

195

The Madras Agricultural
Journal

1931 - May

VOL. 19. NO. 5



JL
Jm 211, N13
N31.19.5
94576

May 1931

Reg. No. 1155

Vol. XIX

No. 5

The Madras Agricultural Journal



Published by
THE M. A. S. UNION
Agricultural College and Research Institute
Coimbatore, S. India



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Vol. XIX]

MAY 1931

[No. 5

SORGHUM—STUDIES IN SOWING DEPTHS

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

Millet Specialist,

AND

K. KUNHI KRISHNAN NAMBIAR, B. Sc. (Ag.),

Assistant to the Millet Specialist.

The prevalent agricultural practice in the red loamy soils round about Coimbatore of sowing the local yellow variety *Peria Manjal Cholan*, deep, behind a country plough in seasons of deficient timely rains led to the study of the general question of the response of the local variety to different depths of sowing.

The sowings were done in pots with adequate drainage in a foot of soil. 100 seeds represent each unit, and prior to sowing, the germination percentage of the seeds was recorded by sprouting them on wet blotting paper in an incubator. A standard strain—A. S. (Andropogon Sorghum) 29—was selected. A seed was recorded as germinated when it managed to push out a bit of green beyond the soil surface. A seedling with its various parts is drawn in figure 1.

TABLE I.
A. S. 29 in different depths of sowing.

Sowing depth in inches	Germination percentage	Average length of mesocotyl in inches	Average number of secondary roots arising from base of Coleoptile
Surface	88	0.0	4.70
$\frac{1}{2}$	100	0.3	4.39
1	97	0.9	4.22
2	95	1.9	3.76
3	85	3.0	3.36
4	72	3.1	3.28
5	52	3.7	3.00
6	16	4.0	1.10

It will be noticed that with increased depth of sowing there is a progressive decline in germination, a progressive increase in the length of mesocotyl, and a progressive decline in the number of secondary roots.

Taking it that the function of the mesocotyl is primarily to buoy up the coleoptile, it was next considered interesting to see, to what degree the coleoptile itself responded in this effort on its behalf. This aspect was all the more prominently brought to notice owing to the different lengths in which the coleoptile showed out of the soil surface in the germinations. It is needless to mention that the successful pushing up of the coleoptile to very near the soil surface is a necessity for the successful record of germinations, though instances occur in which, with the coleoptile still underground, it was given to the seedling to struggle up and show out crumpled leaves. With deeper sowings there is a tendency for a larger underground portion of the coleoptile.

TABLE II.
Sowing depth and Coleoptile length.

Sowing depth in inches	Average Coleoptile length in inches
Surface	0.41
$\frac{1}{2}$	0.43
1	0.50
2	0.75
3	0.86
4	0.90
5	1.00
6	1.06

The conjoint action of mesocotyl and coleoptile is presented diagrammatically in figure 2.

It being clear that there is a combined response of both mesocotyl and coleoptile to differential depths of sowing, enabling them to make a successful effort at germination, it was next planned to pursue the causes producing the larger number of secondary roots in the shallow sowings and the further function of the mesocotyl in the deeper sowings. It was noticed that the rootlets on the mesocotyl were prominent with the emergence of the first true leaf from the coleoptile. For the mesocotyl rootlet counts $\frac{1}{2}$ " and 4" were the two depths chosen, for the reason that the $\frac{1}{2}$ " just covered the seed and that the 4", in the case of this variety, represented the maximum depth consistent with a fair germination. The counts were taken at the end of the third week.

TABLE III.
Sowing depth and number of rootlets on mesocotyl.

Sowing depth in inches	Average number of rootlets on mesocotyl
$\frac{1}{2}$	2.81
4	27.33

Whereas from TABLE I, it will be seen that in $\frac{1}{2}$ " sowings, the larger number of secondary roots help in the growth of the seedling, the deeper sowings with a lesser number of surface secondary roots develop in the mesocotyl, a larger number of rootlets. It was observed that the decay of the mesocotyl started from the seed end, and that a run of purple pigmentation along the mesocotyl preceded the advance of this decay.

The shallow sowings tend to give bigger, heavier, and more leafy seedlings than deeper sown ones.

TABLE IV.
Sowing depth and seedling weight

Sowing depth in inches	Weight of 100 seedlings 21 days old in grams
$\frac{1}{2}$	152
4	119

It will be observed that deeper sowings tend to depend upon deeper layers of soil for their moisture, are initially more economical in early leaf production and with a lesser number of surface secondary roots are less dependent on an erratic surface moisture than the shallower sown seedlings. The germination percentage is less in the deeper sown ones and in consequence a heavier seed-rate is indicated.

The struggle which seedlings undergo in sowing depths 7" and below is shown in figure 3.

