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EDITORIAL

Production of Insecticides and Fungicides The use of insecticides and fungicides for controlling pests and diseases of crops was never popular in India owing partly to the high cost of the many imported chemicals which constituted them and partly to the general indifference of the average cultivator. The reason for the latter is not far to seek. Though the damage caused by insects and fungus diseases to field crops and stored produce was indeed very great and the resultant loss colossal when the country was considered as a whole, the individual cultivator with his small holding seldom realized the extent of the loss or suffered to such an extent as to induce him to invest money on chemicals and appliances. Nor was he convinced that their use would result in the effective control of the pests or diseases. Consequently, the use of insecticides and fungicides was confined to coffee and tea plantations, orchards, etc., where they were found to be beneficial and profitable.

The recent nation-wide drive for enhanced food production and the rising prices of agricultural commodities have not only brought more land under the plough but have also resulted in more intensive farming of existing cultivable land without due regard to season or proper rotation or diversification of crops– factors, which in normal time were responsible to a great extent to keep in check the multiplication of pests and diseases. Moreover, the need for conserving food grains in store houses for considerable period free from damage by pests has also become a war-time necessity. The import of adequate quantities of chemicals from foreign countries being now out of the question, the problem of exploring and augmenting the resources of the country with regard to insecticides and fungicides has become important and deserves the attention of the Scientific Departments, cultivators and manufacturers alike. Sustained and co-ordinated efforts are therefore to be made to place at the disposal of the cultivator, cheap and effective substitutes, if the goal of increased production of food crops aimed at by the inauguration of the Grow More Food Campaign is to be achieved. We are glad to note that the Imperial Council of Agricultural Research and the Government of Madras have taken on hand measures to

investigate the possibility of substituting the imported chemicals with material and plant products available in India. The Government of Madras have already arranged to bring under cultivation large areas of Pyrethrum in the hills and to multiply planting material of Derris which are well known plants yielding powerful insecticidal products. There are also several local plants such as tobacco, *Thevetia, Tephrosia, Acorus,* etc., which yield substances possessing high insecticidal properties and a co-ordinated research programme on the botanical, chemical and biological aspects is of immediate necessity. We commend this to the earnest consideration of all Provincial and State Departments of Agriculture in India, so that the menace from pests and diseases may be readily controlled before they attain serious magnitude and prove a mill stone against the Food Production Drive.

Improvement of Pulses in Madras A scheme for the improvement of pulse crops in the Madras Presidency has been sanctioned by the Government with the aid of a part contribution from the Imperial Council of Agricultural Research, and a Pulses Specialist has been appointed. The need for investigation of this important group of crops with a view to increase their production has been felt for long, especially, as pulses form the chief source of protein in the South Indian diet and also an important cattle feed. The scheme of work as at present drawn up is only for a period of five years, but we hope that the work will expand and that the Pulses Section will be a permanent one like the other crop breeding sections of the Agricultural Department, so that all aspects of the cultivation of pulses may be investigated thoroughly.

Indigenous Dyes of the Madras Province

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Dyeing is a very ancient industry and it is known that barbarians in remote ages painted their bodies with gay colours. It is difficult to decide as to which of the three countries, India, China and Egypt, was the first to learn the uses of vegetable dyes. Though India is one of the countries to originate the art, we have not gone far in improving it on scientific lines. The Westerners learnt the art from the East and step by step improved it to a fine degree in which their knowledge of chemistry was very helpful. With the first World War, aniline dyes, which are products of distillation of coal tar, replaced the vegetable dyes to a large extent. The advent of the Second World War has made the import of these dyes into India very difficult. The plight of handloom weavers of this Province is very hard and very high prices are demanded for the artificial dyes. This is an opportune time to study and develop this industry not only by a study of the chemical processes and skilful combinations of colours but also by a search for new plants that may yield dyes. Most of the important indigenous dyes of this Province, with the local names and short descriptions of the plants from which they are extracted, mordants and uses of the dyes are given below. It is hoped that it will be of assistance to those who are interested in this ancient industry which is full of scope for development.

1. Red and shades of red

1. *Catechu* The dye is extracted from *Acacia Catechu* Willd. (Tam: *Kasikatti maram;* Tel: *Nalla sendra)* which is a moderate-sized deciduous tree with pale yellow flowers. It occurs in the deciduous forests of most of the districts in this Province especially in the Northern Circars. The chips of heart-wood of mature trees boiled with certain mordants yield a dull red dye. Mordants generally used are lime, alum, perchloride of tin and copper nitrate. This dye is much used by the calico printers of India.

2. *Sappan* This dye is extracted from *Caesalpinia Sappan* Linn. (Tam: *Varattangi:* Tel: *Bakanu Patanga)* which is a small thorny tree found under cultivation in some gardens in Madras, Courtalam, Coimbatore and other places. The wood yields a valuable red dye which is largely exported. The root is reported to yield a yellow dye. It is largely used with alum in calico-printing and in Madras for dyeing straw-plait for hat-making. In Pegu it is used for dyeing silk.

3. *Carthamine* is extracted from the flowers of *Carthamus tinctorius* L. (Eng: The safflower, wild or bastard saffron, African or American saffron; Tam: *Kushumba;* Tel: *Kusumba)* which is an annual herbaceous plant with large orange coloured flower heads, cultivated as dye-crop all over India and as an oil-seed in the Madras Province. It is grown extensively in the

black cotton soil areas of this Province and is not found wild anywhere. The florets are picked as fast as they appear and dried in the shade and pressed. The yellow colouring matter is washed off and the red colouring matter is extracted by dissolving in dilute alkaline solutions and is used in dyeing silk and wool.

4. *Gulnari* (Bengal) or *Basanti* (Cawnpore) is extracted from the flowers and seeds of *Cedrela Toona* Roxb. (Tam : *Toona maram*; Tel : *Nandhi chettu)* which is a large handsome tree common in the mountainous tracts of the Province. The flowers yield red and yellow dyes said to be used in Bengal and Mysore for dyeing cotton. The seeds yield a red dye. The colour is fleeting and apparently only used by the poorer classes for dyeing cotton cloth.

5. *Erythrina indica* Lamk. (Eng : Indian Coral-tree; Tam : *Mulu murukk;* Tel : *Badisa;* Mal : *Murukku)* is a striking tree in flower and of moderate size, armed often with prickles. It occurs throughout the Province often planted. The flowers are collected, dried and boiled in water to extract a red dye. The bark is also said to be used in dyeing.

6. *Majiti* (Garhwal) The dye is extracted from the flowers of wild *Impatiens Balsamina* L. (Eng : The Garden Balsam) which is an erect herbaceous annual of one to three feet high. It is found in hilly regions but at low elevations. Flowers yield a red dye. Some people use the juice of this plant mixed with alum to colour their eyes and nails

7. *Henn* or *Henna* is prepared from the leaves of *Lawsonia inermis* L. (Eng : The henna plant; Tam : *Maruthani*; Tel : *Gorinta*; Kan : *Gorantu)* which is a shrub growing to eight feet in height with white flowers and small leaves. It is found in the deciduous forests of the Coromandel Coast and planted sometimes as a hedge plant in other places. Leaves are used in dyeing handkerchiefs in Rajputana and by certain classes of people for colouring beard, nails, etc.

8. *Kamala* is extracted from the red powder which covers the fruits of *Mallotus philippinensis* M. Arg. (Eng : The monkey face tree; Tam : *Kamela*; Tel : *Kunkuma, Kapila*) which is a small much-branched tree common in the deciduous forests throughout the Province. The red powder which covers the fruit yields a rich orange red dye known as *Kamala dye*. The extract prepared with soda imparts to silk a fine and durable flame-colour without further addition or the use of mordants. It is employed in dyeing silk.

9. *A'l dye* is extracted from the roots of *Morinda citrifolia* L. (Eng : The Indian mulberry; Tam : *Nuna*; Tel : *Mogali*; Mal : *Manjanathi)* which is a small tree with white flowers and large fleshy fruits found in the coastal forests of the Northern Circars and the West Coast districts of this Province. Roots of fairly old trees give a red dye. The roots are mixed with a little sweet-oil and ground to powder in a handmill. Cloth is dyed by being boiled with this powder. The cloth is treated with alkaline earth, alum water,

decoction of myrobalan, etc. It is used for dyeing cotton cloth. The dye contained in the root-bark seems to be the best red, whereas that contained in the woody parts of the roots is more yellow than red.

10. *Morinda tinctoria* Roxb. (Tam : *Nuna* ; Tel : *Togari, Maddi*) is a moderate-sized tree found in all the dry districts of this Province. The wood and the bark of stem and root yield a red dye apparently identical with that of *M. citrifolia* L.

11. *Chay root* This dye is extracted from the root bark of *Oldenlandia umbellata* L. (Eng : Indian Madder ; Tam : *Chaya ver* ; Tel : *Chiri veru*) which is a small herbaceous plant with lilac flowers spreading on the ground and growing to six inches in height It is common throughout this Province especially in waste places. It was in much cultivation for its dye at Nellore and Masulipatam many years ago. The root-bark of this plant, commercially known as chay root, yields the dye. Alum is used as mordant. In olden days handkerchiefs were dyed in Madras with this dye.

12. *Santalin* is extracted from the wood of *Pterocarpus santalinus* L. f. (Eng : Red Sanders-wood ; Tam : *Segappu chandanam, Raktha chandanam* ; Tel : *Yerra chandanam*) which is a pretty and moderate-sized tree found only in limited areas. It occurs in the hills of Cuddapah, North Arcot and Chingleput districts. The wood contains a red colouring matter called *santalin* which is easily dissolved out by means of any alkaline solution and is used as a dye. This is used for dyeing textile fabrics, as colouring agent in pharmacy, for dyeing leather, for staining wood and also employed in India as a pigment for marking idols and the forehead in some caste ceremonies.

13. *Manjit* is obtained from *Rubia cordifolia* Linn (Eng : The Indian madder ; Tam : *Manjithi, Shevelli* ; Tel : *Manjishta*) which is a very scabrous climbing herb with ovate-cordate, 5—7 ribbed leaves. It is found in the forest regions throughout the Province. The stem is cut into very small chips which are carefully washed and boiled in water for six hours. The cotton cloth to be dyed for red is boiled for ten minutes in alkaline water made by the addition of some ash and then drenched several times in the dye. Alum is usually employed as a mordant.

14. *Lac-dye* (Tam : *Komburuki* ; Tel : *Kommalaka*). Lac is the resinous incrustation formed on the bark of twigs especially of *Schleichera trijuga* Willd. in this Province by the action of the lac insect, *Coccus lacca*. *Schleichera trijuga* Willd. (Tam : *Puvam* ; Tel : *Puska*) is a large tree occuring in most of the districts of this Province. Systematic inoculation of lac-insects and collection of lac are done by the Forest Department of this Province. The lac-dye has been in use from remote times not only for textile purposes but also as a pigment in cosmetics.

II Yellow and shades of yellow.

15. *Annatto* is extracted from the seeds of *Bixa orellana* L. (Tam : *Kurangu-manjal* ; Tel : *Jaffra chettu*) which is an evergreen shrub or small

tree cultivated and found wild especially in the West Coast districts and the Circars. The dye may be extracted from the seeds direct or from the pulpy matter which may be separated from the seeds by boiling and made into cakes. It is used to give a flesh colour to cotton and silk. It is also used for colouring butter.

16. *Adhatoda Vasica* Nees (Tam: *Adhatodai*; Tel: *Adasara*) is an evergreen shrub, often gregarious, growing to about eight feet in height. It is found in the Northern Circars and elsewhere, cultivated and run wild near villages. The leaves yield an yellow dye on boiling. It gives a greenish blue dye when combined with indigo. The dye is used for dyeing coarse cloth.

17. *Kanthal* is extracted from the wood of *Artocarpus integrifolia* L. (Tam: *Pila*; Tel: *Panasa*) which is a large tree, cultivated throughout India for its monster fruits. The heart wood yields an yellow dye. The colour is fixed, with alum and often intensified by a little turmeric. With indigo it gives a green colour. It is used to colour the Burmese priest's robes and also as an ordinary yellow dye in parts of Madras.

