as the soil is practically wet and fairly covered with some crop. However, it affects the growth of potato crop to a great extent due to damages of their haulms and crowns and other indirect effects of wind erosion.

On the higher elevation of the district the average annual rainfall is 71·42 inches, out of which nearly 31·54 inches are received during south west monsoon (June to September) and 20 inches during north east monsoon (October to December). On the lower elevation towards the west, rainfall is comparatively heavy with an average of 101·35 inches. The rainfall received during north east monsoon is very erratic and ill-distributed, and therefore there is much of accelerated erosion during this period. The rainfall is influenced by the high hills called Dodabetta Range having a maximum elevation of 8,640 feet M. S. L. and lying north south of plateau. In the south east Wynaad the soil erosion is great during the south west monsoon.

Soils: The soils of the plateau regions are derived from gneiss which gives rise to ferrogenous clay. The major soil types are clay, clay-loam and loam. The soils are highly acidic, the pH being round about 4·6 and are generally deficient in N. P. and K.

Ground Cover: The district can be divided into three regions on the basis of the vegetation:

1. Lying at the elevation round about 3000 feet above M. S. L. having deciduous vegetation, tropical trees and shrubs.
2. Having large scrub and evergreen forests on an elevation between 3,000 feet and 4,000 feet above M. S. L.
3. An area having an elevation over 4000 feet above M. S. L. covered with Sholas (Native forest) in small patches and short and coarse grasses covering a large part of area.

Most of the vegetation from the above regions is being cleared regularly for annual and semi-permanent cultivation. A list furnishing the important vegetation growing at different regions is appended.

Farming Practices: In Coonoor and Ootacamund taluks the principal crop grown is potato. This is grown in three different seasons normally taking only one crop per year on the same land. The irrigated crop is sown in January and harvested in May — June. The second crop is sown in August — September and harvested in December — January. The main crop is sown in March — April and harvested in August — September. The cultivation is done mostly by manual labour. The potato is sown by forming ridges and furrows along the slope 6 to 10 feet in length, the ridges being staggered in the adjacent patch lower down. Sometimes a shallow and oblique trench is excavated at a sloping distance of 10 to 15 feet. A few patches are even terraced in odd bits; but mostly these terraces are straight oblique and sloping outwards. Such cultivation practices and the inevitable fallowing after harvest of second crop of potato which coincides with the period of north east monsoon leads to an enormous loss of soil during the rainy season.

There is no definite rotation followed in these tracts. Sometimes the land is kept fallow or the land is put to Samai *(Panicum miliare)* or Wheat *(Triticum spp.)* or Korali *(Setaria glauca)*. In recent years due to very attractive price for the potato, the land is even repeatedly sown with potato, taking two or three crops a year in the same land. Thus the land gets exhausted at a rapid rate. These destructive practices lead to soil erosion and depletion at a very rapid rate. Yet, the ryots of the Nilgiris by their normal practice of applying heavy doses of chemical fertilisers (2000 lbs. per acre average), do not easily realise the magnitude of the loss and destruction to their lands.

In Gudalur taluk in South East Wynaad region, Paddy which is the principal crop is grown on fairly levelled and bunded lands and the loss of soil from these lands is negligible. On steeper slopes round about the valleys and swamps dry crops such as Ragi *(Eluesine coracana)* Samai *(Panicum miliare)*, Tapioca and Ginger are grown. This and the normal practice of shifting cultivation adoped in this tract lead to extensive sheet, rill and gully erosion.

Thus most of the areas in the district are either highly eroded or getting badly eroded due to the extensive and intensive cultivation carried out on any slope and without proper soil conservation measures.

Extent of Erosion: The experiments conducted in controlled plots at the Agricultural Research Station, Nanjanad in Ootacamund Taluk have given some valuable information regarding the soil and water loss taking place under different covers, viz., grass cover, potato and clean cultivated land. These figures, given below, though tentative in character, yet reveal comparable data regarding the extent to which erosion has been taking place in this district.

Soil Cover	Slope 1 in 5 (20%)		Slope 1 in 10 (10%)	
	Soil loss Tons/acre	Runoff water inches	Soil loss Tons/acre	Runoff water inches
1. Ryots method of potato cultivation	3·27	11·92	1·06	2·72
2. Fallow through out the year	6·32	36·91	2·40	6·31
3. Indigenous grass cover	0·49	2·47	0·34	1·56

A preliminary reconnaissance soil conservation survey of the district has indicated that nearly 10% of the total area and lying along the lower fringes of hillocks and adjoining streams is moderately eroded (nearly 50% of the productive soils is lost) and the remaining area is highly or severely eroded (nearly 75% and more of the top soil is lost). The areas lying on steeper slopes is practically devoid of any top soil and cultivation is therefore carried out on subsoil by applying very heavy doses of fertilisers. The extent of erosion can be gauged also by the way in which the streams and reservoirs are getting silted up. Stream bank and bed erosion and road side erosion is also a feature in this district.

Remedial Measures: The remedial measures to control soil erosion and build up the soil fertility can be divided under the following four categories, considering the peculiar local conditions.

(1) Agronomical (2) Agrostological (3) Afforestation and (4) Mechanical.

Agronomical: At present the cultivation is done along the slope. This has to be stopped and cultivation along the contour has to be introduced. All the operations such as ploughing, making the

ridges and furrows, planting have to be done on contours. Further a systematic crop rotation is an essential requisite for not only controlling land against erosion but ensuring permanent preservation and maintenance of the fertility of the land and thereby a sustained yield. It is therefore suggested that two or three year crop rotation such as potato — lupin or potato lupin — cereal at present advocted at the Agricultural Research Station, Nanjanad may be adopted. The fertiliser mixture containing ingredients at the rates of 500 lbs. of groundnut cake, 350 lbs. of bone meal, 200 lbs. of ammonium sulphate, 672 lbs. of super phosphate and 224 lbs. of potassium sulphate per acre of land, with a basal dose of 2½ to 5 tons of cattle manure or compost, suggested by Agricultural Research Station, Nanjanad, can be conveneintly adopted. Thus contour cultivation, proper rotation and judicious manuring would be able to prevent colossal soil loss.

Agrostological: The lands (over 33% in slope) which cannot be cultivated along stream and road margins, gully sides, heads and the like should be put to permanent pastures growing suitable grasses and legumes. The most promising grasses seem to be *Pennisetum clandestinum* (Kikiyu), *Paspalam dilatatum* (Dallis grass), *Phalaris tuberosa* (Harding grass), *Dactylis glomerata* (Orchard grass). *Bromus inermis* (Smooth Brome grass), *Bromus catharticus* (Rescue grass) and *Tripogon bromoides* and so on. The legumes which can be usefully grown in association with these grasses are *Trifolium repens* (white clover) and clovers such as subterranean clover, Bachus Marsh, Dwalganup etc.

Preliminary investigations on grasses have shown that these can be used profitably for soil conservation and field trials are in progress which indicate the efficacy of legumes in building up the fertility of the soil. These pastures can be further improved by excavating furrows of a cross sectional area of about 30 square inches at 5 to 10 feet horizontal intervals. This will help in increasing the yield of pasture as well as conserve the soil and moisture and in subsequent improvement in soil fertility.

Afforestation: Lands steeper than 33% can also be put under economic species of trees like *Eucalyptus globulus* (Bluegum) or *Acacia mollissima* (Black wattle) or *Acacia decurrens* (Green wattle). Leaves of Bluegum yield Eucalyptus oil while the bark of wattle can be used for tanning leather and as such both these species fetch a fair income to the grower in addition to affording cover

canopy protection and making the soil rich in humus content, loose and open textured to absorb and hold considerable amount of water which will gradually appear as springs or pass direct into streams in due course and thereby reduce soil erosion to a great extent. *Acacia melonoxylon* (Blackwood acacia) which is a good fodder tree supplying green fodder during frost season when many species of grasses are affected, can also be planted.

Mechanical Measures: Even though the agronomical, agrostological and afforestation methods explained above are useful soil conservation measures, these alone are not enough to control soil erosion in the Nilgiris. The main reason is that most of the cultivated area in this region comes under the slope group of 16%—33%. As such the above methods particulaaly the agronomic ones have to be supplemented with the mechanical measures. The slope being very steep, the most suitable mechanical erosion control will be to bench terrace these areas prior to bringing them under cultivation. These terraces are to be given a gradient inwards such that the inner edge is a foot lower than the outer edge and a uniform gradient of ¾% longitudinally so that the excess run-off on these terraces is collected along inner edge and conveyed safely lengthwise as rapidly as needed towards vertical drain provided with drop pits at interval. The terrace edges and disposal drains are to be protected by establishing economic species of soil binding grasses. The length of such terrace is restricted to a maximum of 350 feet and the disposal drains are constructed at every 700 feet at the maximum. The cost of bench terracing varies with the slope. Width of bench terraces being constant, the greater the slope the more will be the cost of construction. But for a constant vertical interval, the steeper the slope lesser will be the cost of construction. Construction of bench terraces and maintaining economic width will involve on an average 300 man hours per acre, if the work is carried out by manual labour and about 30 tractor hours, if the same is executed with tractor bulldozer similar to Caterpillar D4 Tractor bull dozer.