The general conditions of germination with reference to A. S. 29—the standard strain of *Peria Manjal* Cholam—having been determined, it was next attempted to find out if there are any differences exhibited by different strains of the same local variety in their adaptability in this respect. With this end in view, four different strains of *Peria Manjal* Cholam were sown at the standard depth of 4", and the results of the germinations are given below.

TABLE V.
Four different strains of *Peria Manjal* Cholam sown 4" deep.

Strain No.	Germination percentage in germination tray	Germination percentage in pots	Average mesocotyl + coleoptile length of germinated seedlings in inches
A. S. 80	96	52	3.63
" 1374	99	57	3.93
" 29	94	81	4.13
" 63	98	85	4.11

Taking it that deep sowing may have to be resorted to under certain circumstances it will be obvious that not all strains successfully respond to deep sowing and that the poor germination capacity of A. S. 80 and A. S. 1374 is due to their comparative inability to produce enough length of mesocotyl and coleoptile combined, to give them that push up necessary to bring out the seedlings to the surface.

This led to the general question of varietal response in this direction. Different varieties were chosen and sown at the standard depth of 4" and the results are tabulated below.

TABLE VI.
Sorghum varieties sown 4" deep.

Number and name of variety	Germination percentage in germination tray	Germination percentage in pots	Average mesocotyl + coleoptile length of germinated seedlings in inches
A. S. 553—Tella Jonna, Nandyal...	83	1	...
" 1053—Sen Cholan, Salem ...	92	60	3.84
T. 6—Pacha Jonna, Nandyal.	75	71	3.61
A. S. 1894—Brown Cholan (A. S. 186 clan) ...	95	73	4.20
" 1010—Pedda Jonna, Bezwada.	100	79	3.81
" 403—Thalavirichan Cholan, Goundanpalayam ...	98	80	4.05
" 1047—Karum Cholan, (Irungu) Manaparai.	96	85	4.19
" 29—Peria Manjal Cholan, Coimbatore ...	94	87	4.03

It will be noticed that there is an appreciable variation in the different varieties in their combined mesocotyl and coleoptile lengths and that this length determines the number of successful germinations. It will thus be evident that this capacity will have to be remembered as one of the probable factors in determining successful seed germinations under dry farming conditions.

In TABLE VI, the one per cent germination in pots of A. S. 553, Tella Jonna, Nandyal, giving 83 per cent of germination in the tray, was pursued.

TABLE VII.
Sowing depths of Tella Jonna, Nandyal (A. S. 553)

Sowing depth in inches	Percentage of germination in	
	Black Soil	Red Soil
$\frac{1}{2}$	85	85
1	50	80
2	45	60
3	10	5
4	0	0