18. *The Tesu dye* is extracted from the flowers of *Butea frondosa* Koen. (Tam: *Purasu, Palasham*; Tel: *Palashamu, Motuku*) which is a moderate-sized tree met with in all dry districts in the deciduous forests. It is very conspicuous when in flower before the leaves appear. The flowers called *tesu* or *kesu* yield a brilliant but fleeting yellow dye. They are collected in March and April and sun-dried. The dried petals are separated and preserved or they are sometimes reduced to powder. Alum, lime or wood-ash makes the colour less fleeting. This dye is used for dyeing textiles.

19. The extract of *Kamala* prepared with soda imparts a fine and durable deep orange colour to silk (vide no. 8).

20. *Turmeric dye* is obtained from *Curcuma longa* L. (Eng: Turmeric; Tam: *Manjal*; Tel: *Pasupu*) which is a herbaceous plant with large leaves and root-stock. A type with harder root-stock and much richer in the dye principle than in the ordinary condiment type, is grown wherever it is used as a dye. The main rhizome yields the dye. Alum purifies the colour and destroys all shades of red. Carbonate of soda and lime juice are mixed for getting a brilliant yellow. This dye is used in all kinds of textiles.

21. *Garcinia tinctoria* Dunn. (*G. xanthochymus* Hk. f.) (Tam: *Mukki*; Tel: *Iwara mamidi*) is a handsome evergreen tree of moderate size with very hard wood found in the forests of Northern Circars, Western Ghats, Nilgiris, North Travancore, etc. The bark is employed in extracting a bright yellow dye which is used in dyeing cotton.

22. *Mahonia Leschenaultii* Takeda (Eng: Indian barberry) is a large shrub with stiff, erect, corky-barked stems. It occurs in the hills of the

Western Ghats from the Nilgiris southwards, above 5000 ft. in shola forests. A yellow dye is extracted from the wood.

23. The dye contained in the woody parts of the roots of *Morinda citrifolia* L. is yellow (vide no. 9).

24. *Nyctanthes Arbor-tristis* L. (Eng: Night flowering jasmine; Hind: *Harsinghar*; Tam: *Parijatham*; Tel: *Pagada malle)* is a bushy shrub or small tree rough all over with stiff whitish hairs found in the deciduous forests of the Northern Circars; elsewhere it is planted. Flowers yield an yellow dye. It is largely used for dyeing tussur silk. Sometimes in combination with turmeric it is used for dyeing other silks. The white portions of the flowers yield a purple dye known as *Gulkama*.

25. *Terminalia Chebula* Retz. (Eng: Myrobalan or Indian gallnut; Tam: *Kadukkai*; Tel: *Karakka*) is a large deciduous tree found in all districts of the Province all over the forests. The dried fruits form the "Chebulic" or Black Myrobalan of commerce. The powdered rind of the fruits steeped in water is used as dye. A permanent yellow dye may be got with alum. This is used for dyeing cotton cloth.

Grey A mixture of the fruit and ferrous sulphate in certain proportions produces an iron grey colour.

Black The fruit is mixed with the pods of *Caesalpinia Sappan* to produce a black dye.

26. *Ulex europaeus* L. (Eng: Gorse or furze) is a thorny shrub of two to four feet in height. It is an European plant and has become completely naturalised in the Nilgiri and the Pulney hills at high elevations. Bark, flowers and young shoots yield an yellow dye. The dye is used for dyeing textile fabrics.

27. *Allium Cepa* L. (Eng: The Onion; Tam: *Venkayam*; Tel: *Vulli gaddalu)* is a bulbous herb with fistular leaves. It is cultivated throughout the Province for its edible bulbs. The dye is prepared by boiling a sufficient quantity of onion skins with some alum for half-an-hour. This gives a good yellow colour. The addition of tin will make the colour orange.

28. *Lichen dyes* Lichens are abundant in places above 2500 ft. in this Province, and are found in all mountainous places. Those that are growing on rocks are preferred to those growing on trees for dyeing purposes. It is used with wool for dyeing red, yellow and brown colours.

III Blue and shades of blue

29. *Indigo* is obtained from *Indigofera tinctoria* L. (Eng: The Madras indigo; Tam: *Neelam*; Tel: *Nili*) which is a bushy shrub growing to six feet in height. It occurs in Circars, Deccan and Carnatic, cultivated or run wild. *Indigofera sumatrana* Gaertn. (Bengal indigo) is also grown in this Province for this dye. Leaves yield a blue dye. It was used for

dyeing all kinds of fabrics throughout the world before the advent of the German aniline dyes.

IV Green Colour

Green results from the mixing of blue and yellow in varying proportions according to the shade of colour required.

V Grey Colour

30. *Pteris aquilina* L. (Eng : Bracken fern). The rhizome of this fern is stout, creeping underground, producing leaves (fronds) two to five feet long and one to two feet broad. It is common in all mountainous tracts of this Province. Roots and young tops yield an yellow dye. One ounce of iron and two ounces of cream of tartar are used as mordant. A quantity of young tops is boiled for half-an-hour, strained and silk is boiled in the decoction for about an hour for dyeing grey.

31. The infusion obtained by steeping the powdered rind of the fruits of *Terminalia Chebula* Retz. in water, imparts a grey colour to cloth.

VI Black Colour

32. Black colour is obtained by using the dried fruits of *Diospyros peregrina* Gurke in combination with the rind of those of *Terminalia Chebula* Retz. and ferrus sulphate. The black colour is also obtained by mixing up the rind of *Terminalia Chebula* Retz. with the pods of *Caesalpinia Sappan* L.

VII Purple Colour

33. The white portion of the flowers of *Nyctanthes Arbor—tristis* Linn. yields a purple dye known as *Gulkama.*

VIII Brown Colour

By different processes with Nos. 1 and 31, brown colour is obtained.

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Importance of Plant Protection in Crop Production*

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The slogan 'Grow more food crops' has now-a-days become so very infectious that at present we hear it from all corners and even from quarters where talk about such subjects connected with the boorish farmer of the uncivilised rural areas is generally considered outlandish and tabooed in high and refined social circles. It is, however, encouraging to note that persons in all walks of life are now beginning to realise the grim fact that the half-naked and ill fed farmer toiling in the out of the way fields and forests is the individual who has to satisfy the vital needs of every human being, be he a prince or peasant. In this particular aspect anyway, the present unfortunate world conditions have contributed to remind us all that it is on the foundation of agriculture that all human activities and thoughts depend in the last resort. The war and the events which have followed have demonstrated with great force the absolute dependence of all phases of industrial life upon the single industry agriculture, which, with its associated activities, forms the one primal, all-essential requisite in the successful prosecution of any enterprise whether war or peace. In the words of Prof. Maskew "the most important, the most vital thing in all the world is to get something to eat; if all of us here present, or mankind in general, were positively unable to obtain anything to eat for the space of one week, the affairs of this world, commercial or otherwise, would soon become of no more consequence than duckweed upon the surface of a pond. Without something to eat there would be no coal mined, no steel forged, no freight cars rolling. Agriculture in its broadest sense is the source of something to eat, and hence the original source of all subsequent action." As is usually the case sheer necessity is now driving us to evolve ways and means to provide the essential food materials which are getting insufficient and very costly as days pass. The suggestions to grow more food crops, to replace as far as possible other crops by cereals and pulses and to utilise all available cultivable space for such purposes are certainly commendable and every land owner and farmer will be well advised in following such laudable suggestions. It need hardly be added that in order to utilise all available areas to grow more food crops and to reap the benefits of such an endeavour several things are essential. Among these are the grant of land to poor farmers who are willing to take up such work either free or on very attractive conditions, freedom from Government taxes or liberal concessions in that direction, the supply of cheap seeds, free irrigation wherever available and even the loan of implements and cattle in many cases. Granting that all these facilities are arranged for and the *ryot* starts operations he has to remember that his duties do not end there; for in crop production the protection of the growing crops from the depredations

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of the various agencies which cause it harm is a very important problem deserving as much attention as other aspects of the work to ensure his obtaining the expected harvest. For, inspite of the best attentions paid to the cultural, manurial and other requirements of the crop in the absence of proper protection the crop might often suffer severely at the hands of pests of different kinds. And especially so is the case when food crops are grown on a very wide scale all over the country and thereby unusual opportunities are offered for various noxious creatures to multiply abnormally and harm the crop in different ways.

Diseases and Pests of Crops Among the various agencies which play their part in causing partial or total damage to growing crops we have representatives both from among animals and vegetable organisms. The losses caused to growing crops by various agencies have been estimated in different countries and it is found that a very good portion of the estimated out-turn in each case is shared by the various crop pests. According to Whetzel "the estimates of the plant disease survey of the U. S. A. Department of Agriculture indicate that approximately one bean in every dozen, one peach in every eight, one bushel of Irish potatoes in every twelve and one bushel of wheat in every ten are destroyed annually by disease in these crops." One can also have some general ideas of the whole-sale losses often caused to crops by such pests as locusts, swarming caterpillars and scale insects all over the world. The most noxious of all pests from the plant's point of view however is man. The enemies of growing crops are weeds of different kinds which either overgrow in the fields affecting the growing crops or are directly parasitic on them. There are also many small invisible micro-organisms like bacteria, fungi etc. which often levy their toll on the crops. Among animals we are all familiar with such higher forms like stray cattle and also wild animals like elephant, pigs, rodents, monkeys etc. in some out of the way areas. Among the lower animals the most important are insects and compared to most other agencies these play a very important and appreciable role as plant pests and the cultivator has to take special care against insects of various kinds some of which often completely destroy extensive areas of crops in an appreciably short period of time! An attempt is made in this very brief paper to offer a few hints to cultivators to help them to check insect pests of sorts which generally cause damage to growing crops with special reference to food crops, with which we are more concerned at the present time. Almost all growing crops and plants are found subject to the attentions of some insect or other and in some cases the different growing stages of individual crops have different categories of insect pests attacking them. It is therefore incumbent on the cultivator to be vigilant from the very early stages of the crop and nip in the bud any pest which appears on it.

Control Measures The different measures which can be adopted by man in the control of any pest, insect or any other organism, may be classed

into two groups - preventive or prophylactic and direct or curative; the former consist of such measures which help to deter or keep away a pest from appearing and the latter include such methods which are employed to destroy or check the further multiplications of a pest when it has already made its appearance. The well known saying 'Prevention is better than cure' is a very old maxim and is specially appropriate in many cases where we have to deal with diseases and pests of various kinds; but unfortunately the very sage advice contained in that pithy saying is more honoured in its breach than in its observance. It may be affirmed that in the case of many insect pests prophylactic measures will be found far more practicable and economical than those adopted to actually fight a desease or pest when it has made its appearance and when it often becomes too late to employ preventive measures, or too difficult to resort to curative methods. In certain special cases, none but preventive measures will be found practicable. It is only when we find it impossible or impracticable to adopt intelligent and prompt preventive measures that the need arises for resorting to what are called direct methods.

Preventive Measures The more important of the preventive measures which can be adopted against insect pests are the following:—

Field and Plant Sanitation Keeping the fields clean by removing all weeds is very important; it not only helps the growing crop to grow without competition but it also helps in checking the multiplication of some crop pests which feed on these weeds The removal of all crop remains after harvest such as stubbles of cereal crops, plant remains of such plants as sweet potato and cucurbitaceous creepers, brinjal plants etc. is also important since failure to remove these allows pests of such crops to breed unnoticed and appear on the same crops during the following season.