Observation on the recouperative capacity of the disturbed soil conditions due to bench terracing have shown that the mixture of soil and subsoil respond quickly to organic and inorganic manuring which the ryots normally apply in large quantities for raising potato crop. The experiments on yield have confirmed this and it was seen that during the first cropping immediately after terracing, the yield is maintained the same as before terracing,

irrespective of loss in area due to construction of terraces, and from the subsequent crop onwards the yield increases by about 40%. This measure though apparently costly obliterates the cost within about two years in view of the increased yield. Further this type of terracing helps in conserving the soil which in the long run will be able to give sustained higher yield.

Land Use Classification: A tentative Land-Use Classification as being recommended already is reproduced below:

Land use suitability Broad group	Land Use Classes	Land Characteristics	Soil Conservation measures proposed
Agricultural Lands.	Class I	Slope upto 2% uneroded or slightly eroded with good soil conditions.	Crop rotation (2 or 3 years) including contour farming & improved agricultural practices.
	Class II	Slope from 2% to 10% moderately eroded with soil conditions fair to good.	Graded bunds or terracing with outlets and disposal drains and other agronomical methods.
	Class III	Slope 10% to 16% slightly, moderately or severely eroded with soil conditions fair to good.	Graded trenching with disposal drains and drop pits and other agronomical methods.
	Class IV	Slope from 16% to 33% slightly, moderately or severely eroded with soil conditions fair to good and with sufficiently deep sub-soil.	Bench terracing with disposal drains and drop pits and other agronomical methods.
Forests or and grass Lands.	Class V	Slopes over 33%—Very badly eroded lands with soil and other conditions poor.	Graded trenching or pasture furrowing with disposal drains and drop pits and other biological methods.

Conclusion: It may be mentioned that the areas in Nilgiris are getting ruined due to the pressure of cultivation. It is of utmost importance that all the cultivated areas are protected with soil conservation measures immediately and whenever the new lands are leased out the first condition should be to enforce these measures.

The State Government is taking steps already and it is hoped that with the co-operation of farmers the menace of soil erosion will be successfully tackled.

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3. Basu, J. K., Narayanaswami, S. & Rege, N. D. — "Land-Use Planning for The Nilgiris" Part I & II Journal of Soil and Water Conservation in India 1956, Vol. 5 No. 1.
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APPENDIX I.

Important Vegetation on the Nilgiris.

I. Below Elevation of about 3000 feet M. S. L:

1. Acacia leucophloea
2. Acacia arabica
3. Acacia latronum
4. Acacia planifrons
5. Albizzia amara
6. Albizzia odoratissima
7. Bombax malabaricum
8. Phyllanthus emblica
9. Trema orientalis
10. Gmelina arborea
11. Feronia elephantum
12. Melia azadirachta
13. Stephegyne parvifolia
14. Hardwickia binata
15. Chloroxylon swietenia
16. Scheleichera trijuga
17. Dalbergia latifolia and
    ,, paniculata
18. Pterocarpus marsupium
19. Terminalia tomentosa
20. Terminalia chebula
21. Terminalia bellerica
22. Terminalia paniculata
23. Anogeissus latifolia
24. Cedrela toona
25. Tectona grandis
26. Santalum album
27. Lagerstroemia lanceolata
28. Lagerstroemia flos reginae
29. Elaeodendron glaucum
30. Butea frondosa

Bamboos:

1. Bambusa arundinacea
2. Dendrocalamus strictus

II. Between about 3000 feet and 4000 feet above M. S. L:

1. Calophyllum tomentosum
2. Mesua ferrea
3. Poeciloneuron indicum
4. Hopea parviflora
5. Canarium strictum
6. Dysoxylum malabaricum
7. Veteria indica
8. Cullenia excelsa
9. Chukrasia tabularis
10. Aglaia roxburghiana
11. Acrocarpus fraxinifolius
12. Bassia latifolia
13. Alseodaphne semecarpifolia
14. Bischofia javanica
15. Artocarpus hirsuta
16. Diospyros ebenum
17. Lophopetalum wightianum

III. Above Elevation of about 4000 feet above M. S. L:

1. Michelia nilagirica
2. Hydnocarpus wightiana and
   ,, alpina
3. Gordonia obtusa
4. Ilex wightiana
5. Elaeocarpus oblongus and
   ,, Munroii
6. Turpinia pomifera and
   ,, nepalensis
7. Meliosma arnothiana
8. ,, wightii
9. Photinia notoniana and lindleyana
10. Eugenia arnothiana and montana
11. Heptaplenrum spp.
12. Vilburnum erubes and
    ,, hebanthum
13. Vaccinium leschenaulti and
    ,, neigherrense
14. Sideroxylon tomentosum
15. Cinnamomum zeylanicum
16. Litsea wightiana
17. Neolitsea zeylanica
18. Glochidion neilgherrense
19. Rhododendron arboreum
20. Ligustrum perrotteii
21. Rapania wightiana
22. Celtis tetranda
23. Daphyniphyllum glaucescens
24. Microtropis spp.
25. Symplocos foliosa and spicata
26. Ternstroemia japonica
27. Eurya japonica
28. Evodia roxburghiana
29. Euonymus cremulabus

Under growth consists of:

1. Berberis tinctoria
2. Hypericum mysorense
3. Dodonea viscosa
4. Rhodomyrtus tomentosa
5. Osbeckia wightiana
6. Gaultheria fragrantissima
7. Eupatorium glandulosum
8. Mahonia leschenaultii
9. Strobilanthes spp.

Studies on Drought Resistance in Rice*

by

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Discussion: The drought resistance of progensies of crosses between the cultivated rice and wild rice was tested in their F3 and F4 generations in the field under restricted water supply. These tests revealed that the cultivated low-land rices are unable to withstand drought whereas the hybrids between the cultivated and wild forms showed greater ability to resist drought. The progenies of crosses studied in the two generations were found segregating for drought resistance and drought susceptibility. This is in confirmation with what Ostermayer (1934) found in oats. Very little work on breeding for drought resistance in rice has been done except for the mention made by Srinivasan (1941), who obtained a few drought resistant cultures from an inter-specific cross, *Oryza sativa* x *Oryza longistaminata (perennis)*.

* Continued from May 1957 Issue.

A study of the morphological characters showed that the progenies resembling the wild parents were able to resist drought better than those resembling the cultivated parents. These resistant progenies exhibited an open type of tillering, broad and flowing leaf lamina and lighter shade of green in the colour of the foliage. The leaf was coarse and rough with bristles. These characters are typical of the wild rice varieties used in hybridisation and it is definite that the progenies resembling the wild rice are drought resistant as a result of inheritance.

The wild rices were, however, found to have delayed germination and slow growth in the early stages but were found to tide over successfully the drought occurring in later stages. On the other hand the cultivated rices showed quick germination and steady growth in the early stages though they were unable to withstand late drought and failed to produce any ears. Hence the progenies which have synthesised the characters of both the parents should be able to withstand both the early drought as well as late drought and this has been confirmed in the trials conducted when many progenies did successfully resist the severe drought in their F3 and F4 generations.

It has been possible to obtain drought resistant progenies possessing the good qualities of the cultivated rice. High yield and good quality grain are the ultimate aim of the rice grower. The wild rices have coarse grain and awns, are highly shedding and are poor yielders, but they possess the quality of resistance to drought. This good quality of the wild parent has been combined with the desirable qualities of cultivated rices.

Duration is one of the important characters in the rice crop, though it can be altered slightly by different cultural practices. This has been observed during the study and it has been found that withholding water and drying the plots enhanced the 'flowering duration' as well as the 'period of flowering' slightly. 'Flowering duration' was found to increase by about seven to ten days in the drought bound conditions and the period or range of flowering increased from seven to eleven days in the semi-wet condition and much protracted in the purely open and dry field. Though early maturing types are only 'drought escaping' they are to be preferred for cultivation under dry conditions. It may not be possible to grow a long duration variety either under purely rainfed condition or under limited water supply owing to the long period it will take to mature. The aim must be to select progenies, resistant to drought as well as shorter in

duration. Studies were made with progenies obtained from crosses of parents belonging to the short duration as well as the mid duration group and it has been clearly demonstrated that the short duration hybrid progenies were the successful ones under the extremely droughty condition in a purely open and dry field. Some of the mid duration progenies failed to put forth ears under this condition though a few progenies earlier than both the parents were obtained. However, these progenies did well under conditions of restricted irrigations. Droughty conditions prevailing at the time of ear emergence in the rice crop are disastrous as they cause bad setting resulting in poor yield. A good yield in rice is possible only with adequate water supply.