SORGHUM—STUDIES IN SOWING DEPTHS

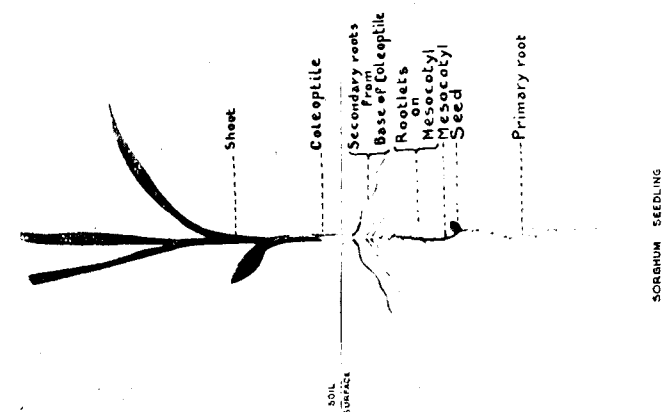


FIG. 1

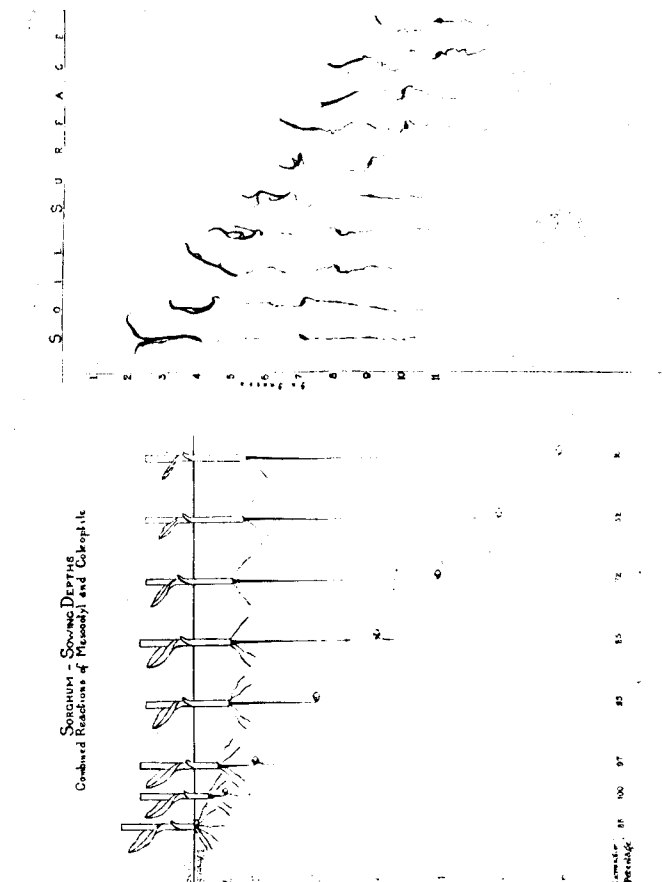


FIG. 2

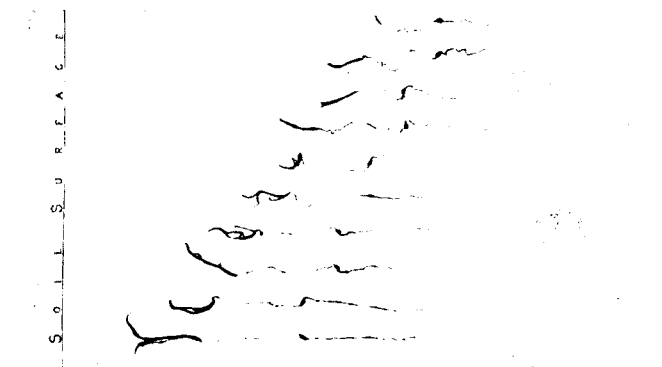


FIG. 3



FIG. 1



FIG. 2



FIG. 3



FIG. 4

Fig. 1. Sugarcane stalks being tied together to overcome lodging. Fig. 2. A well-tied group after the final wrapping. (Roping is visible where $\times$ is marked). Fig. 3. A view of the cane field after roping is finished. Fig. 4. Roping and twisting of leaves.
N.B.—Roping can be seen where $\times$ is marked in the photographs.

A progressive increase of germination with shallower sowings is observable, more noticeably in the heavy black than in the lighter red soils.

An examination of the ungerminated 4-inch depth sown pot of TABLE VI showed that out of 100 seeds sown, 62 sprouted, 18 of them giving an appreciable and measurable length of mesocotyl and coleoptile, whose average mesocotyl length was 1.62 inches, and average coleoptile length was 1.06 inches, their combined average lengths being 2.68 inches, which is 1.32 inches below the soil surface. This varietal difference in response to depths of sowing in terms of germination percentage is graphically brought out in this instance.

These studies reveal the importance of this early phase of the seedlings' existence and the need for their study in the general scheme of the evolution of a successful strain.

SUMMARY

Sowing depth in Sorghum varies with soil and moisture conditions. Successful germination is due to the combined effort of mesocotyl and coleoptile. This combined length is a varietal character and is elastic within limits. Appreciable differences are noticeable within strains. This aspect of a strain will have to be remembered in its evolution.

A SHORT NOTE ON THE SUGARCANE CULTIVATION IN HINDUPUR TALUK

By K. AMBIKACHARAN, B. Sc. (Ag.)
 Agricultural Demonstrator, Hindupur.

My idea in writing this article is to popularize some of the methods adopted by the Hindupur ryots in growing sugarcane. Garden cultivation is important in this taluk and sugarcane forms the chief commercial crop which pays ready money to the ryot. Notwithstanding the various difficulties met with by the ryots in growing a crop of sugarcane every year they cultivate at least half an acre of sugarcane always.

Varieties of sugarcane.—The two popular varieties are 'Pedda Cheruku' and 'Chinna Cheruku' (big and small canes as literally translated). Pedda Cheruku is more juicy than the other, but on personal observation both the varieties yield 350 to 400 maunds of jaggery (1 maund=25 lbs.) per acre. The thinner variety resists drought better and gives a better quality of jaggery which fetches a higher price. Ryots are often impressed with the better tonnage of the canes and so Pedda Cheruku is more popular. Sometimes gardens can be seen where both the varieties are grown as a mixture in order to improve the quality of the jaggery.

Rotations.—There is a common belief that sugarcane after tobacco yields best and that a superior quality jaggery is obtained from such a crop. As tobacco is limited to particular areas the general rotation is paddy or ragi and sugarcane. Between paddy and ragi, ryots prefer paddy to precede sugarcane since they believe the soil improves in its condition after a paddy crop.

Preparatory cultivation.—The land is ploughed eight to twelve times with a wooden plough generally bigger than the ordinary country plough, to

produce a good tilth. The ryots according to the nature of the soil alternate the ploughings with the working of a heavy *Guntakka* (blade harrow) which levels the land and breaks the clods. Ridging is done two feet apart.