Cultural, Mechanical and Chemical Methods of Prevention Some of these measures though partially direct or curative go a great way in checking the multiplication of some pests and effecting their control easily and economically. These include deep ploughing to destroy weeds and white grubs attacking the roots of crops like chillies, cane etc., and for the destruction of the pupae of hairy caterpillars of sorts which are notorious pests this measure will be very useful. Apart from its purely agricultural effect scraping and cleaning field bunds will destroy eggs of grass hoppers especially in rice areas. Flooding of the fields when sufficient water is available will bring up underground pests like white grubs, cut worms, wire worms etc. which would otherwise emerge as adults to attack crops. Digging out and destruction of the nests of ants and white ants in and around any cultivated area will prevent these attacking growing crops especially white ants attacking crops like cane, wheat, groundnuts etc. Raking up and hoeing of the soil around cucurbitaceous plants and fruit trees will bring up the pupae of fruit flies which are bad pests of such crops and which get destroyed when brought to the surface by the weather or by birds etc. feeding on them. Treatment of setts of cane, grape vine etc.

with some chemicals like copper sulphate, crude oil emulsion, tar water etc. before planting prevents white ant, mealy bug and borer attacks during the early stages of the plant. Light Traps—Many insects including some well known crop pests are easily attracted to lights. The rice stem borer moth, the groundnut leaf miner moth, hairy caterpillar moths—of different kinds, cockchafer beetles of sorts, rice jassids and several important crop pests come to lights. A light trap may be kept at the very beginning of such crops so that the breeding of insects the adults of which get attracted to lights may be prevented. Any ordinary lantern kept hanging over a tray of kerosinated water will serve the purpose. Healthy seeds—The use of healthy seeds, cuttings, tubers, setts etc. for propagation will prevent the multiplication of some pests which remain hidden in the unhealthy seeds, tubers etc. and show themselves when the crop begins to grow. Growing of a trap crop—When an important insect is known to infest more crops than one the less important crop is grown as a trap to entrap the pest earlier to save the more important crop; this is of course not possible in all cases The growing of pest resistant varieties of crops—Though this is an ideal, extremely desirable and a very easy method to prevent pests, we have not unfortunately advanced sufficiently well in evolving such pest resistant strains of crops which will stand the test uniformly. As a method for control of pests and diseases the use of resistant varieties of plants suffers from severe disadvantages even according to experts in genetics. A few of these are (1) Plants resistant to more than one disease are rare (2) There exist biological varieties or races of some disease or pest with different habits and so the resistance in one locality disappears in another due to such forms (3) Examples of absolute resistance are not only very few but even in such cases absolute resistance is found to be short lived. An equally encouraging method of pest control, with of course, numerous complexities as in the above method, is what is known as the Biological method of pest control—the use of natural enemies to control a pest. So until we reach better and surer results in these methods by further investigations and trials we have to resort to some of the ordinary practical measures noted above which will in many cases not only prevent the outbreaks of pests but in some considerably minimise the damage even if the pest appears. It is needless to add, however, that the success or otherwise of most of these measures depends a good deal on the promptness with which they are adopted and in the present emergency we cannot afford to resort to experimental measures.

Direct methods Coming to direct methods we could adopt mechanical, physical and chemical measures of different kinds suited to different categories of pests. More important among these methods include hand picking, netting, bagging, jarring, use of sticky boards, use of fly, moth and maggot traps, trenching and creating barriers preventing some pests which move from field to field in swarms. Many of these methods will be found extremely effective and economic if employed at the proper time. Many

insects like plant bugs, weevils, grasshoppers, flea and plant beetles, cockchafers, leaf hoppers etc. can be easily checked by handpicking, netting, jarring, bagging etc. which are simple contrivances and could be taken up by even the poorest *ryot*. Handpicking of hairy caterpillar moths, egg masses of borers, beetles, butterflies, moths etc. of plant caterpillars like those of citrus, castor and other crops will be found extremely effective and economic if resorted to in proper time.

Coming to the physical and chemical methods of insect pest control we all know that they have been in vogue in some form or other from time immemorial in various crude ways mostly as empirical and rule-of-thumb measures and it is only within the last century that scientific and rational use of such methods have come into vogue. Even these have their limitations. Some of those methods either physical or chemical might be very effective in killing a pest infesting a crop but the most important point to remember is that in killing the pest we must not also kill the crop thus making the remedy worse than the disease. Only such measures could therefore be adopted which, while killing or driving away the pest, should not in any way affect the healthy growth of the crop concerned. The artificial application of high and low temperatures which may be useful against some insect pests cannot be successfully adopted in the case of most growing crops. As regards the choice of suitable chemicals of different kinds, it depends a good deal on the nature of the damage done by a particular pest; generally those which remove and eat up the plant tissue are treated with insecticides known as stomach poisons which when they enter the stomach of the insect with the food material poison the creature and kill it; against those insects which suck up the juice of plants without removing the tissue, as in the former case, the materials used are known as contact insecticides which when they come into contact with the insect's body suffocate and kill it. There are numerous insecticides now in use belonging to each of these two main categories, for biting forms like grasshoppers, caterpillars, beetles etc. and sucking forms like plant lice, scales, plant bugs, mealybugs etc. Most of the stomach poisons now in use are unfortunately dangerous drugs (chiefly arsenic compounds) which are poisonous to both animals and man and as such their use can be safely carried out only by trained hands. In a country like India where the majority of the cultivators are illiterate, such remedies in their hands are likely to cause more harm than good. The recommendation of such dangerous and risky poisons, however effective in their own way as pest controls, is a matter which demands very serious and weighty considerations. Leaving aside that aspect of the question for the present we have first to examine and find out whether it will be advantageous to the average farmer of the Indian plains to adopt insecticidal measures of pest control against all his pests. Every one who has any correct ideas regarding agricultural conditions prevailing in India, especially regarding the comparatively small size of the Indian holdings, their proverbial poverty and the equally poor returns got out of

such staple food crops like rice, millets etc. can at once find out that insecticidal measures against pests on such field crops are quite impracticable and uneconomic. On the other hand, experience has shown that the use of insecticides to fight pests infesting valuable and well paying crops like cotton, tobacco, sugarcane, fruit trees etc. are quite a practical and economic proposition. Nor is it a practical proposition in these days when such insecticides and appliances become non-available Until therefore we are in a position to find out local preparations which are harmless to handle and which are easily available we have to be very careful in the use of poisonous insecticides. It will therefore be found that while modern methods of insecticide application might be suitable in the case of pests on paying industrial crops of different kinds the poor farmer growing food crops has to depend mainly on practical, cultural and mechanical methods. To put the whole subject briefly the safe guarding of the growing food crops needed for our modern emergencies from the ravages of insect pests depends a great deal on the proper attention and care bestowed on them by the cultivator all through the season and resorting to preventive and easily workable direct measures—unlike the absentee landlord who sows his seeds and returns to the fields only at harvest time. It has to be remembered that by our present efforts to raise crops in all available lands we are offering exceptional temptations to some of our worst pests to enable them to extend their nefarious activities to wider fields; as such greater attention has to be paid in the directions of the proper selection and preparation of the soil, sufficient manuring and irrigation and in preventing the attacks of diseases and pests.

In conclusion it has however to be strongly emphasised that in all measures of plant protection, especially in the case of small holdings, unless there is co-operation between farmers of adjacent plots—especially when we get mass attacks of pests like grasshoppers, cut worms, plant hoppers etc. in any area, the methods earnestly adopted by one or two individuals will not have any benefit. It need hardly be added that it is the important duty of the Government Agricultural Departments also to help the poor farmer in all ways to protect his growing crops so that he may get the expected returns for his labours.

Inheritance of Characters in Safflower—*Carthamus tinctorius* L.

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Introduction The safflower is an oil-seed crop belonging to the natural order *Compositae*. This was once grown extensively in Bengal, United Provinces, the Punjab, Bombay and the Central Provinces for the extraction of an yellow dye, carthamin, from the florets of this plant, but with the introduction of synthetic dyes, this industry has ceased to exist, and the importance of this crop has very much dwindled. It is now grown merely for the sake of its oil. The seeds when crushed yield a clear straw-coloured oil which is largely used for culinary purposes In the Madras Presidency this crop is cultivated chiefly in the black soils of the Ceded Districts, the largest area being in the Bellary district. Little known outside the Ceded Districts it does not find a place in the Season and Crop Report of this Province. This crop is sown in October--November and is harvested by February. It is usually sown as a mixture with coriander, sorghum or wheat. As a pure crop it is sown only along the borders of fields where its spiny bracts serve as a protection against cattle trespass.

The literature regarding this crop is rather scanty. The earliest reference is in the Commercial Products of India, Watt (1908), where a general account of this crop is given and the existence of two types of plants, the spinose and the spineless, is recognised. Howard *et al* (1915) published detailed descriptions of 34 types. Subsequently Sabnis and Phatak (1935) have made a classified list of 63 types, based on the flower colours and on the nature and shape of bracts. At the Agricultural Research Station, Hagari, selection work on this crop has been in progress for some time and the mode of inheritance of a few plant characters has also been studied incidentally. The results obtained are recorded in this paper.

Spinose and spineless types In safflower two distinct types, the spinose and the spineless can be distinguished. In the spinose type the tips and margins of the involucral bracts as well as those of the upper leaves become stiff and spiny, while in the spineless the bracts and leaves are devoid of any such outgrowths. The difference between the two types becomes very marked when the flower heads appear. With regard to the genetic behaviour of these two characters mention is made in the Scientific Reports of the Pusa Institute (1931 to 1934) that the spineless behaves as a recessive to its allelomorph spinose in a 1:15 ratio as a result of duplicate factors. The inheritance of these characters were studied at Hagari in a number of artificial crosses and it was found that the spinose type behaved as a simple dominant to the spineless type (Table I).

Bloomy and bloomless types Another differentiation of types has been made out from the presence or absence of heavy bloom on the inner

bracts of the involucre. This bloom gives a whitish appearance to the plants when the flower heads appear, while plants without such bloom appear green. An examination of the several types grown at this Station showed that bloom is present in all types, the density of the deposit alone being either heavy or sparse. Sabnis and Phatak (1935) in their classification of Indian safflowers describe these two types as "Inner bracts felted and white" and "Inner bracts smooth and green". This "felted and whitish appearance" is due to the heavy deposit of whitish, waxy and hairlike outgrowths on the surface of the involucral bracts. A study of the segregations for these two characters showed that the heavy bloom behaves as a simple dominant to sparse bloom (Table II).

TABLE I. Segregation for Spinose and Spineless bracts

Generation	Selection number	Character of selection	Behaviour of progeny Segregating for	
			Spinose	Spineless
Parents	C. T. 53 / C. T. 62		♂	♀
F. 1	Cross 28 & 29		Spiny	
F. 2	From cross 28 :—			
	C. T. 304 & 305	Spiny	63	24
	From cross 29 :—			
	C. T. 331 to C. T. 335	,,	496	156
F. 3	From C. T. 304 : —			
	C. T. 304/1, 3, 7, 9, 11	,,	525	166
	,, 304/2 & 8	,,	Pure	,,
	,, 304/6 & 10	Spineless	,,	Pure
	From C. T. 305 ;—			
	C. T. 305/1, 2, 4 to 5	Spiny	649	229
	,, 305/5 & 8	Spineless	,,	Pure
		Total	1733	575
		Expected (3:1)	1731	577

$X^2 = 0.0092$, P between 0·95 & 0·90.

TABLE II Segregation for Heavy Bloom and Sparse Bloom

Generation	Selection number	Character of Selection	Behaviour of progeny Segregating for	
			Heavy bloom	Sparse bloom
Parents	C. T. 53 / C. T. 62		♀	♂
F. 1	Cross 28 & 29		Heavy bloom	
F. 2	From cross 28 :—			
	C. T. 304 & 305	Heavy bloom	68	19
	From cross 29 :—			
	C. T. 331 to C. T. 335	,,	494	158
F. 3	From C. T. 304 :—			
	C. T. 304/1, 3, 6, 9 to 11	,,	648	221
	C. T. 304/4 & 8	,,	Pure	
	C. T. 304/2, 7 & 8	Sparse bloom		Pure
	From C. T. 305 :-			
	C. T. 305/1, 2, 4 to 7	Heavy bloom	659	219
	C. T. 305/3 & 8	,,	Pure	
		Total	1869	617
		Expected (3 : 1)	1864·5	621·5

$X^2 = 0.1303$, P between 0·8 & 0·7

Linkage relationship When the interactions between the two pairs of characters, spinose and spineless and heavy bloom and sparse bloom were studied, it was found that a linkage existed between the two sets of allelomorphs with a cross-over value of 13%±2%. Table III (a) and (b) give the relevant data, in the coupling and repulsion phases respectively.