The dry rices are comparatively poor yielders with an average of 1000 to 1500 lb. of grain per acre whereas rices grown in swamps yield up to 5000 lb. per acre. Attempts have however, been made in the present study to select progenies which yield high under the droughty conditions. High yielding progenies selected in the F3 generation were found to give significantly higher yield in their F4 generation also as shown in Table 2. Correlation of duration and yield has shown that longer duration groups, with 125 days 'flowering duration' give significantly higher yield than the early duration groups with only 110 days 'flowering duration'. Light green foliage, though found associated with drought resistance, could not be correlated with high yield.

Review of the work of various authors shows successful evolution of drought resistant strains of wheat, oats and many other crops by hybridisation and selection under definite droughty conditions. It is seen that there is a definite varietal resistance to drought in crops. Progenies of crosses between the resistant and susceptible types as well as between two drought resistant types also exhibit variation in drought resistance (Vassiljjev 1936, Isenbeck 1939, Aamodt and Johnston 1936 etc.). The present study has demonstrated that drought resistance in the progenies is a heritable character and it is possible to evolve high yielding drought resistant strains from the hybrid populations by repeated selection from families raised both under extremely drought conditions as well as restricted irrigated conditions. The capacity to resist conditions of drought has thus been found to be genotypic.

The importance of root system has been stressed by more than one worker in this field. Ostermayer (1934) found in oats that the progenies of the resistant types had a well developed root system

PLATE 1

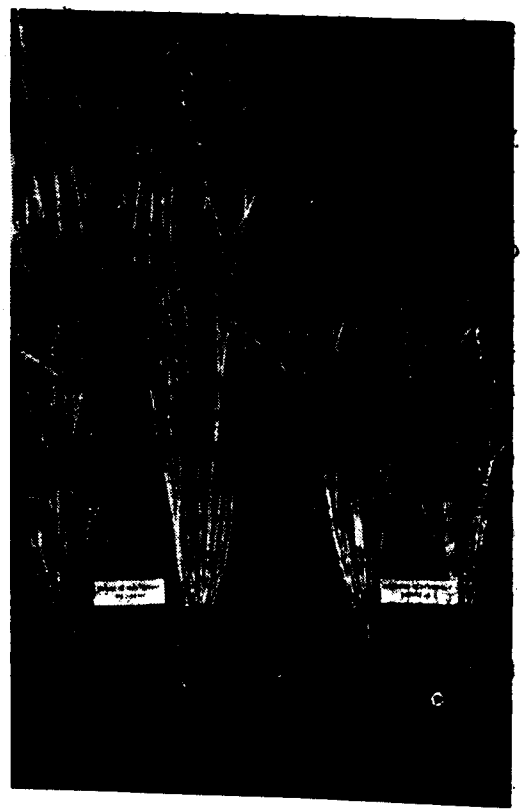

PLATE 2

as compared to their shoot. From his study of over twenty years in oats he has concluded that drought resistance behaves as a Mendelian character and it is associated with root system. Udoljskaja (1937) observed in the drought resistant *Triticum-Agropyron* hybrids, a much longer root system than the common wheat varieties. Similar observations have been recorded in the present study in the drought resistant F3 progenies of crosses between the cultivated and wild rice varieties (Plate 1). Root production was more in the resistant progenies and more of thick roots were noticed in them. The susceptible parents (Plate 2) as well as the susceptible progenies had poor shoot growth and the plants withered and died before they could throw out all the earheads. The production of tillers was good but many of them died and this should have happened since there were not enough of roots to support the tillers. The dry weight of roots of the resistant progenies was more than one and a half times that of susceptible plants. Thus it may be concluded that drought resistance is an inherited character and it is vitally associated with the root system in the rice plant.

Summary: Rice varieties belonging to the cultivated forms and the wild species of *Oryza* were taken for the study on drought resistance in rice. Among the cultivated forms five varieties grown under swamps which are high yielders but susceptible to drought were chosen. Nine wild rice varieties belonging to *Oryza sativa* forma *spontanea* were used as parents for hybridisation.

Crosses were effected between the cultivated and wild rices to synthesise the drought resistant habit of the wild species of *Oryza* with the high yielding, non-shedding nature and other good qualities of the cultivated rice. Nine successful hybrids were studied in their F1 and F2 generations for their morphological characters. The F3 and F4 generations were studied for their reaction to drought and segregation for tillering, height, awning and shedding of grains. Yields of the progenies were recorded in the F3 and F4 generations and a positive correlation between the two yields has been obtained.

The progenies were found segregating for drought resistant and drought susceptible plants and that drought resistance is an inherited character in rice has been established by the study. Attempts have been made to associate the morphological and physiological characters with drought resistance. Foliage colour was found associated with drought resistance. Light green plants were found to resist drought better than the dark green plants. Progenies

with spreading habit and open type of tillering, broad and flowing leaf lamina with coarse and rough bristles were able to survive drought better than those resembling the cultivated forms. Crosses of the short duration parents were more suitable for extremely droughty condition. The drought resistant progenies were found to possess a highly developed root system.

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TABLE 1

Root weight of drought resistant and drought susceptible F_3 progenies.

S. No.	Particulars	Mean dry weight of root in grams	Standard error	Standard error of the difference between means (Ed).	d/Ed.
1.	Drought resistant F_3 progenies	2·57	0·164	0·165	6·63*
2.	Drought susceptible F_3 progenies	1·48	0·018		

* = highly significant

TABLE 2

Correlation of yield between F_3 and F_4 generation of drought resistant cross between cultivated and wild rice, Co. 13 x T. 129.

F_4 yield as percentage on control	F_3 yield as percentage on control									
	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	Total
80— 89	3	1					1		1	6
90— 99	1	1								2
100—109	1	3		2						6
110—119										0
120—129			1							1
130—139										0
140—149	1									1
150—159		1			1	1				3
160—169		1	1	1		2				5
170—179				1				1		2
180—189					1	1				2
190—199					2					2
200—209		1		1		1				3
210—219			1	1	2		1			5
Total ..	6	8	3	6	6	5	2	1	1	38

$r = + 0·392 \pm 0·152$

TABLE 3

Frequencies of yield of progenies with light green and dark green foliage in F_3 generation of cross between cultivated and wild rice Co. 13 x T. 129.

Particulars	yield as percentage on control						
	90—99	100—109	110—119	120—129	130—139	140—149	150—159
Light green progenies	6	2	3	4	1	1	1
Dark green progenies	3	1	4	3	4	1	1

Particulars	Yield as percentage on control 160—169	Total	Mean	Standard error	Ed	d/Ed	
Light green progenies	..	18	113·9	4·26	6·17	1·25	Not significant
Dark green progenies	1	17	121·6	4·46			

TABLE 4

Frequencies of yield of progenies with light green and dark green foliage in F_4 generation of cross between cultivated and wild rice Co. 13 x T. 129.

Particulars	Yield as percentage on control							
	91–100	101–110	111–120	121–130	131–140	141–150	151–160	161–170
Light green progenies	4	3	7	11	5	10	6	5
Dark green progenies	8	6	10	10	17	13	7	12

	Yield as percentage on control							
	171–180	181–190	191–200	201–210	211–220	221–230	231–240	241–250
Light green progenies	4	4	1	3	1	3	3	3
Dark green progenies	10	9	8	10	8	6	5	4

	Yield as percetage on control					Total	Mean	Standard error	Ed	d/Ed	
	251-260	261–270	271–280	281–290	291–300						
Light green progenies	..	2	1	2	1	79	165·1	5·76	7·05	1·59	
Dark green progenies	6	7	3	2	2	163	176·3	4·07			Not significant

TABLE 5

Frequencies of yield progenies with 110 and 125 days flowering duration in F_4 generation of cross between cultivated and wild rice Co. 13 x T. 129.

Particulars	Yield as percentage on control							
	91–100	101-110	111–120	121–130	131–140	141–150	151–160	161–170
110 days	3	6	10	13	3	4	2	4
125 days	8	4	8	6	19	17	11	11

	Yield as percentage on control							
	171–180	181–190	191–200	201–210	211–220	221–230	231–240	241–250
110 days	1	2	1	..	..	3	2	..
125 days	12	11	8	12	8	5	7	5

	Yield as percentage on control					Total	Mean	Standard error
	251–260	261–270	271–280	281–290	291–300			
110 days	..	3	1	..	..	58	148·8	6·33
125 days	5	6	3	4	3	173	179·6	3·90

Ed. 7·43 d/Ed. 4·15 Highly significant.

APPENDIX.