Manures and manuring.—Cattle manure is the most favoured manure. The ryots allow the manure to undergo complete decomposition for fear of white ants after application. A liberal dose at 60 cart-loads per acre is applied to the field. The manurial ingredients will constitute a very low percentage since lot of earth is added to the manure during preservation. A careful ryot, in addition to the cattle manure, applies 25 to 30 maunds of *Pungum* cake or occasionally castor cake and 150 cartloads of tank silt. The cake manure is usually applied first while ploughing takes place and the cake is applied along the ridges. Some ryots mix *Pungum* oil with irrigation water and are of the opinion that the jaggery outturn is more and will be of a high quality when the oil is used. It should be mentioned that there is absolutely no practice of applying the cake for a second time two or three months after planting.

Planting setts.—It is very encouraging to note the adoption of an economic seed rate in many of the villages of the taluk. The usual seed rate is 12,000 setts per acre. In the eastern portion of the taluk, i.e., in the villages of Gorantla, Palasamudram, Kodura, Chilamaturu and Kodikonda, the usual seed rate is 16,000 setts per acre. The ryots are quite aware of the importance of using the sugarcane tops for seed purposes. In some places they use the top canes for planting. This system is adopted especially when planting takes place after crushing. They preserve the tops under shade of some trees well covered with paddy straw and sugarcane trash.

It is interesting to note that the planting and milling of canes are done side by side and last from December to April.

Irrigation.—The first irrigation is given while planting. After 8 days the field receives a second irrigation and a third after 15 days of planting. A month after planting, digging and ridging takes place and afterwards the crop is irrigated once in four days according to the nature of the weather. On the whole the crop receives on an average 40 to 50 irrigations before it is harvested.

Wrapping and roping.—Wrapping is common but roping is new to many. The first wrapping takes place after three months and subsequent wrappings are done once in a month. Thus on the whole 8 to 9 wrappings are done.

Roping is an interesting operation. The Hindupur ryot is a very careful grower of sugarcane. With less cost he makes his canes proof against sudden gales. Even wind-breaks are not much in vogue. The roping operation does immense good. When the crop is 7 or 8 months' old, ten or twelve canes are tied together and several groups of canes are thus formed. If the crop does not grow very high, the crop is left with this. If it grows tall a rope made of aloe fibre is passed from group to group and sugarcane leaves are twisted against the rope along with it, which gives additional strength and firmness to the groups against sudden gales.

This operation is quite peculiar to the tract and worthy of imitation as it involves a small expenditure of only Rs. 5 or 6 per acre. No propping is done.

Harvesting.—The crop comes to maturity after 11 months as elsewhere. Harvesting, milling and planting take place simultaneously in many places. Six men harvest one acre of cane crop within 15 days. They are not always engaged in harvesting. They help in jaggery boiling also.

Milling of canes.—The three-roller iron mill is used. The country mill is practically absent. The juice is collected in a conical receiver (similar in shape to a flower pot) which is buried flush with the ground and the juice is carried to the pan by means of pots.

Jaggery making.—At every charge 2 to 2½ maunds of jaggery are obtained. Sometimes three maunds are obtained. Moulds are not employed. The jaggery is made into balls. When the jaggery is about to solidify the semi-solid jaggery is poured into a wooden pit one yard square and 6 inches deep, made for the purpose. While the stuff is still hot it is made into balls. Two men prepare into balls in half an hour, 2½ maunds of jaggery. Moulds are not preferred because balls withstand transit better than moulds. The latter breaks often and fetches a low price. Hindupur supplies jaggery to all the four Ceded Districts.

Studies in cost of cultivation.—Mr. Nanjappa is a retired village school-master much esteemed for his three R's. He has seven acres of garden land in Hindupur and grew one acre of sugarcane this year. I collected the following facts and figures from him which are very near to the average figures I collected from many parts of the taluk.

Mr. Nanjappa used the Sindwahi furnace and pan for the preparation of jaggery with the help of the Agricultural Department last year and this year and he is quite convinced of the benefits of using the Sindwahi furnace and pan.

The local furnace consists of a pit wherein the heavy local pan rests three-fourths to its height and there is a vertical distance of 1½ feet from the bottom of the pan to the bottom of the furnace. There is a hole of three inches diameter in the centre for the ashes to escape into a diagonal hollow of 6' long dug for the purpose. The labour taken for constructing such a furnace is 8 men who are paid eight annas a day and thus the total cost comes to Rs. 4.

The local pan costs about Rs. 35.

Let me work out the economic saving as accepted by Mr. Nanjappa by adopting the Sindwahi furnace.

.....	Local furnace and pan.	Sindwahi furnace and pan.
Number of boilings per day	6	8
Taking three maunds of jaggery are obtained per boiling, number of days required to mill an acre would be (Yield of 350 maunds of jaggery per acre)	20 days	15 days
Labour required (for one day for harvesting, milling, boiling, etc., 9 men are required)	180	135
Cost of labour	Rs. 56-4-0	Rs. 42-3-0

Thus there is a saving of Rs. 14-1-0 in boiling alone. There is a saving in fuel also in the improved furnace which will amount to Rs. 5 and only three men are required for constructing the furnace and hence an extra saving of Rs. 2-5-0. Thus the saving on the whole is Rs. 21-9-0 by using the Sindwahi furnace.