TABLE III. Linkage between spininess and bloom

Generation	Selection number	Character of selection	Behaviour of progeny Segregating for			
			Spinose		Spineless	
			Heavy bloom	Sparse bloom	Heavy bloom	Sparse bloom
		(a) Coupling phase				
Parents	C. T. 63 / C. T. 231		♂			♀
F. 1	Cross 9		F. 1			
F. 2	From cross 9 :—					
	C. T. 291	Spinose, heavy bloom	109	11	8	30
	Expected @ 13% Cross-over		110	9	9	30
	X^2=0·6547, P between 0·95 & 0·90					
		(b) Repulsion phase				
Parents	C. T. 53 / C. T. 62					
F. 1	Cross 28 & 29		F. 1			
F. 2	From cross 28 :—					
	C. T. 304 & C. T. 305	Spinose, heavy bloom	45	18	23	1
	From cross 29 :—					
	C. T. 331 to 335	„	339	157	155	1
F. 3	From C. T. 304 :—					
	C. T. 304/1, 3, 9 & 11	„	291	144	136	2
	From C. T. 305 :—					
	C. T. 305/1, 2, 4 to 7	„	432	217	227	2
		Total	1107	536	541	6
	Expected @ 13% cross-over		1103	539	539	9
	X^2=1·0386, P between 0·8 and 0·7					

Normal and rosette types In the course of these studies one late type, C. T. 12, was isolated, which had numerous close-set radial leaves resulting in a rosette-like appearance. The plants of this type were similar to the erect and late types, Nos. 1, 2, 5 and 15 among the Pusa types (Howard *et al*, and Sabnis and Phatak). The genetic behaviour of this type of plant-habit was studied and the data are presented in Table IV. It would be seen that Rosette is a simple recessive to the normal type and is also inherited independently of spininess.

TABLE IV

Generation	Family number	Character of selection	Behaviour of progeny Segregating for			
			Spinose		Spineless	
			Normal	Rosette	Normal	Rosette
Parent	C. T. 12					♀
F. 1	Natural cross		F. 1			
F. 2	C. T. 81	Spinose, normal	199	59	56	21
F. 3	From C. T. 81—					
	C. T. 143 to C. T. 148	„	795	290	272	104
		Total	994	349	328	125
		Expected (9 : 3 : 3 : 1)	1010·25	336·75	336·75	112·25
			X^2 = 2·3827, P between 0·5 and 0·3			
	C. T. 150	Spinose, normal	Pure			
	C. T. 149	„	106	34		
		Expected (3 : 1)	105	35		
			X^2 = 0·116, P between 0·8 and 0·7			
	C. T. 152	Spinose, rosette		Pure		
	C. T. 151, 153 and 154	„		222		66
		Expected (3 : 1)		216		72
				X^2 = 2·000, P between 0·2 and 0·1		
	C. T. 155 and 156	Spineless, normal			Pure	
	C. T. 157 and 158	„			536	185
		Expected (3 : 1)			540·75	180·25
					X^2 = 0·5004, P between 0·5 and 0·3	
	C. T. 159 and 160	Spineless, rosette				Pure

Floret colours The flowers in *Carthamus tinctorius* are arranged in composite heads. The florets, which are all tubular in this genus, exhibit four different colours ranging from white to orange. The existence of such colour differences has been recorded by Howard, Howard and Khan (1915) and their description of the Pusa types is based mainly on these variations in flower colours. Sabnis and Phatak (1935) also, have taken the floret colour-groups as the basis for their classification of Indian safflowers.

The colour groups referred to above are as follows:—

(i) *Orange* Florets yellow when fresh, developing a reddish tint on fading and drying finally to orange. This is the commonest and most predominant type in the Bellary area. The flower buds are yellow, but these too, if injured develop a reddish colour at the tips.

(ii) *Red* Florets reddish orange while fresh and deep red on drying.

(iii) *Yellow* Florets yellow both when fresh and dry. Both the buds and florets resemble type (i) when fresh, but does not change colour on drying.

(iv) *White* Florets white, which when dry turn creamy white.

These four types have been described by Sabnis and Phatak as (i) florets yellow, turning red on fading, (ii) florets reddish orange, turning to deep red on fading, (iii) florets yellow turning to brownish yellow on fading and (iv) florets white.

These four types can easily be distinguished, the colours being quite stable and recognisable even long after the plants have matured and dried up. In the inheritance studies recorded below, orange, red, yellow and white refer to the colour of the dry florets.

Inheritance of floret colours Mention is made in the Scientific Reports of the Pusa Institute (1935-36) that orange and yellow are both dominant to white. At this station, numerous single-factor segregations for flower colours, have been recorded, from various natural and artificial crosses. These are summarised in Table V below.

TABLE V

Colour groups	No. of families Studied	Actual numbers	Expected numbers on 3:1 ratio	X^2	Probability
					P between
1. Yellow & white	4	477:152	472:157	0·2336	0 5 & 0·7
2. Red & white	10	1347:430	1333:444	0·6186	0·3 & 0·5
3. Red & yellow	5	418:130	411:137	0·4764	0·3 & 0·5
4. Orange & white	2	410:132	407:135	0 1206	0·7 & 0·8
5. Orange & yellow	7	778:253	773:258	0·0934	0·7 & 0·8
6. Orange & red	14	1753:579	1749:583	0·0092	0·9 & 0·95

It is seen from the table that (1) orange is dominant to red, yellow and white, (2) red is dominant to yellow and white and (3) yellow is dominant to white, each with a single factor difference. This indicates that three factors are necessary for the manifestation of the orange colour, two for the red and one for the yellow.

In table VI are given the two-factor segregations observed in the floret colours. It would be noted that all of them are modified 9:3:3:1 ratios where the last two groups get merged into one, due to the interaction of factors.

TABLE VI

Colour groups	Actual numbers	Expected numbers on 9:3:4 ratio	X^2 and probability		Remarks
				P between	
1. Red: yellow : white	98: 26: 38	91: 30: 41	1·3031	0·5 & 0·7	Artificial cross
2 Orange: yellow : white	93: 39: 44	99: 33: 44	1·4780	0 3 & 0·5	Do.
3. Orange: red: white	692:226:304	687:229:306	0·0888	0·95&0·98	Natural cross
4. Orange: red: yellow	281:113:127	293: 98:130	2·8567	0·2 & 0 3	Artificial cross

TABLE VII Inheritance of Flower colours in Safflower

Generation	Selection Number	Parental constitution		Segregating for				X^2	Probability P between
		Phenotypic	Genetic	Orange	Red	Yellow	White		
Parents	C. T. 18	White	OORRyy				♀		
	C. T. 40	Yellow	oorrYY			♂			
F. 1	Cross I			Orange					
F. 2	C. T. 307, 308 and 309	Orange	OoRrYy	260	103	120	151		
	Expected on 27 : 9 : 12 : 16 ratio			268	89	119	158	2·7605	0·5 & 0·3
F. 3	Selections from C. T. 308								
	C. T. 308—1, 5, 11, 14, 16, 18, 19	Orange	OoRrYy	487	142	173	254		
	Expected on 27 : 9 : 12 : 16 ratio			446	148	198	264	7·496	0·1 & 0·05
	C. T. 308—3, 4, 7, 10	Orange	OORrYy	380		121	166		
	Expected on 9 : 3 : 4 ratio			375		125	167	0·2007	0·95 & 0·90
	C. T. 308—8, 13, 15, 17	Orange	OoRrYY	319	110	124			
	Expected on 9 : 3 : 4 ratio			311	104	138		1·9722	0·5 & 0·3
	C. T 308—20	Orange	OoRRYy	30	10		16		
	Expected on 9 : 3 : 4 ratio			31·5	10·5		14	0·2381	0·9 & 0·8
	C. T. 308—2 9	Orange	OORRYy	232			69		
	Expected on 3 : 1 ratio			226			75	0·6921	0·5 & 0·3
	C. T. 308—6, 12	Orange	OORrYY	221		80			
	Expected on 3 : 1 ratio			226		75		0·3998	0·7 & 0·5
	C. T. 308—21, 24	Red	ooRrYy		179	55	92		
	Expected on 9 : 3 : 4 ratio				183	61	82	1·8971	0·5 & 0·3
	C. T. 308—22	Red	ooRrYY		122	44			
	Expected on 3 : 1 ratio				124	42		0·0201	0·9 & 0·8
	C. T. 308—25, 26, 27, 28	Yellow	{oorrYy / OOrrYy}			487	168		
	Expected on 3 : 1 ratio					491	164	0·1471	0·8 & 0·7

The above data (Table VI) suggests the following hypothesis. The basic colour of the florets is yellow and is due to a factor 'Y'. In the absence of this factor no colour can develop and the florets remain white. A supplementary factor 'R' acting in conjunction with 'Y' produces red colour. A third factor 'O' with 'R' produces the orange colour, but as 'R' itself requires the presence of Y for manifestation, the orange colour would contain all the three factors O, R and Y. Factor 'O' cannot develop the orange colour without 'R' nor can 'O' and 'R' produce any colour without the basic colour factor Y. On this hypothesis the genetic constitution of the four types of floret colours would be as follows—

Phenotype	*Genetic constitutions*
Orange	OO RR YY
Red	oo RR YY
Yellow	oo rr YY, OO rr YY
White	OORRyy, OOrryy, ooRRyy, oorryy

With the object of testing this hypothesis, a cross was made between C. T. 18 a white with the constitution OORRyy and a yellow (C. T. 40) of the constitution oorrYY. The behaviour of this cross was studied up to the third generation and it was found to substantiate the above hypothesis in all respects. The data are detailed in Table VII.

The inheritance of these floret colours was found to be independent of the nature of the bracts, (spiny or spineless), as seen from the data presented in Table VIII.

TABLE VIII

Generation.	Selection number	Nature of parent	Segregating for					
			Spiny			Spineless		
			Orange	Red	White	Orange	Red	White
F. 2	C. T. 34/1		Spiny natural cross from spineless white bulk lot C. T. 34.					
F. 3	C. T. 119	Spiny orange	14	3	6	3	2	2
F. 4	*From C. T. 119*							
	C. T. 181	,,	100	32	43	33	15	15
	,, 182	,,	78	40	33	29	7	10
	,, 184	,,	101	50	42	32	12	18
	,, 189	,,	141	43	66	52	7	23
	Total of F. 3 & F. 4		434	148	190	149	43	68
	Expected on 27 : 9 : 12 : 9 : 3 : 4 ratio		435	145	194	145	48	65
	$X^2 = 0.9165$ P is between 0.98 and 0.95							

Summary In safflower (*Carthamus tinctorius* L.) the mode of inheritance of a number of characters have been studied and recorded.

Spinose bracts behave as a simple dominant to spineless. Sparse bloom on the involucral bracts behaves as a simple recessive to heavy bloom. The two sets of allelomorphs were found to be linked with a

cross-over value of 13 %. Rosette-like arrangement of leaves was a simple recessive to the normal. This character was independent of spininess.

Four types of floret colours viz. orange, red, yellow and white have been observed. The genetic inter-relationship of these four colours are explained on a three factor hypothesis.

There is a basic factor 'Y' for colour, due to which the florets are yellow. In the absence of this factor no colour can develop and the florets are white A supplementary factor 'R' produces the red colour in the presence of 'Y'. A third factor 'O' develops the orange colour in conjunction with 'R' which in turn is dependant on 'Y', the basic colour factor, for its manifestation.

The inheritance of these flower colours were found to be independent of the nature of bracts.