Description of rice varieties used in the study.

1. *G. E. B. 24.* '*Kichilisamba*'. Isolated from Konamani, probably a mutant. This is a very popular strain in Madras State on account of its high quality of table rice. It matures in about 150 days when sown in July-August but the duration will be extended or reduced according to the sowings being made earlier to or later than July-August. It gives an average yield of 3,600 lb. per acre and with intensive cultivation a maximum of 5,000 lb. per acre has been obtained.

Time of harvest: Fourth week of November
Grain size : L. 7·8 mm., B 2·4 mm., T. 1·8 mm.
Glume colour : Straw; Rice: white

2. *CO. 1.* '*Periakichili*' Isolated from GEB. 24 as a natural cross yielding 20 per cent over GEB. 24. Possesses the qualities of GEB. 24 but rice is coarser and duration is a week late. It is popular in Coimbatore and Tiruchirapalli districts.

Time of harvest: 1st week of December
Grain size : L. 8·5 mm., B. 2·6 mm., T. 1·9 mm.
Glume colour : Straw; Rice: white

3. *CO. 2.* '*Poombalai*' or '*Kartigaisamba*'. Isolated from Poombalai grown in Sivagiri Taluk of Ramanathapuram district. It adapts itself better than other varieties of late planted conditions in October-November. On an average it has recorded eight per cent over ryots' bulk. It has given a maximum yield of 4,000 lb. per acre.

Time of harvest: Second week of December
Grain size : L. 7·5 mm., B. 2·5 mm., T. 1·9 mm.
Glume colour : Straw; Rice: white

4. *CO. 5.* '*Chinnasamba*'. Isolated from Chinnasamba cultivated in Coimbatore. Yields 12 per cent over ryots' bulk. It responds to high manuring and yields about 3,500 lb. under average conditions. Rice is fine.

Time of harvest: Third week of December
Grain size : L. 7·9 mm., B. 2·6 mm., T. 1·9 mm.
Glume colour : Straw; Rice: white

5. *CO. 13.* '*Arupathamkodai*'. This strain was isolated from Arupathamkodai or vellaikodai from Madurai district. Yields 19 per cent over the local seed. It can be grown both in the first crop (June-September) and late navarai (February-May) season. It has given an yield upto 3,000 lb. of grain per acre with an average of 2,170 lb.

Duration : 110 days
Grain size : L. 7·8 mm., B. 3·1 mm., T. 2·0 mm.
Glume colour: Straw with purple tip; Rice: white

6. *T. 113.* Extracted wild rice. It is an awned variety with short tip to full awns and shedding.

Duration : 135 days.
Grain size : L. 8·5 mm., B. 2·4 mm., T. 1·8 mm.
Glume colour: Straw with light dirty furrows; Rice: white

7. *T. 128.* Extracted wild rice- Short awned and shedding.

Duration : 138 days
Grain size : L. 8·6 mm., B. 2·3 mm., T. 1·8 mm.
Glume colour: Dull straw; Rice: red

8. *T. 129.* Extracted wild rice. Awns full and shedding.

Duration : 145 days
Grain size : L. 8·7 mm., B. 2·2 mm., T. 1·8 mm.
Glume colour: Light dirty furrows; Rice: red

9. *T. 162.* Extracted wild rice. Awned and shedding.

Duration : 145 days
Grain size : L. 6·9 mm., B. 2·5 mm., T. 1·9 mm.
Glume colour: Brown furrows; Rice: white

10. *T. 469.* 'Pasoher' wild rice. This is found in Madhya Pradesh. The grains are fully awned and badly shattering.

Duration : 128 days
Grain size : L. 8·5 mm., B. 2·9 mm., T. 2·0 mm.
Glume colour: Straw; Rice: red

11. *T. 740.* 'Kun-Kuan Mouning', a wild rice from China. It is an awned variety with short tip to medium awns and badly shedding of grain.

Duration : 125 days
Grain size : L. 8·0 mm., B. 3·0 mm., T. 2·1 mm.
Glume colour: Straw; Rice: white

12. *T. 1601.* 'Chulto Balunga Uriya', a wild rice from Berhampore, Orissa. It is a fully awned variety and a badly shedding type.

Duration : 145 days
Grain size : L. 7·9 mm., B. 2·1 mm., T. 1·8 mm.
Glume colour: Black; Rice: red

13. *T. 1602.* This is a wild rice from Berhampore called 'Berhampore wild 8'. This was collected from Para village. It is an awned variety with full awns. Grains are very easily shedding.

Duration : 145 days
Grain size : L. 8·1 mm., B. 2·1 mm., T. 1·8 mm.
Glume colour: Black; Rice: red.

14. *T, 1702.* 'Valnellu'. This is a wild rice collected from Kodaikanal in Madras State. It is a fully awned variety and grains are easily shedding.

Duration : 140 days
Grain size : L. 9·0 mm., B. 3·2 mm., T. 2·1 mm.
Glume colour: Dull straw; Rice: red.

Lime for Paddy in Coorg

by

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Rice is one of the most acid tolerant crops. Yet Mitsui (2) mentions that for a long time Japanese farmers have been laying great emphasis on the application of lime to paddy fields. He found that addition of lime remarkably increased nitrogen mineralisation and that 1100 kg. per hectare of slaked lime corresponds to the application of as much as 350 kg. of soybean cake per hectare. Govindarajan and Narayanan (1) report on the beneficial effect of liming for paddy. It was therefore thought worthwhile to try application of lime on acid soils in Coorg. The environmental and soil conditions here have been described by Subramaniam (4). Simple experiments in cultivators' fields were laid out on the broad lines described by Panse and Sukhatme (3) to find the crop's response to lime.

During the 1954–55 season a simple manurial experiment with 37 replications on randomly selected fields all over Coorg was laid out. In each field three plots of 10 cents were marked out and given the following three treatments:

(a) Control i. e., cultivators' practice

(b) 30 lb. N as ammonium sulphate, 30 lb. P_2O_5 as Superphosphate.

30 lb. K_2O as Muriate of potash per acre.

(c) 30 lb. N, 30 lb. P_2O_5, 30 lb. K_2O plus 5 cwt. lime per acre.

The treatments were superimposed on what the cultivator would normally do i. e., six rounds of ploughing, two of which in the dry stage, incorporation of 2 tons of farmyard manure and 2000 lb. green leaves per are, transplanting of a month old seedlings of "Kiribilia" 9"–12" apart in July–August and one weeding during the growth period. The treatments were randomised for each field. One and quarter cent plots were marked out randomly in each treatment plot and harvested in December–January. The grain yield is presented in table I.

TABLE I

Results of manurial experiment 1954—55 season. Mean yield of paddy in pounds per plots of 1/80 acre.

Zone	Number of replications	Rainfall inches annual	Treatment a	b	c	F Value treatment	C. D.
Somwarpet	9	71–100	39·7	51·2	56·0	15·2	8·77 c b a
Fraserpet	4	40–70	46·2	52·5	52·2	not significant	
Ponnampet	8	71–100	49·4	49·5	58·4	9·1	7·15 c b a
Virajpet	7	above 100	40·1	44·6	50·0	not significant	
Mercara	4	do	48·5	64·0	65·8	do	
Nopoklu	5	do	39·8	46·8	47·2	do	
District	37	do	43·5	50·5	54·5	25·9	7·15 c b a

While there was significant response in yield to application of lime in two zones lying in the 71–100" rainfall belt, in all other zones the paddy crop in the lime applied plots was much greener in appearance and flowered earlier and had more percentage of well filled grains, than in the other two plots.

During the 1955–56 season another type of experiment on similar lines was laid to find out the effect of lime alone with the following four treatments:

(a) Control or cultivators' practice same as last year

(b) 5 cwt. lime per acre

(c) 10 cwt. lime per acre

(d) 15 cwt. lime per acre

There were 36 replications and in each replication four ten cents plots were treated. As before 1/80 acre plots were randomly harvested in the treatment plots and the yield data is given in table II.

TABLE II

Results of manurial experiment 1955—'56 season mean yield of paddy in pounds per plot of 1/80 acre.

Zone	Number of replications	rainfall inches annual	treatments a	b	c	d	F value treatment	C. D.
Eastern	11	40–70	55·4	58·3	64·1	62·6	2·2	not significant
Central	12	71–100	44·1	48 0	50·3	53·6	10·91	4·62 d c b a
Western	13	above 100	38·6	40·8	42·1	42·3	1·45	not significant
District	36		45·6	48·5	51·5	52·3	7·2	3 78 d c b a

In the second year also there has been significant response to lime in the 71–100″ rainfall zone. There has also been progressive increase in yield for higher doses of lime.

It is probable that this phenomenon of response only in the 71–100″ rainfall zone may be due to either the soil type or due to rainfall intensity in that zone. Rice in Coorg is a purely rainfed crop grown between July and December. The monthly mean rainfall for six representative places is given in table III.