POULTRY AS A SIDE LINE

By T. MURARI, B. Sc. (Oxon), F.L.S.,
Officiating Deputy Director of Agriculture, Live Stock.

In nearly every civilized country the egg has been recognized as a wholesome food. The demand for the article is so great that nearly every country is paying a great deal of attention to poultrying. Apart from mere production, marketing has become highly efficient. In Europe, especially in Denmark eggs are collected, each egg marked as to the number of Co-operative Society concerned, etc. and packed efficiently so that it may reach the market some hundreds of miles away with as little breakage as possible. From the East, China is able to produce large quantities of eggs for the market in England and make a decent profit, despite the distance the eggs have to travel. Assam is also making strenuous efforts in the marketing of eggs.

It is a well-known fact that various breeds of fowls have originated from the red jungle fowl (*Gallus Bankiva*) which ranges from the north of India to south-east Asia as far as the Phillipines. Though breeds apparently find their origin in India yet the Indian ryot cannot boast of maintaining a respectable breed. Generally the breed found in the villages are hardly pure and as for system of keeping, there is none. The economic conditions in India are simply pitiable and it is time that the ryot thought of giving more attention to poultry management, and earn a few more annas, which are no doubt most welcome in these hard times. The more advanced type of ryot, or the educated classes which are apparently interested in agriculture can easily organize poultry farming, and in course of time not only supply the markets in India but also the one in London.

Poultrying in Europe, is a woman's job on most farms. The farmer's wife generally manages the poultry and for her trouble keeps the earnings to herself. There is no doubt that similar system exists in this country wherever fowls are kept, and I hope earnestly that the women in this country would be as much interested in this side of Industry as her sisters in Europe. I am hereunder making some notes for the benefit of those, who wish to interest themselves in poultry, but it must be remembered these observations are in no way complete. For instance, feeding of poultry is still empirical and it is likely that we shall know more about the nutrition of poultry when Belfast, Harper Adams College and Cambridge poultry sections have completed their investigations. In the near future the Live-stock section will, I hope, be in a position to carry out feeding tests with local grains etc., and give the public useful advice.

CHOICE OF BREED.

Choice of breeds greatly depends on the purposes of the breeder. For egg production, one may choose either the Leghorns or the Ancona, for

general purposes perhaps Faverolle or Wyndotte, for table Indian Game, and for fancy either the English Game or the Cochin. Various breeds may be classified according to their special qualities. The general shape and carriage of different breeds give us a fair indication as to their utility. Look at a fowl from the side and imagine a line drawn from the front of the neck to the thigh. If the great bulk lies behind this line, laying qualities are indicated and the fowl is classed as a layer, but if the bulk is in front of the line, it is classed as a table bird. When it is difficult to say on which side the greater part lies, it is apparent that both the qualities are equally balanced and the fowl is classified, as general purpose or utility variety. For general information, a number of breeds are classified according to their qualities as follows :—

LAYING OR NON-SITTING VARIETIES

Ancona	Hamburg	Minorca
Andalissian	Houdan	Redcap.
Campine	Leghorn	

GENERAL PURPOSE OR UTILITY

Cochins.	Faverolle.	Langshan.
Brahma.	La Brasse.	Plymouth Rock.
Sussex.	Wynadotte.	Orpingtons.
		Rhode Island Red.

TABLE VARIETIES

Concou de Malines.	Game.
Dorking.	Indian Game.
	FANCY
Aseel.	Bantam.
Cochin.	Silky Yokohama.

Classification according to colour of Flesh and Skin.

White Flesh & Skin

Black Sumatra.
 Faverolles.
 Minorca (White).
 Orpington (Buff,
 white and
 spangled).

Yellow or Cream Flesh & Skin

Ancona.
 Brahma.
 Cochin.
 Game (some varieties).
 Leghorn.
 Java.
 Wyandotte.

Grey or White Flesh Skin

Andalusian.
 Langshan.

Austral Orpington.
 Minorca (black).

Ducks.

Caydega—Table—White flesh and skin.
 Roven—Table—Yellow flesh and skin.
 Aylesbury—Table—White flesh and skin.
 Khaki complete—Layer—Iron white flesh and skin.
 Indian Runner—Layer—Yellow flesh and skin.

Geese.

Roman—Layer—Creamy white flesh and skin.
Toulouse—Table—Yellow or orange flesh and skin.
Chinese—Table.

Turkeys—all for table.

Black—White flesh and skin.
White—Reddish white flesh and skin.
Cambridge Bronze—White flesh and skin.

Classification according to soils.