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A Plea for Reviving the Omblachery Breed of Cattle in the Tanjore District

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Omblachery breed The district of Tanjore, familiarly known as the "granary of the South", is also reputed from time immemorial, for its sturdy cattle, in relation to its agricultural economy. The *ryots* of the district have been depending for long, for their agricultural operations on a well-suited local breed of cattle known as the "Omblachery breed", taking its name from a village called Omblachery, in the Taluk of Tiruturaipundi. The bullock of this breed is a sturdy worker, both at the wheels and at the plough. It is of medium size with a comparatively small head. Its complexion is, generally, bluish grey, and it has a white star on its fore-head. It has shining dark eyes and wears a few thick hairs, on its chin. Its tail is black above the thighs and ends with a lotus like brush of snow-white hair, soft and glossy like silk. Its hoofs are equally white and resemble ivory, in their finish. The pure bred pedigree sire is generally ferocious by nature. Owing to the large demand for this breed of cattle and due to lack of organised effort in breeding in the past decade, its population in the village of Omblachery has slowly dwindled At present, the pure stock is very rare and outnumbered by those of mixed blood. The pure breed is known throughout the district, as the *jothi madu.*

At present, according to an Omblachery breeder-*ryot*, there are only about thirty cows, and but five bull calves which may be considered as typical of the breed. Recently, at a meeting of the Taluk Agricultural Association, Tiruturaipundi, the members were reliably informed that the wealthy *mirasdars* of the district were trying to secure, at any cost, the surviving calves for their use and that owing to the owners' unwillingness to part with them, these calves have not changed hands. We were further given to understand that unless early steps were taken by the Government to purchase and maintain them in Government Farms the race of the pure breed would be extinct once for all.

Pasture The village of Omblachery is about seven miles by road from Tiruturaipundi Town, and four miles from the nearest Railway Station of Kariyapatnam, on the Tiruturaipundi—Point Calimere Branch of the S. I. Railway. The village is very near to the sea and lies on the Coromandel Coast and bears a bracing climate. About forty *velis* or about 270 acres of pasture land have been set apart as communal grazing area and the soil is rich in calcium salts so essential for building a race of sturdy bulls suited to heavy ploughing duties. A small river running through the grazing area and falling into the sea takes back large quantities of high tide sea water during summer, and this serves as a good nervine tonic to the entire cattle, that resort to them for their daily wash and for quenching their thirst. The varieties of fodder generally found on the pasture, are, *kai korai, neru netti korai, manji pillu, pillipessara* and other varieties peculiar to coastal areas. The breeding operations are specialised by the *ryots* of the village, while a few of the neighbouring villages having communal rights in the village also join in them. Only two houses have earned a district-wide repute for the quality of the animals bred by them, and their animals are called the *Vannan madu* (the *Dobhi*) and the "Ganesa Iyer *madu*". The cows and the breeding bulls of the village are not dehorned.

According to the information furnished by the *ryots* of the village every cow-calf would become fit for its first service, at the age of four, and later the spacing would extend over two-and-a-half years for every subsequent calving. The cows bear thin wiry frames of strong bones and nerves and their milk-yield is rather scanty, and meagre in quantity. Hence the young ones are allowed to run away with their mothers to the pasture so soon as they could walk distances without detriment to their safety and health. When the calves are but six months old, they are fed in addition to their mother's milk, on a mixture of half-a-Madras measure of water-soaked brown rice, one seer of ground-nut cake, about two seers of bran, mixed with an ounce and a half of common salt. The feeding is done by the women-folk of the house-hold at regular intervals of the day, and the calves run up for their grub at the appointed hour when called on by their pet names.

Marketing methods No organised marketing is done as in fairs and festival days. Calves even at the age of six, seven and eight months, are sold away by needy owners to shrewd middlemen *mirasdars*, who sell them

to others at fancy prices. A full grown bull fetches generally three-hundred rupees, while calves do at least sell at a hundred per head. In view of the racy market for it by the richer section of the ryots of the District, the poor live-stock-owner cannot afford to own them long. Hence there is a danger of their extinction altogether, as a breed.

The case for revival of the breed The plea for reviving and increasing the number of the pure blood through Government patronage, gains support from the admissions of the Veterinary and the Agricultural Departments, as to their hardihood and endurance in facing and shouldering tough agricultural duties all the year round, their medium size and wiry frames suited for ploughing operations of clay soil and above all their comparatively low cost of maintenance—all qualities in a bull to be plumped for by the poor live-stock owner *ryot*. It is further significant to be told that because of the lack of patronage from Government quarters, in the way of grant of premium benefits to breeders, the breed has fast been disappearing.

Suggested reforms (1) Reinclusion of the breed in the schedule entitled to premium benefit, by the Veterinary Department. (2) Opening a model farm at Omblachery village, with a view to increasing the pure breed. (3) The immediate purchase of the surviving calves for purposes of the proposed farm. (4) Launching a co-operative enterprise with the subscribed capital of the Mirasdars of the district with objects, such as, (a) the immediate purchase, upkeep and maintenance of all available cows of half and three-fourths blood, (b) the purchase and maintenance of sufficient land for pasture and for growing cattle fodder, (c) assumption of rights and powers of exclusive marketing by or through their agency, (d) the imposition of a ban on the sale of heifer calves for a period of ten years from date of commencement of the said farm, and further ban on all sales of them to butchers. Other measures incidental to and in furtherance of the objects may also be adopted. But it is urgently in the interests of the live-stock improvement of the District that early steps are taken by the authorities for reviving the reputed "Omblachery breed."

SELECTED ARTICLES

Notes on Erosion

By SIR A. TOTTENHAM, C. I. E.,
Administrator, Pudukottai

Erosion is a world-wide problem. Europe is the continent least affected, though even in parts of Europe, for example the Russian steppes, erosion is a serious problem. In America, Asia and Africa its importance cannot be exaggerated. In regard to Africa, General Smuts has said 'Erosion is the biggest problem confronting this country; bigger than any politics'. The Darbar consider that in our own State anti-erosion work is more important than even Medical Relief or Education. But, until the public have been further educated in the importance of this work, it would be hopeless to give it the priority to which it is entitled in our Budgets.

Erosion is of two main kinds, erosion due to wind, and erosion due to water. Erosion due to wind is of little or no importance in our State, though there is reason to believe that in Coimbatore, and perhaps other Districts of the Madras Presidency, it is of much greater importance. How important it is in the U.S.A. may be learnt from the story told by Stuart Chase in that terribly interesting book *Rich Land, Poor Land* that an old Nebraska farmer was sitting on his porch during a dust storm. Asked what he was watching so intently, he replied 'I'm counting the Kansas farms, as they go by'! In Pudukkottai we have to deal with erosion due to water.

This begins as 'sheet erosion', which most people would not notice at all. Layer after layer of the soil is peeled off, and finally, after less than a foot, it may be, is gone, what the Americans call 'hard-pan' is reached, which is infertile, at all events unless it has been ploughed up, and exposed to the action of the atmosphere for some time. For the time being, at all events, the soil is devoid of plant-food. Then come gullies, small at first, increasing rapidly, and finally forming gorges, perhaps 20 feet deep. There are such gorges in our State, for example at Ariyur *vari*, and Tudayamparai. As the process goes on large areas of rock are laid bare, as can be seen at the places already mentioned, and at many others in the State, among which may be mentioned Manaturai *vari* (which feeds Valnad *Periyakulam*) and Ponnechchikulam, both in Alangudi taluk.

It must always be borne in mind that—apart from the serious silting up of the tanks caused by erosion—it is not a mere question of transporting soil from one place to another, where it may be equally useful. Whatever may be the nature of the silt carried by the Nile in Egypt, and some of the large rivers in China, the silt formed by erosion in our State is *infertile*, owing to the changes in the physical and chemical structure and composition of the soil that it undergoes, when carried to any distance by water. In their book *The Rape of the Earth*, Jacks and Whyte say 'The water breaks down the transported soil-crumbs into their constituent particles of sand, silt, and clay, thereby destroying most of the characteristic soil properties and fertility, so that even when the eroded particles are redeposited on cultivable land, they have lost much of their productive capacity'. (p. 33).

It is not too much to say that, unless effective measures are taken to check erosion in our State, within a measurable time—it may be a century, it may be more, or less a very large part of the high grounds, such as are common in the Alangudi and Tirumáyyam taluks (there is much less erosion in Kulattur taluk, probably owing to the fact that there is less laterite in the subsoil there and more gneiss) will have been reduced to a desert of bare and eroded rock, scarred by horrifying ravines, incapable of supporting any form of life,—human, animal or vegetable; while all the tanks will have been silted up, and most of the cultivable lands destroyed by the deposit of infertile silt.

All books on this subject lay stress on the fact that this artificial or man-caused erosion, as opposed to natural erosion, which is on the whole a beneficial process, is of *recent origin* Such appears to be the case in our State. In fact, if erosion had been proceeding for any considerable period at the same pace as at present, the condition of the State would already be such as has been foretold above. The *Vattani Karnam* (village accountant) assured the writer that where the appalling Ariyur ravine now is, forty years ago there was no ravine at all. That this is literally true the writer cannot guarantee, but it seems not unlikely.

What started it? The clue may possibly be found in the following quotation from the State history. "It may be mentioned that the Resident made arrangements for clearing the forests and increasing the cultivable area of the State. In 1826 in reply to a question of the Governor to the Raja whether the country

was covered as much with woods as before, the Raja informed him that 'agreeably to his father the Colonel's' (i. e., Col. Blackburne's) 'order, the woods had been almost cut down, and that cultivation was going on, some thin wood remaining still in some places'. The fact remains, however, that in some of the areas where erosion is worst there is still a good deal of scrub jungle, and of course there was never high forest in Pudukkottai.

Cart-tracks are a fruitful cause of gullying. This is mentioned by Lord Hailey in his work on Africa. In any area where erosion is in progress the process can be seen by which at first small gullies are formed by the wheel tracks, then these are deepened, till the cart-track has to be abandoned, and another route is taken by its side, while the original track cuts deeper and deeper till a formidable gully is formed, to grow in due course into a ravine.

Nothing had been done to check erosion till some six years ago. Attention had been concentrated entirely on the silting-up of tanks, which it was sought to check by building expensive masonry grade-walls at the *bottom* of the *varis* leading into the tanks. Owing to their cost, these could only be few, whereas hundreds—nay thousands—are required. They were not particularly effective, even in stopping silt reaching the tanks. An idea was entertained that the silt deposited behind them might be removed in lorries, but of course this was never done. The cost would have been prohibitive, and it would have been difficult to find a place to dump the silt, whence it would not at once have washed down into another tank, or some cultivable fields. The problem of the rapid denudation of the *uplands* was of course not touched at all. It was like putting a basin on the floor to stop a leak in the roof!

What we now aim at is *preventing denudation and consequent formation of silt*, not merely the disposal of silt after it has formed, and after valuable soil has been carried away from the uplands and defertilized. The cardinal principle that has now been adopted is that anti-erosion work must begin at the *top* of the eroded area, and work down to the bottom. Rubble dams have been built in very large numbers, and earthen bunds formed to check surface-wash. Dams formed of the trunks of palmyras (*Borassus flabellifer*) were tried at first, and would have been very cheap, but were not a success, owing probably to seasoned timber not having been used.

Steep banks have been terraced, and on the bunds and terraces various kinds of grass have been sown. Two African species have been tried, Kikuyu grass (*Pennisetum clandestinum*) which had already been cultivated at Kodaikanal, and Giant Star grass (*Cynodon plectostachyum*) which was specially obtained from Kenya and Pretoria. Various indigenous grasses have also been tried. The Kikuyu grass has not proved successful, but the Giant Star has done well in some places, Much more remains to be done in this direction.

A considerable area adjoining Manaturaivari has been ploughed with the State motor tractor, *along the slope*, and *Cholam* (*Sorghum vulgare*) sown. The ploughing is of course very beneficial, but the *Cholam* was sown at the wrong time and failed. Aloes (*Agave*), Cashew (*Anacardium occidentale*) and *Virali* (*Dodonaea viscosa*) are other species planted or sown. Owing to the comparatively cheap nature of these expedients, a good deal of work has been done in half a dozen places, and a steadily increasing allotment is being made for these works in the Budget.