TABLE III

Mean rainfall (inches) based on data for 50 years.

Places	January	February	March	April	May	June
Mercara ..	·16	·24	·76	2·56	5·21	25·50
Virajpet ..	·13	·26	·70	2·84	5·63	24·47
Frazerpet ..	·16	·26	·43	2 65	5·21	6·36
Somwarpet ..	·18	·15	·48	2.52	4·40	13·96
Ammathi ..	·19	·18	·85	3·03	5·45	16·70
Napoklu ..	·36	·38	1·77	5·48	6·38	24·21

Places	July	August	September	October	November	December	Annual
Mercara ..	43·11	26·80	11·08	8·29	3 00	0·72	127·43
Virajpet ..	34·38	17·29	7·73	8·46	3·36	·57	105·82
Frazerpet ..	9·27	5·23	3·38	6·37	2·85	0·58	42·75
Somwarpet ..	29·81	17·28	6·40	6·76	3·35	0·66	85·95
Ammathi ..	26·29	15·84	6·26	8·17	3·53	·52	87.01
Napoklu ..	40·85	21·89	7·85	9·21	3·58	0·64	122·60

An attempt was made to correlate yield with rainfall in the control plots of this and other manurial experiments in cultivators' field in this district in 1955–56 season. The mean yields in control plots are given in table IV.

TABLE IV

Yield and Rainfall

Annual rainfall inches	Number of plots harvested	Mean yield in pounds per 1/80 acre plot
41–50	21	52
51–60	21	40
61–70	34	43
71–80	14	47
81–90	21	48
91–100	42	45
101–110	21	40
110–120	7	41
121–130	19	42
131–above	14	39

There is progressive increase in yield with increase of rainfall upto 90″ and with further increases in rainfall there is a steady decrease in yield. Strangely the mean yield for the 40–50″ rainfall zone is the highest. There would also appear to be some reason to believe that the 70–100″ rainfall zone has the optimum conditions for maximum growth and response to applications of lime. How much effect the property of soil in this zone has on yield needs investigation. However it is clear that profitable returns can be had from application of lime to rice soils in Coorg.

The experiments were sponsored by the Coorg Government and laid out by the gram sevaks. Grateful acknowledgements are due to the cultivators who co-operated in these trials. Thanks are due to Drs. Utham Chand and V. N. Amble who kindly scrutnised the layout plans.

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Curing Trials on Groundnut

by

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Introduction: Of the two million acres sown to groundnuts in the present Madras State nearly 90% of the area is in the rainfed season. Sowings are done in July — August with the receipt of south west monsoon rains and the crop utilises both the monsoons for growth and development. Harvest synchronises with the declining activity of the north east monsoon. Groundnut harvest is a big problem to the cultivators as ideal conditions are obtained possibly once in a few years. Without adequate soil moisture harvests become costly and inefficient and in rare cases the crop is altogether abandoned. When continuous wet weather prevails harvests are no doubt easy but adequate drying facilities are lacking and invariably the quality is affected. The groundnut crop is valued primarily on its quality as may be seen from the fact that while good quality produce fetches Rs. 150/- per candy of 531 lb. to-day, poor quality produce is offered Rs. 90/- or even less per candy. Quality is mainly influenced by the stage of maturity and the post harvest handling of the produce.

The harvesting practices commonly adopted by the ryots vary with the tract, the variety cultivated and the seasonal conditions prevailing. In Pollachi for example bunch groundnut comes up for harvest in July-August. Heavy south west monsoon rains are usual at the time and harvests have to be taken up as the crop reaches maturity to prevent losses by field sprouting. Adequate drying facilities are not available and the produce from the tract is generally of poor quality. In the bunch tract of North Arcot district on the other hand, harvest comes about the middle of November. Absence of heavy rains and adequate facilities for drying result in good quality produce. In Guntur District of the Andhra State the bunch crop comes up for harvest in September - October. There is dearth of labour and immediately the bunch groundnut crop is harvested, it is stacked in the field itself for 2 to 4 weeks. Stripping of pods by beating with flails is taken up after the plantings of chillies and tobacco are over. By this time the produce gets well dried and cured and the out-turn is of very good quality.

In the case of the spreading groundnuts, harvesting is a difficult operation as the pods are formed all along the procumbent branches. Adequate soil moisture is essential for efficient harvest. When moisture is a limiting factor the harvest is very costly and also inefficient because a large quantity of pods is left behind necessitating picking from the soil after one or two ploughings or harrowings in extreme cases. The chances of receiving rain at the optimum time when the crop is fully mature are so uncertain, that a majority of cultivators commence harvest with the receipt of rains even if the crop has not fully matured. This defect is particularly common with small agriculturists with limited resources. The harvested plants are immediately stripped and the produce dried for the two or three days and disposed off to middlemen merchants. The immature harvests and subsequent defective handling impair quality. The well-to-do ryots pay a little more attention to quality and reap the benefit of higher prices.

In countries like America curing is a common feature. The crop after mechanical harvest is stacked around a pole with the pods inside. The stacks are small and commonly spaced in the field itself. They are allowed to stand for about 4 to 8 weeks after which the pods are separated with the peanut picker. The system of curing is reported to yield a superior quality produce. An alternative practice of leaving the harvested produce in neat rows in the field itself for curing is also done by some cultivators. Stacking in the field without any support as well as stacking in shade are also in vogue in some countries.

Materials and Methods: With a view to study the effect of curing fully mature and near mature crop of groundnut on the quality of the produce an experiment was taken up at the Agricultural Research Station, Tindivanam in 1947–'48 and continued till 1954–'55. During the years 1950–'51, 1951–'52 and 1952–'53 due to failure of the seasonal rains plants dried and therefore the different methods of curing could not be tested. The following treatments were adopted on TMV 2 bunch and TMV 1 spreading strains.

I. *Harvested ten days before maturity :*

(i) Pods stripped immediately.

(ii) Stacked around a pole.

(iii) Left to dry in the field.

II. *Harvested when fully mature :*

(i), (ii) and (iii) treatments as above.

In treatment (i) the plants were stripped immediately after harvest and the pods sun dried for about a week. In item (ii) the plants were stacked around a pole on cross rods of about 3 feet length and a foot above ground level. The pods were in the centre of the stack and the top of the stack was given a slope and covered with haulms to prevent rain water entering inside. The curing was continued for ten days at the end of which the pods were stripped. In item (iii) the plants were allowed to cure spread in the harvested field itself and stripped at the end of the ten days. In both these cases the produce required only 3 or 4 days dryings after curing. The produce from the different treatments was analysed for quality, consisting of percentage, natural test weight of one Madras Measure (108 cubic inches) of pods and kernels, number of kernels per pound and oil and free fatty acids content.

Results: The averages of the data collected for four years from the quality studies on the produce under different treatments, are given below:

Quality analysis of produce from curing trials
(Average for four years)

Treatment	Shelling percentage	Natural test weight (in gms.) of one M. M. of Pods	Natural test weight (in gms.) of one M. M. of Kernels	No. of Kernel per lb.	Oil content %	Free fatty acid content %
TMV—2 Bunch groundnut:						
I Harvested before ten days of maturity.						
Immediately stripped	76·6	635	1310	1313	47·91	0·50
Stacked around a pole	75·2	634	1305	1314	41·38	0 34
Dried in the field	73·2	629	1296	1296	47·94	0·04
II Harvested when fully mature.						
Immediately stripped	78·0	661	1308	1276	49 16	0·42
Stacked around a pole	76·7	660	1319	1319	47·93	0·39
Dried in the field	76·8	647	1313	1271	48·25	0·44
TMV—1 Spreading groundnut:						
I Harvested before ten days of maturity.						
Immediately stripped	72·2	595	1197	952	50·65	0·34
Stacked around a pole	71·8	591	1217	950	51·71	0·50
Dried in the field	70·9	568	1177	959	49·97	0 91
II Harvested when fully mature.						
Immediately stripped	73 9	612	1222	931	50·12	0·53
Stacked around a pole	72·1	594	1202	933	50·41	0 48
Dried in the field	72·3	607	1224	936	50·53	0·84

Discussion: The results show definitely that the quality of the produce harvested at full maturity is better than in the lot harvested ten days before maturity in the case of both varieties. The former treatment gives better shelling, higher natural test weight of both the pods and kernels with lower number of kernels per pound showing better development, as compared with the latter. In both the varieties best quality produce is obtained by stripping the pods immediately and drying them, while the produce from plants left to dry in the field is poorest. The drying in this case is not as efficient as when the pods are immediately stripped and dried. A small increase in the oil content is noticed in both the varieties in the cured produce from the stack and this is more evident in the lot harvested ten days prior to full maturity.