It is generally thought that :

Fowls with white flesh do best in light soils.
Fowls with grey and medium flesh do best in medium soils.
Fowls with yellow flesh and legs do best on heavy soils.

Speaking generally, the birds must be symmetrical and true to their breed with regard to colour, size and shape. They must not only be healthy but also show signs of vigour. Very often, the above breeds are crossed when catering for a particular purpose, such as utility. I have not given any descriptions of the breeds, for they can be had from any book on poultry.

HOUSING

Fixed house with runs and portable houses on wheels (see Sketch 1) are only meant for those, who wish to start poultrying on a large scale. For the Indian ryot, however, the usual method of putting the fowls under baskets for the night is the most economical, from the point of view of initial outlay and cleanliness. For those who wish to start on a large scale, it must be remembered that success can only depend on hard work. These houses should be cleaned every day, fresh litter put in, disinfectants or lime wash applied. The runs must also be limed often, changed as far as possible. There must be sufficient shelter from the heat and rain, and water-supply in the form of fountain is indispensable.

Trap nests. (See Sketch 2). *Details of trap nest.*

An ordinary dealwood box 2' x 1' x 1' will suffice for the nests.

The entrance is made of three pieces joined together ; the top piece is loosely tied with two strings and the others with leather pieces.

In sketch 'A' is the natural position of three pieces folded and kept at the top—piece 2 is folded to 1 and 3 to 2.

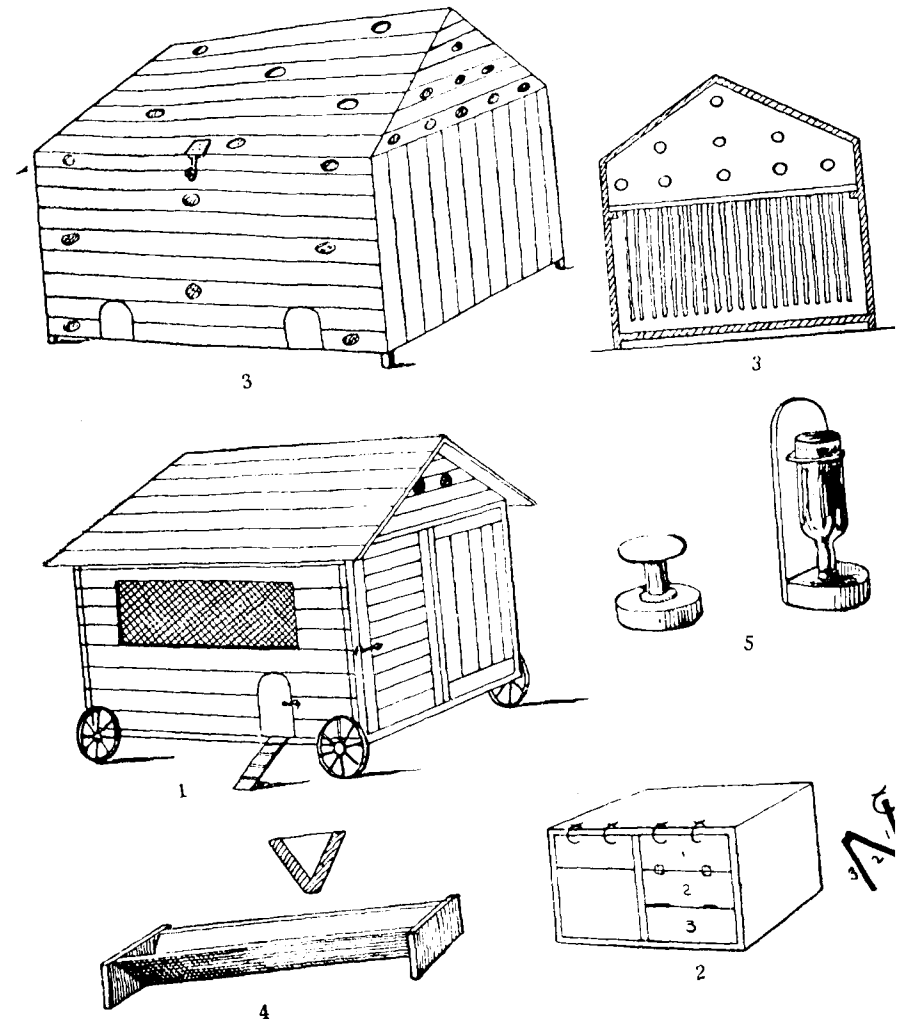
'B' is the position when the joined pieces fall down after the entrance of the hen.

The height may be adjusted by tying the top piece loose or tight.

In order to be really successful at poultrying, trap nesting and keeping of egg-laying records are absolutely important. Trap nests can be easily made from square boxes 18" x 18" x 18". The door, which is in three parts, is held from the top of the entrance by strings, which can be adjusted as required. The three parts are attached to each other by leather strap and folded inwards.