The *ryots* were at first by no means convinced that these works were to their advantage. They said that they were cutting off the supply to their tanks; which in any case were doomed to destruction sooner or later, if nothing was done—a fact that they did not grasp—though actually the ultimate effect of the works must be to improve the water supply, by raising the general water-level in the

upland sub-soil, while checking the velocity and reducing the violence of floods. Now, it is believed that many, even of the *ryots*, are beginning to see how beneficial these works are.

What the Darbar are doing at present is but little, it is true, having regard to the magnitude of the problem. Lakhs, perhaps crores, might be spent on it. That is not possible, but the Darbar consider that it is better to go on methodically, year after year doing what little they can, rather than to do nothing. They do not subscribe to the principle 'Posterity has done nothing for me, so there is no reason why I should do anything for posterity'.

Addendum to Notes on Erosion The Darbar must not omit to mention the valuable advice that they received from Rao Sahib E. V. Padmanabha Pillai who was lent for a short time by the Madras Government to study the problems of erosion in the State, and advise as to the methods to be taken to deal with them. He visited the State from 28th August to 7th September, 1938 and again from 21st January to 1st February 1939, and wrote a useful note on the subject, which the Darbar had printed.

An appeal to Tanjore *ryots* *

By M. S. SIVARAMAN, I. C. S.,

Collector and President, District Agricultural Association, Tanjore.

There is an impression among many that paddy cultivation which has been in vogue from time immemorial in Tanjore District has reached a high level of perfection. But the truth is that no proper attention is paid to cultivation in this district. The average outturn realised is 25 *kalams* per acre which is about one-third of the yield per acre in the Aduturai Farm and one-fourth of the yield per acre in Spain and Japan.

The reason for this low outturn is the deficiency of the bulk of the soil of the delta in the two vital elements, nitrogen and phosphoric acid, which are essential for the successful raising of paddy. The existing manurial supplies are totally insufficient to replace the elements taken off the lands by the crops raised and there has been a gradual deterioration of the soil which has gone on for centuries. It is necessary that more attention should be paid to the proper manuring of the lands if the average outturn of the district is to be anything like what it ought to be.

Can the *ryot* repair the damage done in the course of centuries and secure a better outturn in the immediate future without much extra expense? He can, if he follows the advice of the Tanjore District Agricultural Association. He can increase the average yield of the district by over a hundred per cent even in the course of two years.

The deficiency of nitrogen can be made good by green manuring. The Association has distributed seeds of several kinds of green manure plants like *daincha*, *pillipesara*, sunhemp, *karumpayar*, *kolinji* and *Sesbania speciosa* with instructions to *ryots* to raise their own seed requirements on bunds of fields and on waste lands. The intention of the Association is to make every *ryot* self-sufficient in respect of the supply of green manure seeds. There are 1·2 millions of acres of wet land in this district and these will require atleast 20 million lb. of green manure seed or roughly 1¼ lakhs of bags of seed. Each seed produces not less than 2000 seeds in the course of a season and in two seasons, it is theoretically possible to get 40 lakhs of seed. Five lb. of seed can be theoretically multiplied in the course of two seasons to satisfy all the requirements of the

* An appeal issued on 15th February 1943.

district. The Agricultural Association has distributed free already over 1000 lb. of different kinds of seeds for multiplication purposes alone. If a *ryot* is anxious to raise his green manure seeds and plants on his own lands nothing will stand in his way except his own lethargy and want of initiative. Already over 20 lakhs of *pungam* plants have been planted in the last rainy season along road margins, canal banks, field bunds and on lands which are not put to any use now. The green manure crops raised on the fields and the green manure leaves that can be grown on lands that are left waste now should be more than sufficient to supply the deficiency of nitrogen.

The deficiency of phosphoric acid can also be made good by the *ryot* without any extra expenditure. The chief source of phosphoric acid available for the *ryot* is bone which however, requires to be converted into a suitable form for application uniformly to the lands. Raw bones are hard to break; but if the bones are calcined, they crumble to pieces in the fingers. The *ryot* can easily collect all available bones and have them calcined as follows: The bones are spread between alternate layers of *karukkai* (*shavi* paddy) or *umi* (paddy husk) or other fuel and the whole is covered with a layer of leaves or straw and mud-plastered. A few small holes are made for ventilation before the heap is set on fire. After the fuel is completely burnt, the bones will remain intact consisting mainly of calcium phosphate and they can be easily powdered with a stone if it is done on a small scale and in the mortar mill if required on a larger scale.

The bone loses 40 per cent of its weight during calcination and the remaining bone-ash is richer in phosphoric acid content than bone-meal. Analysis by the Agricultural Chemist at Coimbatore has shown that it consists of 37·8 per cent of phosphoric acid against 23·2 per cent in bone-meal. Bone-ash has no smell and it can be stored in the house. It is less bulky and it costs nothing if the *ryot* converts the bones of his dead cattle into bone-ash with the waste products of paddy cultivation like *karukkai* or *umi* as suggested above.

At present, the bones are collected by a few collecting agencies and converted into bone-meal or super-phosphate with the aid of expensive machinary or chemicals. The *ryot* does not realise that the bones which are sent out of the district in this way are derived from cattle that are fed on the crops raised on his own lands and therefore, there is a continual drain of phosphates which can certainly be prevented if he is careful. The Association therefore appeals to every *ryot* whose lands are deficient in phosphoric acid to arrange to collect all available bones and calcine and powder them and apply the ash to the fields.

With intensive green manuring and bone-manuring, every *ryot* should be able to produce at least 75 *kalams* to an acre and the Association hopes that the *ryots* will stir themselves up and see that their lands produce more paddy at less cost and thereby improve their own material prosperity and the prosperity of the country.

Abstract

Factors affecting the longevity of cottonseed D. M. Simpson (*J. Agri. Res 64,407—419, 1942*). The longevity of cottonseed is definitely dependent upon the moisture content of the seeds and the temperature conditions under which the seeds are stored. The studies here reported deal with the effects of moisture alone under "normal" storage temperatures and with the combined effects of controlled moisture temperature conditions.

In ordinary storage, seeds quickly reach a moisture content in equilibrium with that of the storage environment. In storage experiments with upland and sea-island cottonseed under the humid and fairly high temperature conditions prevailing near Charleston, S. C., seeds in bags deteriorated rapidly after 2 years,

but seeds with a moisture content reduced below 8 percent and stored in tin containers to prevent the rapid reabsorption of moisture retained their viability with only slight impairment for 7 years, and a few seeds were still germinable after 10 years' storage.

Lots of upland and sea-island cottonseed sealed in glass jars and containing 11 percent moisture were worthless for planting purposes after 2 years' storage, but other lots, especially of the sea-island seed, containing 6 and 8 percent moisture, showed a high percentage of viable seeds after 7½ years' storage. Thus, cottonseed containing less than 8 percent moisture apparently does not require aeration and can be kept viable for many years in airtight containers even at the temperatures that prevail along the Coastal Plain.

Cottonseed of two upland varieties was adjusted to several levels of moisture ranging from 7 to 14 percent and stored at constant temeratures of 90°, 70°, and 33° F. Corresponding checks were subjected to normal fluctuating temperatures at Knoxville, Tenn. The seeds stored at 90° deteriorated rapidly, those containing 14 percent moisture were all dead in 4 months, and after 36 months' storage only those seeds with 7 percent moisture were germinable, and their vitality was impaired. In contrast seeds stored at 33°, even with 14 percent moisture, retained their viability for 36 months without appreciable impairment. Seeds stored at air temperature and at 70° were somewhat intermediate with respect to moisture tolerance. The higher moisture lots deteriorated less rapidly at 70° than at air temperature.

If the moisture content is low cotton seeds can withstand high temperatures without rapid deterioration, and if the temperature is kept low they are tolerant of high moisture, but both temperature and moisture cannot be high if rapid deterioration is to be prevented.

In field germination tests, the percentage of seedling mortality was greater from seeds stored at 33°F. than from seeds stored at higher temperatures. Apparently, the low storage temperature was also favourable for the survival of anthracnese spores on the seeds.

Analyses of stored seeds showed that with increased seed moisture or increased storage temperature there was a corresponding increase in the percentage of free fatty acids in the oil. (*Author's Summary*).

Gleanings

Synthetic fibre from soyabean It seems, as it were, that there is no end to the list of uses in which soyabean can be used. Here is the news of a synthetic fibre, similar to sheep's wool, produced from soyabeans, which is coming into use in upholstery in ever increasing quantity. The pioneering lead was given by the Ford Motor Company which now operates a 'pilot' mill capable of spinning more than thousand pounds of synthetic fibre a day. The fibre is spun from a molasses-like substance containing soyabean protein as its chief ingredient. The process involves the extraction of oil from soyabean and the subsequent removal of protein from oil-free meal. Protein, thus extracted, is dissolved to produce a viscous substance which is forced through a spinneret containing 500 holes to emerge in the form of filaments. The filaments are then passed through acid baths and later on immersed in formaldehyde baths to set the fibres. The fibres are cut according to required lengths and subjected to a process of drying under controlled conditions of temperature and humidity. Some other minor operations are necessary before the fibres are finally made ready for spinning. The product is merited with a natural crimp and a high degree of resiliency. The research chemists are of opinion that the synthetic product can

be best used in combination with sheep's wool, and it is in this form that soya-bean fibre is now-a-days used in American upholstery mills. (*Science and Culture, November 1942.*)

Cotton cloth made warmer A simple process has been developed on behalf of the Indian army by an Indian scientist in co-operation with B. S. I. R. for imparting warmth of wool to cotton cloth. The process involves in impregnating cotton cloth with seeds of indegenous trees grown profusely in India. The treated cloth develops thermal qualities compatible with natural wool. (*J. Indian Chem. Soc. Industrial and News Ed*; *1942, Vol. 5, No. 4.*)

Milk from virgin goats Under the caption 'Milk from Virgins' the July issue of *Monthly Science News* publishes a note how Dr. S. J. Folley and his colleagues at the National Institute for Research in Dairying at Shinfield have recently succeeded in making virgin goats produce milk and demonstrated the superfluity of the usual process of mating. This somewhat peculiar result is reported to have been achieved by treating virgin animal with diethylstilbaestrol and hexoestrol—synthetic alternatives to sex hormones, first prepared by Prof. E. C. Dodds. The basis of such treatment is the knowledge gained recently through researches that hormones from two glands, the ovaries and the anterior pituitary glands, are mainly responsible for the development of the mammary glands of the animals and the production of milk. It has been found that the hormones from the latter gland are indispensable for starting and maintaining the flow of milk. A definite knowledge as to whether sex hormones act directly on the mammary glands, or simply stimulate the anterior pituitary glands, to generate other hormones which are directly responsible for the development of udders is, however, yet lacking. Dr. Folley has further observed that the quality of milk from cows depends on the strength of the doses of sex hormones or the synthetic preparations administered. Strong doses may even altogether stop the production of milk. Weak doses, on the other hand, have been found to increase the proportion of fat and other solid matter in milk which demonstrates that a proper selection of strength can improve the quality of milk. Further research in this direction is in progress and these new results are destined to be of considerable economic importance. (*Science and Culture, December 1942*).

Research Item

Another use of *Cryptostegia grandiflora* R. Br. for war purpose

Milk-weed (*Asclepias curassavica* L.) is an introduced plant with pretty flowers often found on the bunds of rice lands in Coimbatore District and other places and sometimes grown in gardens. It is a troublesome weed in the United States of America; but the floss from the fruits (follicles) has turned out to be a very important war purpose commodity. It is now used for filling life jackets and in linings of flying suits, instead of Kapok (*Eridodenron pentandrum* Kurz.) formerly imported from Java. It is six times as boyant as cork and is as warm as wool. During the current year 50,000 acres of barren land in Michigan is reported to be put under this plant.