Summary and Conclusion: Harvesting the crop when fully mature and stripping the pods immediately and thoroughly drying them subequently, yield the finest quality produce. Even if the crop has been harvested a week or ten days prior to maturity, stripping the pods immediately is preferable to the other two methods studied. The necessity to cure the crop arises only when there is acute labour shortage and possibly also when rainy whether prevails. Curing by stacking is recommended in such cases as the resulting produce is superior to allowing the plants to dry in the field. The latter method may result in loss or damage by birds and rodents. Besides a few pods in contact with the soil will get damaged especially if there is a heavy rain during the period. In the case of the bunch variety loss by field sprouting also occurs.

Common Salt as Fertiliser

by
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As the very name indicates common salt is quite a common substance which is both cheap and abundant. Its use as an item of man's daily dietary is well-known and widespread, but what is not so widely known is its use as a manure in agriculture. Salt is mentioned as a manure in the Bible, and by Roman poets like Virgil and Cato. English farmers of the 16th, 17th and 18th centuries as well as German and Spanish farmers were also well aware of its use as manure, but still, at the present day it is difficult to find another fertiliser, the utility of which is so hotly disputed, as common salt. Even as early as 1805 salt was recognised as very useful manure, particularly for turnips, sugar beet and mangolds and also for wheat in potash-deficient soils. Subsequently the use of salt fell

away, due mainly to the vigorous development of other fertilisers like super-phosphate, ammonium sulphate, potash salts, kainit, Chilean nitrate etc. It is worth noting that even then, plenty of sodium and chlorides were being added to the soil, though in different compounds such as Chilean nitrate (i. e. nitrate of soda): Kainit was mostly potassium chloride and many other low-grade potash salts that were used as fertilisers, contained large proportions of sodium chloride. During the First World War (1914-18) there was a revival of interest in using common salt as a substitute for potash, but due to erratic results it earned more discredit than credit in this period.

Further work in recent years has enlarged our knowledge and the utility of common salt can now be assessed in its proper perspective. In light soils as well as in soils too rich in humus, the sodium content is likely to be low, and hence common salt is likely to prove more helpful in such soils, rather than in soils of normal texure and clay content. Certain crops too are very much more responsive to sodium than others; for example, mangolds, beets and turnips show large responses even when the potash supply is ample, crops like wheat, peas and cabbage show slight to medium responses when potash supply is ample, while barley oats and millets show slight to medium responses only when potash supply is deficient.

Sodium is now considered to have a dual function in plant nutrition to replace K in plant metabolism as such and to displace fixed K from soil complexes and and thereby make more of potassium available for plant growth. When we consider the chlorine *ion*—it is now accepted that chlorine acts as a base-carrying vehicle in the nutrient solution; Sri John Russell has concluded that the *Chloride ion* helps in keeping the leaves and stems of plants more turgid and possibly by increasing the concentration of the cell sap reduces the rate of water loss by evaporation. Further, the chloride ion hastens maturity, thus supporting the common observation that common salt dressings will be advantageous when cereals are grown on thin, light soils. One of the usual handicaps in light soils is the risk of drought in hot spells in summer, here the chloride in common salt helps the plant to curtail water loss and maintain their metabolic functions with smaller quantities of water. Care is however necessary in using salt on clayey soils, owing to the risk of making them too sticky and unworkable. Another use of common salt is as a weedkiller. Any readily soluable substance can be toxic to plant life if used at sufficient concentration.

With regard to the optimum rates for common salt as a fertiliser, futher work is needed to make specific recommendations though for suggar beet there is a general view that up to 5 cwt. per acre can be spread some weeks before sowing. A smaller dose is preferable for other crops and particularly for cereals the dose should not exceed 200 lb. per acre but a great deal of further study is still necessary to know all about the possibilities and limitations of common salt as as a fertiliser.

Research Notes

Seed Borne Fungi and Seed Treatment in Sorghum

It is well known that seed borne fungi interfere with germination and emergence of seeds. Evidence in support of this has been provided by the work of Luckel and Martin (1943), Ganguly (1947), Govindaswamy (1955), Dastur (1932), Mitra (1935), Christensen and Stakman (1935), and Tarvest 1945. The problem of investigating the seed microflora actually participating in the predisposition of seed to disease by impairing vigour is, therefore, of paramount importance in divising suitable and effective methods of controlling seed borne organisms.

The present investigation was undertaken with a view to determine the associated fungal flora of sorghum seed and to study their role in influencing the germination and emergence of seed. For this purpose, seed samples of different varieties of sorghum were obtained from all the Regional Millets Breeding stations of the Madras State. The seed borne fungi were determined by two different methods viz., centrifuge method and Agar plate method. The fungal flora of the seeds mainly consisted of species of *Curvularia, Fusarium, Aspergillus, Rhizopus* and in a few cases *Helminthosporium, Alternaria* and a non-sporulating fungus. An experiment was conducted to test the efficacy of three well known fungicides, viz., Mercuric chloride, Agrosan GN and sulphur in eliminating the fungal flora. The seeds of different varieties treated with the fungicides were incubated in the oats agar medium along with an untreated control in triplicates. On the 3rd or 4th day the number of seeds developing fungal colonies in each plate was recorded. The percentage of seed giving rise to fungal colonies under different treatments is furnished in the following table.

Percentage of seed showing fungal colonies under different treatments:

Name of station and Sorghum variety	Control unsterilized	Mercuric Chloride (1 in 100)	Sulphur (4g/lb.)	Agrosan GN (2g lb.)
Millet Breeding Station, Coimbatore:				
Co. 1	50	62	78	6
Co. 12	36	32	66	4
Co. 11	82	88	54	6
Agricultural Research Station, Koilpatty:				
K. 1	46	40	72	6
K. 2	86	78	60	2
K. 3	72	42	94	2

Percentage of seed showing fungal colonies under different treatments:

Name of station and Sorghum varieties	Control unsterilized	Mercuric Chloride (1 in 100)	Sulphur (4g./lb.)	Agrosan GN (2g./lb.)
Agricultural Research Station. Palur:				
Co. 11	44	44	36	4
Co. 12	88	58	66	Nil
Regional Millet Station, Tiruppathur:				
Co. 1	66	32	60	Nil
Co. 19	42	32	50	Nil
Tpt. 1	72	40	48	Nil
Regional Millet Station, Ariyalur:				
Sencholam	40	46	78	Nil
Manjal Cholam	36	53	44	Nil
Vellai Cholam	56	44	38	Nil

The results obtained have shown that there was no marked difference between untreated control seeds and those treated with sulphur and mercuric chloride in the development of fungal colonies. But in the case of seeds treated with Agrosan GN, it was remarkable to note that excepting for stray cases with few varieties there was complete absence of fungal growth. This finding is important in that the seed treated with an organo mercury fungicide is superior to sulphur fungicide in arresting the activity of various seed borne fungi. The present recommendation for the control of short smut of sorghum *Sphacelotheca sorghi* is seed treatment with sulphur. The substitution of sulphur with Agrosan GN might serve the double purpose of preventing smut as well as protecting the seed from other seed borne fungi detrimental to proper germination of seed.

The results obtained in this study further indicates the need for studying the role of various fungi on sorghum seed during storage especially under moist conditions. Studies relating to this aspect as well as on the fungicidal seed treatments are under progress.

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The Occurrence of Abnormal Carpellary Structures in Cotton.

Introduction: Cases of abnormal origin of carpels have been reported in several plants from time to time. In the case of cotton, instances of development of flower buds in bolls as well as dovelopment of extra carpels have been reported in Acala Upland Cotton, (Hubbard, 1929). Such an abnormal development of supernumerary carpels inside bolls have been also observed by Ramanathan, (quoted from Abraham, 1934) in the annual varieties of G. *hirsutum*. Abraham, (1935) has also reported cases of occurrence of extra carpellary ovules on the floral axis in a cross between G. *herbaceum* and *cernuum*. He attributed the occurrence of such central proliferations to the prolongation of the floral axis and development of receptacular vascular cylinder. He concluded that probably genetic disturbances resulting from hybridisation was the cause of such abnormalities in hybrids. Beckett, (1935) observed such abnormal carpels in a large proportion of bolls and sometimes containing one to three mature seeds which were covered with lint as in the case of normal bolls. He concluded that the abnormality noticed in the strain appeared to be hereditary though largely influenced by environment. Ramanathan and Balasubramanian, (1937) also reported cases of extra carpellary structures in X-ray treated plants in G. *herbaceum* cotton. Thus, all the cases reported so far were in the annual types of cotton. The development of extra-carpellary structures now reported in the present note is in the case of several perennial cotton plants belonging to the species G. *hirsutum*. It is interesting to note that many of these abnormalities were similar to the records made by previous workers. The object of this paper is just to record the occurrence of such abnormalities as a regular feature even in the perennial types. Studies are in progress to see how far such occurrences are caused by hereditary factors and also to study the behaviour of the plants raised from the seeds collected from the abnormal bolls.