The nest in the box should be clean and comfortable and sometimes a dummy egg may be placed in each box. In order to find out which of the

POULTRY AS A SIDE LINE



1. Portable Poultry House.
2. Trapnest and side view.
3. Foster mother (with flannel strips) and cross section.
4. Feeding Trough.
5. Fountains.

hens are laying, they are ringed either on the legs or wings, with numbered rings. The box is kept as in diagram A and as soon as the hen enters, the door gradually works inwards, due to slight push and gravitation. The thickness of the door should not be more than $\frac{3}{4}$ "

INCUBATION

(a) Natural method.

Select a broody hen of the proper type—good size and docile. Experience shows that hens with short legs are efficient for the purpose. The nest should be about 15 inches across, made in the earth as a mould, and nicely covered with hay. The number of eggs to be placed would naturally vary with the size of the hen. Usually seven to fifteen, may be placed in the nest depending on the size of the hen. The brooder should be fed with maize and wheat or paddy and cholam, or paddy and ragi (add lub.), grit, and water by placing the food at the door of the nest. Each day, it would be best to remove the hen gently by placing the thumb on the wings and fingers under the thigh and lifting her off without disturbing the eggs. After five minutes, the hen should be allowed to the nest. In cold climates, while the hen is away, the nest should be shut to keep in the warmth. The hen should be disinfected so as to keep away lice etc.

(b) Artificial method.

By artificial method, hatching is done by placing a number of eggs in an apparatus, the temperature of which can be regulated. This machine must be in a room where the temperature does not change frequently. A great advantage in this method is, that a large number of eggs, depending on the size of the incubator, may be hatched. The temperature should be 103° F. before the eggs are placed in the drawers, and the egg should be turned twice daily, aired for five minutes the first week, 10 minutes the second week and 15 minutes during the last week. In order to avoid overheating, the eggs should be sprinkled with water each day and make sure that the receptacle for water within the incubator is not empty. In some parts of the country it will be necessary to keep buckets of water in the incubator room so that the atmosphere does not become too dry. It would be best to keep one of the buckets under the incubator. In the plains eggs may be hatched artificially generally between June and February.

TESTING EGGS

The egg should be neither too small nor abnormally large. Stale eggs and delicate eggs that are from highly inbred stock can generally be hatched by the natural method. The egg should be of good size, clean without nodules on the shell. The shell should not be too thin under natural method, because the hen is likely to break the egg. The egg may be placed before a paraffin lamp in a dark room and the air space clearness, network of veins, bloody patches, and abortion noted. Air space depends on fertility and the age of the egg. By 18 days the air space increases to about $\frac{1}{4}$ " depth of the egg. The spiderlike line indicates fertility while the other types are not fertile. In Europe, when testing on a large scale, electric lights are used, and many hundreds of eggs are tested in an hour. Under artificial method, it would be best to test eggs every other day and remove the infertile ones.

CHICKEN REARING

Chicken rearing is the most difficult part of poultrying and yet, if proper care is taken, there should be no loss. Chicks generally die of cold, chicken-pox or bad feeding. It is, therefore, imperative that personal attention is paid more than ever while rearing chicks. They ought to be kept warm and clean, and given sufficient food and exercise. When artificial incubation is adopted, a foster mother is essential, and care must be taken with regard to the temperature when using a lamp for heating, but in the plains heater is not necessary and partition with flannels may be substituted. (See Sketch III).

By natural method, attention must be given to housing and feeding. Dust bath, charcoal and grit are indispensable in poultry management. Green foods such as dandelion, alfalfa (lucerne), cabbage, onions, green oats, lettuce and greens of various sorts available in India may be given in every stage in poultry feeding, for they supply the required salts and vitamins.

FEEDING TABLE

First Week.

After hatching no food may be given from 36 to 48 hours and very little for the first week, because the yolk is not completely absorbed in the abdomen and causes digestive troubles. For the first week, a little skimmed milk to drink and dry feed (dry oatmeal, equal parts of kibbled wheat and maize or broken rice) may be given every three hours in addition to good supply of water and grit.

At Hosur the following ration is adopted with success. Yolk of hard boiled egg chopped very finely along with the shell and toasted bread crumbs given about ten spoonful for every six chicks once in two hours. One loaf of bread would last six days for 12 birds. When there is no skimmed milk pure water may be given. Charcoal powder and shell grit may also be placed in the scratching pen, and the floor covered with chopped straw.

Second and Third Weeks.