The floss of all plants of *Asclepiadasceae* being similar in nature, the floss of *Cryptostegia grandiflora* R. Bn., the rubber vine would provide yet another article for winning the war.

Madras Herbarium,
Agricultural Research Institute,
Coimbatore, 27—4—'43.

K. Cherian Jacob.

Hints for Bee-keepers

For June, 1943

The important pollen sources in the month are maize, *cholam*, *cumbu*, *Lagasca mollis*, guava, coconut, babool, *Euphorbia* and *Poinciana regia*. Tamarind. *Antigonon* and drumstick afford a scanty supply of nectar. In spite of the varied flora in flower very little foraging is done due to the outbreak of the South West monsoon and the consequent windy weather. Brood rearing almost ceases and there is a steady dwindling in the population of the colonies. They have to be looked after carefully to avoid desertion. The supers and superfluous combs in the brood chamber should be removed and stored carefully in an insect-proof receptacle. A dummy division board may be given for weak colonies to maintain the temperature and provide the necessary compactness. Colonies without adequate stock of honey should be artificially fed either with pure dilute honey or sugar syrup once a week. The food may be poured over the frames or given in a cigarette tin. In the latter method the tin should be filled with the food, a piece of cloth tied over its mouth and kept inverted inside the hive. An empty super may be added to accommodate the tin. It is not advisable to feed colonies kept side by side, as the bees from adjacent hives sometimes get excited and begin to rob and fight.

Along with the depreciation in the progress of the colonies the bee enemies get the upper hand. Of these the wax-moth is the most serious. The larvae of this moth infest and devour the combs with the result the bees desert the hive. The pest can be easily kept under check by adopting the following simple hints.

(1) Maintain the colony strong. (2) Keep the hive and its parts scrupulously clean. (3) Remove all superfluous combs and store them carefully. (4) Do not leave any piece of comb exposed. (5) Examine all the crevices, splits and joints of the hive for egg-masses of the wax moth and crush them. (6) Change the hive body once in four or five days to avoid the infestation from egg-masses, which might have been laid in the inaccessible places.

The larvae also attack the stored combs. They can be eliminated by exposing the combs to a mild sun, for about fifteen minutes, the temperature in the open not exceeding 90°—100°F. If there is a suspicion that the eggs have been laid in these combs they can be destroyed by immersing the combs in cold water for about 32 hours. The water may be removed with a honey extractor and the combs dried in the shade and stored carefully.

M. C. Cherian and S. Ramachandran.

Crop and Trade Reports

Statistics—Sugarcane—1942—third or final report The average area under sugarcane in the Madras Province during the five years ending 1940-41 represents 3·0 per cent of the total area under sugarcane in India.

The area planted with sugarcane in 1942 is estimated at 121,970 acres. When compared with the corresponding estimate of 112,110 acres for the previous year and the actual area of 109,527 acres according to the Season and Crop Report, the present estimate reveals an increase of 8·8 per cent and 11·4 per cent respectively. The estimate of the previous year was greater than the actual area by 2·4 per cent.

The present estimate of area exceeds the second forecast by 5,580 acres. The excess occurs mainly in Vizagapatam, Kistna, South Arcot, North Arcot, Trichinopoly and Madura.

The estimated area is the same as that of last year in Kistna, Nellore, Chingleput and South Kanara. A decrease in area is estimated in East Godavari, West Godavari, Guntur, Kurnool, Anantapur and Chittoor and an increase in area in the other districts of the Province, especially in Vizagapatam (+5,060 acres), Bellary (+730 acres), South Arcot (+1,170 acres), Central districts except Chittoor (+6,740 acres), and Madras (+780 acres).

The present estimate includes an area of 12,700 acres under ratoon sugarcane in the districts of Vizagapatam (4,500 acres), West Godavari (550 acres), Kistna (1,450 acres), Bellary (350 acres), South Arcot (660 acres), Chittoor (1,200 acres), Salem (1,300 acres), Coimbatore (1,720 acres), Trichinopoly (300 acres), Tanjore (450 acres) and Malabar (220 acres).

The crop suffered to some extent from insufficient rainfall in parts of the Province. The harvest has commenced. The yield per acre is expected to be normal in Tanjore, Madura, Ramnad and South Kanara and below normal in the other districts. The seasonal factor for the Province as a whole is estimated at 89 per cent of the average as against 92 per cent in the previous year according to the Season and Crop Report. On this basis, the yield is estimated at 3,082,300 tons of cane the gur equivalent of which is 328,230 tons as against 2,836,310 tons of cane with a gur equivalent of 309,280 tons according to the final figures of the previous year. The present estimates reveal an increase of 8·7 per cent in the case of cane and 6·1 per cent in the case of gur as compared with the previous year.

The wholesale price of jaggery per imperial maund of 82⅔ lb. (equivalent to 3,200 tolas) as reported from important markets on 30th January 1943 was Rs. 14--13—0 in Cuddalore, Rs. 13—3—0 in Erode, Rs. 12—13—0 in Coimbatore, Rs. 12—2—0 in Mangalore, Rs. 11—8—0 in Salem, Rs. 11-0-0 in Adoni, Rs. 10-15-0 in Chittoor, Rs. 10—9—0 in Trichinopoly, Rs. 10—5—0 in Vellore, Rs. 9—14—0 in Cocanada and Rajahmundry, Rs. 9—7—0 in Bellary, Rs. 9—2—0 in Vizianagram and Rs. 8—4—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 7th December 1942, these prices reveal a rise of approximately 31 per cent in Coimbatore, 21 per cent in Bellary, 18 per cent in Chittoor, 9 per cent in Trichinopoly and 6 per cent in Vizagapatam and a fall of approximately 20 per cent in Adoni, 8 per cent in Salem and 6 per cent in Cocanada, the prices remaining stationary in Vizianagram, Rajahmundry, Vellore and Mangalore.

Statistics - Gingelly—1942-43—fourth or final report The average of the areas under gingelly in the Madras Province during the five years ending 1940-41 has represented 16·0 per cent of the total area under gingelly in India.

The area sown with gingelly in 1942-43 is estimated at 738,700 acres. When compared with the area of 683,400 acres estimated for the corresponding period of last year, it reveals an increase of about 8·1 per cent. The present estimate reveals an increase of about 6·6 per cent when compared with the finally recorded area of 693,070 acres in 1941-42.

One lakh, forty-six thousand and three hundred acres have been reported as sown since the previous forecast was issued in January as against 147,600 acres during the same period last year. These late sowings were mainly on wet lands in East Godavari, West Godavari, South Arcot, Trichinopoly and the South where gingelly was raised as a second crop after paddy.

The estimated area is the same as that of last year in Guntur, Kurnool and South Kanara. An increase in area is estimated in West Godavari, the Deccan (except Kurnool), Nellore, South Arcot, the Central districts (except Trichinopoly) and the South (except Madura). The increase is marked in Anantapur (+ 13,800 acres), South Arcot (+ 19,400 acres), Salem (+ 16,300 acres) and Tinnevelly

(+18,500 acres). A decrease in area is noticed in the other districts of the Province, especially in Vizagapatam (-15,800 acres).

The yield is estimated to be normal in Salem, Tinnevelly and South Kanara and below the normal in the other districts, especially in Kurnool, Cuddaph and North Arcot (75 per cent in each), Chingleput (70 per cent), Bellary and Chittoor (60 per cent in each) and Anantapur (50 per cent). The condition of the late-sown crop is reported to be generally fair.

The seasonal factor for the Province as a whole works out to 84 per cent of the average as against 89 per cent estimated in the Season and Crop Report of the previous year. On this basis the total yield works out to 84,400 tons, i. e., the same as that estimated in the Season and Crop Report of the previous year.

The wholesale price of gingelly per imperial maund of 82⅔ lb. as reported from important markets on 10th April 1943 was Rs. 18—13—0 in Trichinopoly, Rs. 18—1—0 in Cocanada, Rs. 17—6—0 in Ellore, Rs. 15—7—0 in Tuticorin, Rs. 15—5—0 in Vizianagram, Rs. 14—15—0 in Tinnevelly, Rs. 14—7—0 in Salem, Rs. 13—14—0 in Rajahmundry, Rs. 13—6—0 in Cuddalore and Rs. 12—9—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 13th February 1943, these prices reveal a rise of approximately 43 per cent in Trichinopoly, 33 per cent in Cocanada, 32 per cent in Vizianagaram, 30 per cent in Ellore, 16 per cent in Salem and Tuticorin, 11 per cent in Cuddalore and Tinnevelly and 8 per cent in Rajahmundry, the price remaining stationary in Vizagapatam.

Statistics—Groundnut—1943—first report The area sown with summer or irrigated groundnut during the three months (January to March 1943) is estimated at 52,900 acres. When compared with the estimated area of 33,700 acres for the corresponding period of last year, there is an increase of 57 per cent.

The wholesale price of groundnut (shelled) per imperial maund of 82⅔ lb. as reported from important market centres on 10th April 1943 was Rs. 12—14—0 in Nandyal, Rs. 12—13—0 in Vellore and Erode, Rs. 12—11—0 in Adoni, Rs. 12—9—0 in Cuddapah and Tadpatri, Rs 12—5—0 in Guntur and Coimbatore, Rs. 12—1—0 in Vizagapatam, Vizianagram, Cuddalore and Hindupur, Rs. 11—10—0 in Salem, Rs. 10—9—0 in Bellary and Rs. 10—4—0 in Guntakal. When compared with the prices published in the last report, i. e., those which prevailed on 18th January 1943, these prices reveal a rise of approximately 43 per cent in Cuddapah, 42 per cent in Vellore, 39 per cent in Cuddalore, 38 per cent in Guntakal, 36 per cent in Erode, 34 per cent in Nandyal and Vizagapatam, 32 per cent in Guntur, 30 per cent in Vizianagram, 26 per cent in Adoni and Tadpatri, 25 per cent in Salem and Hindupur, 23 per cent in Coimbatore and 18 per cent in Bellary.

Statistics—Cotton - 1942-43—fifth or final forecast report. The average area under cotton in the Madras Province during the five years ending 1940—41 represents 9·7 per cent of the total area under cotton in India.

The area under cotton in Madras Province in 1942-43 is estimated at 2,171,800 acres, as against 2,541,400 acres for the corresponding period of last year and 2,127,900 acres according to the forecast report issued in February. The present estimate for the province represents a decrease of 15·0 per cent as compared with the finally recorded area of 2,555,954 acres in 1941-42. The final estimate of last year fell short of the actuals by 0·6 per cent.

The decrease in area in the current year as compared with the area in 1941-42 occurs in all the important cotton growing districts of the Province except Guntur, Kurnool and Trichinopoly. The decrease is marked in Bellary (-105,600 acres), Coimbatore (-74,100 acres), Madura (-51,000 acres) and Tinnevelly (-112,900 acres).

Picking of cotton is in progress and may be finished in about a month.

The crop was affected to some extent by the heavy rains of December 1942 in parts of the districts of Ramnad and Tinnevelly and by drought in the rest of the Province.

The yield per acre is expected to be normal in Salem (irrigated Cambodia cotton only) and below the normal in the other districts of the Province.

The seasonal factor for the Province as a whole works out to 75 per cent of the average for both irrigated and unirrigated cotton, the corresponding figures according to the Season and Crop Report of the previous year being 99 per cent. On this basis, the yield works out to 406,300 bales of 400 lb. lint as against 564,350 bales estimated for the previous year which represents a decrease of 28·0 per cent. It is, however, too early to estimate the yield with accuracy as much will depend on future weather conditions and their effect on the second crop and on the amount of damage done by insect pests.