Observations: During the years 1955—'56 and 1956—'57, it was observed at the Cotton Breeding Station, Coimbatore, that certain perennial plants like Exotic 3 obtained from Surat, which was characterised by the development of red colour throughout the plant body, another tree cotton from Surat which had green plant body, another tree cotton from Surat which had green plant body and a Brazilian perennial variety, 'Moco' showed boll abnormalities. Since the abnormalities were similar in all the cases only a typical case is described. The abnormal bolls developed supplementary carpel like structures in their central axis. The number of such carpels ranged from one to three. The development of one abnormal carpel was common while cases of three were rare. Normally such abnormal carpels developed only aborted ovules and at the stage of boll bursting these carpels were

PLATE 1

found to be shrivelled up either into thread like structures or blade like vestiges in the centre of the axis. (Plate II). Sometimes the abnormal carpels developed to a certain extent like normal carpels and even had seeds bearing lint as pointed out by Beckett. Plate I, shows photographs of four bolls developing abnormal carpels inside them. A portion of the boll content is removed to expose the abnormal carpel. The two bolls on the right side of the plate clearly show the development

PLATE 2

of the seed and lint inside the abnormal carpel. It is proposed to pursue the study further by not only collecting seeds of plants which show such abnormality and study the behaviour of the progenies but also to study the behaviour of the plants raised from the seeds collected from the abnormal carpels. The latter aspect is of great significance since there is every possibility of the development of seeds by parthenogenesis. If this occured some of the resulting plants are likely to be haploids.

The abnormality recorded in the present paper differed from the one reported by Hubbard, (1929) where the stigmas of flowers were found to be accrescent and the intra-carpellary structures had no connection with the accrescent stigma. In the present case, the stigma was found to wither as in a normal flower. As the extra carpel in the present case had a pointed structure at the top as seen in the third boll from the left of Plate I, it is likely that the pollen tube could have passed through this tract from the stigma of the parent flower and effected fertilisation of the ovules of the abnormal carpels also to form seeds. The possibilities of parthenogenetic orgin has also been pointed out in the para above. Further observations are in progress.

Discussion: In view of the varied origin of this interesting case of the abnormal development of carpels in both annual and perennial Asiatic and American cottons and also the possibilities of its being hereditary to a certain extent and the chances, of the plants raised from the seeds developed in the abnormal carpels to be haploids, it is proposed to conduct a systematic and large-scale careful study of such abnormal carpels and the resulting seeds, to elucidate many interesting facts not recorded so far.

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Weather Review — For May, 1957

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1957
North	Madras (Meenambakkam)	0·4	— 0·6	0·4
	Tirurkuppam*	0·7	— 2·4	0·7
	Vellore	1·6	— 0·7	3·2
	Gudiyatham*	6·5	+ 4·2	7·8
East Coast	Palur*	0·5	— 2·7	0·6
	Tindivanam*	0·7	— 1·2	0·8
	Cuddalore	0·4	— 0·6	1·6
	Nagapattinam	2·0	+ 0·4	2·4
	Aduthurai*	1·4	— 0·7	2·3
	Pattukottai*	0·1	— 1·0	2·4
Central	Salem	2·4	— 2·2	3·9
	Coimbatore (A. M. O.)* ..	4·1	+ 1·5	5.2
	Coimbatore	3·9	+ 1·4	4·3
	Tiruchirapalli	2·4	— 0·2	4·3
South	Madurai	2·8	+ 0·1	3·1
	Pamban	1·2	+ 0·2	2·4
	Koilpatti*	1·3	— 1·3	3·2
	Palayamcottai	3·5	+ 1·9	7·5
	Ambasamudram*	1·8	+ 0·3	4·2
	Nagarcoil	14·1	+ 9·7	18·3
Hills	Kodaikanal	4·7	— 1·7	13·4
	Coonoor*	16·1	+12·5	26·4
	Ootacamund*	26·4	+20·6	30·0
	Nanjanad*	14·9	+ 9·9	21·3

Note:— 1. *Meteorological Stations of the Madras Agricultural Department.

The dry weather that commenced to prevail on 25—4—1957 continued upto and inclusive of 8—5—1957. On 9—5—1957 and on the succeeding day as well a few localised showers were received in the interior Madras, while the weather elsewhere remained dry. Again on 11—5—1957 the weather was dry throughout the Madras State. A few places in south Madras had localised showers on 12—5—1957 while the weather was dry elsewhere. Due to the formation of a shallow trough of low pressure over South West Arabian Sea off the Malabar Coast and the pervading of equiatorial maritime air over the extreme south Peninsula on 13—5—1957, localised thunder showers were received in Madras. This trough became less marked on 14—5—1957 and only a few places in Madras had some localised light showers on this day. For two days from 15—5—1957 only a few places in the interior Madras received localised showers when the weather elsewhere was mainly dry. On 17—5—1957 dry weather prevailed in Madras State. Under the influence of a well-marked trough of low pressure in South-east Arabian Sea off the Malabar Coast localised thunder showers were received in South Madras on 18—5—1957. On 19—5—1957 the weather was mainly dry. A few places in south Madras had light localised showers on 20—5—1957. On 21—5—1957 under the influence of a well marked trough of low pressure off

Malabar Coast a temporary advance of the south-west monsoon took place over South Kerela as a result of which a few places in the interior Madras had some rains on this day. For three days from 22—5—1957 the monsoon was active in Kerala and fairly widespread mild showers were received in Madras during these three days. On 25—5—1957 the monsoon was active only in South Mysore. For five days from 25—5—1957 localised rains were received at a few places in Madras. In the last two days of the month a few places in the interior Madras had mild localised showers, when the weather elsewhere was mainly dry. On the last day of the month i. e. on 31—5—1957 the northern limit of the monsoon air at one Kilometer a. s. l. passed through Trivandrum and Port Blair.

During the first ten days on the month, there were only mild fluctuations in the day temperatures. During the remaining period of the month the day temperatures were markedly below normal over major portions of the State, particularly in the coastal regions.

Rainfall: The note-worthy rainfall and the Zonal rainfall for the month are furnished below:

Noteworthy Rainfalls for the month

S. No.	Date	Name of place	Rainfall in inches
1.	13—5—57	Tiruchirapalli	1·18
2.	22—5—57	Coimbatore	1·57
3.	do	Agricultural Meteorological Observatory, Coimbatore	2·33
4.	23—5—57	Ootacamund	4·33
5.	24—5—57	Kallakurichi	6·69
6.	25—5—57	Nagapattinam	1·18

Zonal Rainfall for the month in inches

Name of Zone	Rainfall for the month	Departure from Normal	Remarks
North	2·3	+ 0·1	Just above normal
East Coast	0·9	— 1·0	Below normal
Central	3.2	+ 0·1	Just above normal
South	4·1	+ 1·8	Above normal
Hills	15·5	+ 10·3	Far above normal

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Review of Market Conditions of Commercial Crops in the areas of Market Committees for the Month of April, 1957.

Cotton: (In this section: Cdy = 784 lb.
Pothi = 280 lb.)

Tirupur: There was a small rainfall of 77 cents during the month under report. Arrivals of cotton into the markets seemed to be better and the off take was brisk. The harvesting of cotton is about to be completed. The market had an opening balance of 5623 cdys of Cambodia and 183 cdys of Karunganni lint. Arrivals into the market accounted for 13,985 cdys of Cambodia and 685 cdys of Karunganni lint which included 3895 cdys of Cambodia and 297 cdys of Karunganni lint, ginned locally. Despatches from Tirupur amounted to 12,008 cdys of Cambodia and 399 cdys of Karunganni lint, which included 2,815 cdys of lint sent to Kerala, Mysore, Ramanad, Madras, Tiruchirapalli, Tanjore, Bombay, Tinnevelly, Cawnpore, Rampur, Cambay and Pondicherry. At the end of the month, there was a closing stock of 7,600 candies of Cambodia and 472 candies of Karunganni.

The Kapas market opened with a stock of 18,965 pothis of Cambodia and 1,039 pothis of Karunganni kapas. Receipts during the month were 98,088 pothis of Cambodia and 10,711 pothis of Karunganni while disposals amounted to 87,280 pothis of Cambodia and 8,023 pothis of Karunganni kapas inclusive of 1,310 pothis of Kapas despatched to Mathurai. The closing balance at the end of the month stood at 29,773 pothis of Cambodia and 3,727 pothis of Karunganni. The prices showed an upward trend and they were ranging from Rs. 131/- per pothi of 280 lb. of Cambodia Kapas and Rs. 117/- per pothis of Karunganni kapas. The prices of Cambodia lint were Rs. 972/- per cdy of 784 lbs.