The average wholesale price of cotton lint per imperial maund of $82\frac{2}{7}$ lb. as reported from important markets on 10th April 1943 was about Rs. 46—1—0 for Cocanadas, Rs. 41—15—0 for white Northerns. Rs. 35—6—0 for red Northerns, I·s. 34—0—0 for Westerns (*mungari*). Rs. 37-3-0 for Westerns *(jowari)*, Rs. 85-12-0 for Tirupur Cambodia, Rs. 73—7—0 for Coimbatore *karunganni*, Rs. 65—6—0 for Southern Cambodia, Rs. 58—15—0 for Tinnevellies and Rs. 39—6—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 6th February 1943, these prices reveal a rise of approximately 58 per cent in the case of Coimbatore *Karunganni*, 55 per cent in the case of Cocanadas, 48 per cent in the case of red Northerns, 46 per cent in the case of Tirupur Cambodia, 43 per cent in the case of Westerns (*jowari*), 36 per cent in the case of white Northerns, 18 per cent in the case of Westerns (*mungari*) and 11 per cent in the case of *Nadam* cotton. (*Secretary, Board of Revenue—Civil Supplies, Madras*)

Cotton raw in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 30th April 1943, amounted to 112,412 bales of 400 lb. lint as against an estimate of 393,900 bales of the total crop of 1942—43. The receipts in the corresponding period of the previous year were 140,296 bales. 155,027 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 56,600 bales were imported by sea mainly from Karachi and Bombay. (*Director of Agriculture, Madras*)

Moffusil News and Notes

Agricultural Exhibition—Guntur District An agricultural exhibition was held at Kotappakonda in Narasaraopet taluk during the *Mahasivaratri* festival from the 2nd to 5th March. Seeds of Departmental strains of crops, Presidency collection of chillies, banana fruit preserves, ploughs and bund former were some of the important exhibits. (A. D. Narasaraopet)

Agricultural Exhibitions—Cuddapah District Agricultural exhibitions were organised at Vontimitta in Sidhout taluk and Pushpagiri in Cuddapah taluk at the time of the car festivals from the 18th to 20th April and 7th to 9th May, respectively. Various improved agricultural implements, models of *Kifayat Rahats* and *Sindhwahe furance*, seeds of high yielding strains of crops and posters on Grow More Food campaign and the several concessions granted by the Government to aid the same were exhibited. Ploughing with iron ploughs, forming bunds with the bund former and levelling with the buck scraper were

demonstrated. Lectures were delivered on Grow More Food and War propaganda. The National War Front organisation also participated in the activities. (D. A. O. Cuddapah)

Agricultural Exhibitions—Ramnad district Agricultural exhibitions were conducted at Tiruchuli in Aruppukottai taluk and Kunnakudi in Tirupattur taluk from 14th to 21st March and 18th to 21st March respectively. Seeds of Departmental strains of crops, labour saving appliances such as iron ploughs and ball bearing mhote wheels and specimen crops of *daincha* and *kolinji* grown in pots were exhibited. Posters on Grow More Food campaign and the concessions granted by Government were displayed prominently. Pamphlets on Grow More Food and other items of agricultural propaganda were distributed free to the visitors. Seeds of vegetables such as tomato, raddish and Bellary onion, cuttings of Jaffna *murangai* and lime squash from Fruit Research Station, Kodur, were sold. The exhibitions were highly appreciated. (D. A. O. Ramnad)

The First West Coast Fruit Show The first of the regional fruit shows for West Coast fruits, fruit products, fruit dishes and recipes was held on the 26th and 27th April at the Government College, Mangalore. The function served to focuss the interest of the people on the important role of fruits in providing a healthy supplementary food to all diets. (D. A. O. Mangalore)

B. Sc. Ag. Degree Examinations 1943

List of successful candidates

First Examination Anjaneyulu, C. V. Audinarayana Reddi, G. Balasubrahmanyan, R. Bettai Gowder, R. Govindarajulu, R. Gulam Muhammad Sheriff. John Chinnayya, E. Kanakachala Rao, K. Krishnan, A. S. Madhava Rao, V. N. Muhammad Azimuddin. Muhammad Madar, A. M. Nageswara Rao, P. Narasimhalu, K. Narasimha Rao, V. V. Narayana Reddi, K. V. Padmanabhan Nambiar, K. P. Raghavan, K. Raghavendra Rao, W. Rajappa Ayyar, P. V. Ramachandrachari, C. Ramakrishna Rao, P. Ramamohana Rao, A. Ramamohana Rao, S. Raman, K. R. Ramanathan, K. Ramanathan, M. Ranga Rao, D. Samuel Sundararaj, J. Satagopan, R. Shanmugham, T. S. Sundaram Pillai, K. Thomas, R. E. Thomas Reddi, A. Venkatachalam, K. Venkataswami, B. Viswanadham, Y. (Agricultural College, Private Study). Bhaskara Rao, K. Kanaka Rao, G. Khaja Sha Habibulla. Ranganathan, R. Venkatanadhachari, G.

Second Examination Ammi Raju, P. Appalanarasayya, K. Chellam Vincent, E. R. Chockalingam, C. D. Dasaradhi, T. B. Ibrahim Ali, S. A. Francis Gurubatham, Krishnamurthi, P. A. Narasimha Doss, T. Narasimham, R. Narasimha Rao, G. Narasimha Sastri, V. L. Narayanaswami, K. R. Nargunam, W. R. Navaneethakrishna, T. V. Padmanabha Pillai, D. Priyavratha Rao, S. B. Raghavan, N. Rajagopalan, K. Ramanjaneyulu, S. Rami Reddi, D. Sankara Reddi, G. H. Somayajulu, P. L. N. Srinivasa Ayyar, P. A. Suryanarayana Sastri, M. Thyagarajan, N. Vasudeva Reddi, C. Venkatarama Reddi, T. Venkataswami, T. Vankatraya Pai, T. Subba Rao, K.

Final Examination Ganesan, K. R. Krishnaswami, S. Kuppuswami, K. P. Kutumba Reddi, K. Narasimha Rao, I. L. Prabhakara Reddi, G. Rajagopal Reddi, V. Thandavarayan, K. Anantakrishna Rao, P. N. Devadas Kamath, V. Dhanavantari Reddi, M. Gopalakrishna Sarma, M. V. Govindaswami, C. V. Krishnamurthi, C. (Ist class). Kuppuswami, B. S. Mirza Anser Baig. Narasimha Reddi, R. Padaki, G. R. Palaniswami, T. V. Ramakrishna Sastri, K. Rama Rao, V. Ramesh Adyanthaya, N. Sridhara Sastri, D. Srinivasan, C. Subrahmanya, R. Sundara Rao Y. R. Suryanarayanamurthi, K. V. S. Tiruvengadam, C. R. Ummerkutti, O. V. Venkataraman, T. M. Venkataraman, C. R.

Anantakrishnan, N. Koulutlayya, M. C. Nageshwar Rao, J. P. Narayanamurthi, R. Radhakrishna Reddi, A. Ramanadhan, S. Ramaratnam, W. S. Ranga Rao, K. Venkataramana Reddi, G.

Departmental Notifications

Gazetted Service—Appointments, Postings and Transfers

Sri Samuel Jobitharaj, D. A. O. is appointed Pulses Specialist with effect from the date of taking charge.

Sri M. Subramania Ayyar, D. A. O. Madura, is appointed to hold full additional charge of the post of D. A. O. Tinnevelly, *vice* Sri T. G. Muthuswami Ayyar permitted to avail leave.

Sri M. U. Vellodi, D. A. O. Coimbatore is appointed to hold full additional charge of post of Deputy Director of Agriculture, Coimbatore, *vice* Sri B. Ramayya granted leave for 21 days from 3—5—43.

Sri B. Ramayya on return from leave to resume the post of Deputy Director of Agriculture, Coimbatore.

Sri U. Vittal Rao, D. A. O. (on leave) to be D. A. O. Mangalore.

Sri K. K. Raghavan, D. A. O. Mangalore to be D. A. O. Tanjore.

Leave

Sri K. Venkatarama Ayyar, D. A. O. Ellore, l. a. p. for 2 months and 15 days from the date of relief.

Sri T. S. Ramasubramania Ayyar, Assistant Agricultural Chemist, Coimbatore, l. a. p. for 1 month from 13—4—43.

Subordinate Service—Postings and Transfers

Name of officer	From	To
Sri M. K. Lingiah	F. M. A. R. S., Koilpatti	A. D. Wheat Rust Control Scheme, Coonoor
„ S. V. Naidu	A. D. Done	A. D. Markapur
„ V. Satagopa Ayyangar	F. M. Central Farm, Coimbatore	A. D. Mayavaram
„ P. Somayajulu	A. D. Salur	F. M. A. R. S. Samalkota
„ G. Ranganathaswami	F. M. A. R. S. Anakapalle	A. D. for Vegetable Nurseries, Vizagapatam District
„ G. Satyanarayana	A. D. Ramachandrapuram	„ „
„ Ch. Venkatachalam	A. D. Tadepalligudam	„ „
„ T. Lakshmipathi Rao	A. D. Bhimavaram	„ „
„ V. K. Kunhunni Nambiar	A. D. (on leave)	A. D. Manantoddy
„ K. V. Natesa Ayyar	A. D. (on leave)	A. D. Gudiyattam
„ K. B. Vaideswara Ayyar	A. D. Gudiyattam	F. M. Kalahasti
„ V. S. Rangacharlu	F. M. Kalahasti	A. D. Saidapet
„ K. S. Mudali	A. D. Orathanad	A. D. Tiruturaipundi
„ L. K. Narayana Ayyar	A. D. Tiruturaipundi	A. D. Papanasam
„ M. K. Swaminathan	A. D. Papanasam	A. D. Orathanad
„ G. C. Balaraj	F. M. A. R. S. Aduturai	F. M. A. R. S. Pattukottai
„ P. Gopalakrishnan	F. M. A. R. S. Pattukottai	F. M. A. R. S. Aduturai
„ A. Ramadoss	F. M. A. R. S. Aduturai	A. D. Arantangi
„ R. Subramania Ayyar	A. D. Arantangi	F. M. A. R. S. Aduturai
„ R. Krishnamoorthy	A. D. Mayavaram	F. M. A. R. S. Pattukottai.

Leave

Name of officer	Period of leave
Sri R. Govindarama Ayyar, F. M. A. R. S. Pattukottai	L. a. p. for 2 months from the date of relief
„ M. Satyanarayana, F. M. A. R. S. Guntur	Extension of l. a. p. on m. c. for 1 month and 3 days from 27—3—43.
„ P. S. Athmarama Ayyar, A. D. Avanashi	L. a. p. for 1 month from 10—5—43.
„ T. V. Srinivasacharlu, A. D. Sriperambudur	Extension of l. a. p. on m. c. for 1 month from 20—5—43.
„ B. Shiva Rao, A. D. Tuni	L. a. p. on m. c. for 2 months from 29—4—43.
„ P. V. Hanumantha Rao, A. D. Virdhachalam	Extension of l. a. p. on m. c. for 3 months from 28—4—43.
„ T. Gopalan Nair, Asst. Fruits Section (on leave)	Extension of l. a. p. on m. c. for 7 weeks from 1—4—43
„ M. P. Gowrisankara Ayyar, A D. Devakottai	L. a. p. for 2 months from 21—4—43.
„ M. Srinivasa Rao, A. D. Kavali	L. a. p. for 30 days from the date of relief.
„ M. Kandaswami, Asst. Tobacco Res. Scheme, Guntur	L. a. p. for 1 month from 3—5—43.
„ K. S. Ramana Rai, A. D. Hospet	Extension of l a. p. for 1 month from 23—4—43.
„ B. G. Narayana Menon, F. M. Nileswar	L. a. p. for 62 days from 26—4—43.
„ K. M. Jacob, A. D. Manantoddy	L. a. p. for 3 months and 29 days from 1—5—43, preparatory to retirement.
„ M. Subba Reddy, A. D. Venkatagiri	Leave on half average pay on m. c. for 60 days from 17—5—43.

OBITUARY

We regret to learn and to announce the following deaths.

A. Chinnathambi Pillai, retired Assistant Director of Agriculture expired on the 9th May 1943 at Koomapatty, Ramnad district.

V. Karunakaran Nair, Agricultural Demonstrator, Sivaganga, expired on the 8th May, 1943, at Parappanangadi, S. Malabar.

We extend our sympathies to the members of the bereaved families.