Ramanathapuram District: Failure of seasonal rains during the month has adversely affected the standing crop of cotton and in most

of the areas they have withered. The pickings of 1st crop kapas are over and the crop was poor. The second crop appears to be practically negligible during the year. The three markets of Sattur, Rajapalayam and Virudhunagar put together started with an opening stock of 650 pothis of Kapas and 1,280 cdys of cotton lint with which 35,000 pothis of Kapas and 3,850 candies of lint were added by way of receipts while the disposals made in the month amounted to 35,000 pothis of Kapas and 4,060 cdys of lint. The trade was left with a closing balance of 650 pothis of Kapas and 1,070 cdys of cotton lint at the close of the month.

The prices of Uganda cotton at Rajapalayam went up further. The transactions were moderate since the merchants were on the expectation of a further rise in prices, in view of the limited stocks of cotton at Rajapalayam. The Karunganni cotton market during the month was active and brisk with better prices.

The opening and closing prices of cotton kapas and lint that ruled in these markets are detailed below:

		Opening in Rs.	*Closing* in Rs.
Karunganni Kapas per pothis	...	100 to 108	101 to 112
Tinny Karunganni Kapas per pothi	...	95 to 98	92 to 108
Tinny Kapas	...	—	92 to 102
Cambodia Kapas	...	—	105 to 120
Karunganni lint per candy	...	826 to 866	845 to 866
Tinny Karunganni mixture	...	—	825 to 846
Tinny	...	—	806 to 811
M. U. 2 Certified Uganda	...	1061 to 1068	1150 to 1160
M. U. 1 Certified Uganda	...	1020 to 1028	1101
Uncertified Uganda	...	955 to 957	960 to 1020
Cambodia	...	—	820 to 950

South Arcot district: The opening stock was only 2 pothis at the beginning of the month and 137 pothis were received at Villipuram market while despatches to Tirupur accounted for 101 pothis. The closing stock left over at the end of the month was 38 pothis. The prices were down and the average price ranged at Rs. 78·75 per pothi of 280 lbs. in Villipuram market.

Groundnuts: (In this section Candy = Kernels of 531 lbs.)

North Arcot district: This being off season, the market centres of the district were not active. Arrivals and off take were moderate, since the Calcutta and Bombay interests have renewed their dealings at Madras, thus helping the oil in finding a ready market. The cut in the supply of electricity had not only affected the large off take but also developed greater hardships to millers to run their mill to full time. Sellers came forward to part with their produce at reasonable rates that were offered while buyers were also ready to buy eagerly because of the availability of ready market for oil.

The following is the stock position of groundnuts in the district.

	Opening balance	Arrivals	Despatches	Closing balance
	Tons	Tons	Tons	Tons
Grountnut pods	2159	480	869	1770
Groundnuts kernels	363	730	731	362

No marked change was noticed in the prices of groundnuts during the month under review. The prices of kernels ruled around Rs. 145 to 157 per candy while that of oil around Rs. 305 to 315 per candy. Groundnut pods were sold at Rs. 15 to 17 per bag of 80 lbs. and oil cake at Rs. 8 to 9 per Imperial Maund. For the same period during last year, kernels were sold at Rs. 148 to 160, oil cake at Rs. 294 to 316 per candy, Groundnut pods at Rs. 15 to 19 per bag of 80 lbs. and oil cake at Rs. 7 to 8 per Imperial Maund.

South Arcot district: At the beginning of the month the trade had an opening stock of 3335 tons. Due to slack season, arrivals were poor. All the markets together had total receipt of 1515 tons from local produce while 1003 tons were from North Arcot, and Tiruchirapalli districts and 317 tons from Andhra State. A quantity of 3194 tons and 204 tons were consumed by the oil mills and country chekkus respectively. Despatches to other districts like Madras and Tanjore amounted to 440 tons and exports to Pondicherry State amounted to 23 tons while wastages were calculated at 107 tons. The closing stock was 2292 tons with the trade.

Market conditions for groundnut were generally easy and prices were on the downward trend. The average prices were ranging from Rs. 141 to 157 per candy of 531 lbs. according to quality in the several markets.

Ramanathapuram district: Arrivals of kernel from local crop and from other districts during the month were poor. The millers were hesitant in purchase, in view of the summer crop, which is about to commence in local areas and in Tanjore district.

The Virudunagar market, with an opening stock of 40 tons of pods and 1,400 candies of kernels received 70 tons of pods and 200 cdys of kernels during the month. Disposals were placed at 70 tons of pods and 900 cdys of kernels leaving a closing stock of 40 tons of pods and 700 cdys of kernels at the end of the month. The prices of kernels, oil and cakes ruled practically steady during the month with few fluctuations. They were as below:

	Opening	*Closing*
Groundnut kernels (per cdy of 531 lb.)	170 to 175	168 to 175
Groundnut pods (per maund of 82 2/7 lb.)	17 to 18	—
Groundnut oil per tin of 35 lb.	22·75 to 23	22·75 to 23
Groundnut oil cakes per Md.	9 to 10	8·62 to 10·50

Gingelly: (In this section: Bag: 168 lb.)

South Arcot District: The opening stock with the trade at the commencement of the month stood at 579 bags. Since arrivals showed little improvement, Vridachalam market had a receipt of 1,704 bags while the other 3 markets together received 318 bags. Receipts from Madras and Tiruchirapalli districts accounted to 385 bags. 103 bags were crushed in oil mills and 684 bags in country chekkus. Despatches to Madras and Tiruchirapalli amounted to 1599 bags. The closing stock at the end of the month was 600 bags. The prices were on the increase and the average prices ranged between Rs. 66 and 72 per bag of 168 lbs. according to quality in the several markets.

Tobacco: *Coimbatore District:* At the beginning of the month under report there was a stock of 7950 cdys of chewing and 500 cdays of cheroot tobacco. Harvesting of tobacco is about to be completed. New crop of tobacco is arriving into the market. Sales were effected in chewing and pitcured tobacco of Karamadai and Palladam areas due to some demand. About 1330 candies of chewing and 200 candies of cheroot tobacco were despatched to Malabar, Mysore, Ramanad, Virudunagar, Salem, Tanjore, Tiruchirapalli, Andhra, Bombay, North Arcot, Pondicherry, Tirunelveli and Madras. At the end of the month there was a stock of 7985 candies of chewiug and 390 candies of cheroot tobacco.

The chewing tobacco market continued to be dull. The prices of Meenampalayam tobacco declined some what, while the prices of all other varieties were mostly at the level of that of last month.

The prices ranged as follows:

Variety	(Prices per candy of 500 lbs.) I Grade Rs.	II Grade Rs.	III Grade Rs.
1. *Chewing tobacco - Suncured:*			
(a) Meenampalayam	250 to 270	150 to 230	75 to 125
(b) Other varieties	180 to 220	120 to 160	60 to 95
2. *Cheroot varieties - sun - crued:*			
(grown in Erode & Bhavani Taluks.)	260 to 400	200 to 260	100 to 160
3. *Chewing varieties:*			
Pit - cured (grown in Palladam & Sulur areas)	220 to 240	160 to 175	100 to 125

Review of Administrative Activities of Market Committees for April, 1957.

I. **General:** Except Coimbatore Market Committee and South Arcot Market Committee all other Market Committees are functioning under 6–A of the Act, under their revenue heads of the districts concerned. The stalemate in the case of Tirunelveli Market Committee and Ramanathapuram Market Committee has not yet been cleared.

II. **Enforcement:** The following are the progress of licencing by the Market Committees during the month under report.

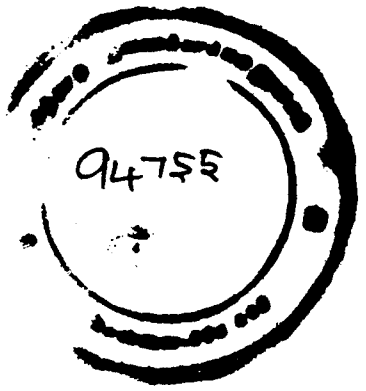
	Section 5 (1)		*Section 5 (3)*		*Weighmen*	
	A	B	A	B	A	B
North Arcot Market Committee	98	557	83	507	46	385
South Arcot Market Committee	101	1030	60	828	48	774
Coimbatore Market Committee	113	415	93	372	77	313
Ramanathapuram Market Committee	...	...	...	...	...	...
Tirunelveli Market Committee	...	...	...	...	...	...

A: During the month.

B: Up to the end of the month from January 1957.

III. **Meetings:** No meeting was held during the month.

IV. **Quality Analysis:** During the month 24 samples were analysed at Vridachalam Market. Eight samples contained total refraction below 4% and the rest between 4 to 8%.



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