(Scalded biscuits-meal mixed with Sussex ground oats for the first meal and midday) and dry food (same as first week) be second and last meal. The following rations may also be given :—

- | | | |
|------------------------------------|---|---|
| i. 4 parts middlings or ragi flour | } or { | ½ part fish meal
½ „ crushed oyster shell. |
| 2 „ maize | | |
| 1 „ pea or gramseed | | |
| ii. 3 parts canary seed | iii. Broken rice and wheat alternately with egg and oatmeal as above. | |
| 2 „ millet seeds | | |
| 1 „ emp seeds | | |
| 2 „ groats | | |
| 1 „ crushed peas | | |
| iv. 4 parts finely broken rice. | | |
| 1 Do. cholam | | |
| 1 Do. ragi flour | | |
| 1 Do. shell grit. | | |

Note.—Pure food and water in all cases. Wherever skimmed milk is available it can be used in lieu of water.

4th to 10th Week.

Some crushed oyster shell separately.

Sussex ground oats with a little skimmed milk may be given (twice) and grain (twice).

or

Mash : 3 parts rice bran
2 „ wheat bran
1 part ragi flour
1 „ fish meal
½ „ lime and bonemeal
½ „ chipped alfalfa hay or lucerne.

Grains : 1 part cholam } or { 1 part cumbu
2 parts paddy } 1 „ ragi
3 „ broken rice } 2 parts paddy
2 „ broken rice.

Mash may be divided into two portions and given twice a day. On cold days it is better to give the mash a little warm.

After 10 weeks.

Cockerels should be separated from the pullets on about the 12th week. When there is room for foraging two feeds may be given. Usually where cockerels are not required for breeding they are fattened off. As no water is given and they are kept in small runs they ought to be given moist food :

1 to 2 oz. grains } according to the size of bird.
1 to 2 oz. paste }

The following is quite a good morning food for layers :—

- 4 parts scalded bran.
2 „ well worked maize-meal.
2 „ pea meal.
1 part sharps.
1 „ cooked lean meat.
2 parts chopped and scalded alfalfa or lucerne.

Grains as above ; shell grit and water with a little potassium iodide as disinfectant ; 2 to 3 oz. grain every morning and 2 to 3 oz. green feed midday, and 2 to 3 oz. mash in the afternoon.

For fattening, first quality Sussex ground oats mixed with skimmed milk is given twice a day. Fattening period lasts for a fortnight.

BREEDING

Healthy and hardy birds should be chosen. Strong chickens are produced from hens in their second year. Generally cockerels are mated to hens in their second year for a high percentage of fertile eggs. When very early chickens are required, pullets are mated to a vigorous two-year old cock. In the early part, six hens may be allowed to one male but the number may be increased to 10.

DISEASES

If any bird shows signs of illness, it must at once be removed from the healthy stock. The following are the commonest, their symptoms and control:

DISEASE	SYMPTOMS	CONTROL
Catarrah	Sneezing and thin watery discharge from the nostrils	Dry quarter food, soft and nourishing with a little ginger powder. Copper sulphate in drinking water poured in an earthen vessel.
Roup	Discharge thicker with offensive odour, loss of appetite	Same as above and mouth may be washed with permanganate of potash.
Crop bound	Caused by careless feeding	Pour a little water down the throat and gently work the crop with hands.
Gapes	Parasite worm in wind pipe. Repeated gaping, shaking wings, running backwards and droops the wings	Remove chicks to fresh ground and good dressing of lime. With a small feather dipped in turpentine or eucalyptus oil pass down the wind pipe. Dead chicks should be burnt.
Scaly leg	Rough scales on shanks	Wash legs with warm water and soap and dress with paraffin. Disinfect the perches. Avoid fattening.
Eggs bound	Prolonged visit to the nest without laying eggs	Avoid fattening food, hold the hen with vent over vessel containing boiling water and pour a little oil into the vent. The bird should then be left in a quiet place for a few hours. Give little Epsom salt in drinking water.
Red mites	Egg yield diminishes and birds are not quite thrifty	Disinfect all birds, limewash houses, and clean perches with paraffin every day.
Liver disease	Emaciated comb, shrivels, excreta is light yellow	Change quarters, disinfect; bad cases should be killed and burnt, give doses of Epsom salt and feed sparingly. Administer liver falls.
Avian Tuberculosis	Do.	Same as above: consult Veterinary department.
Powl cholera (enteritis)	Exceedingly thirsty, excreta green at first, then thin white and adhere to feathers. Die suddenly...	Isolation of infected birds, change quarters, disinfect. Burn excreta and cover the run with lime.
Chicken-pox	Discharge from nose and eyes, dulness, off-feed, black protuberances on the nose, eyebrows, angles of wings, joints of legs, etc.	Segregation, wipe eyes and nostrils with boric lotion, paint with tincture of iodine and give low nutritious diet.
Pseudo Pest	White diarrhoea, paralysed condition of limbs and wings, open mouth and difficulty in swallowing	Dead birds should be burnt; vaccine injection. Consult Veterinary department.

MARKETING

This side of the industry is neglected by many and the cause of failure is due to bad marketing. The egg should be graded so as to have the best ones weighing about 2 oz. As soon as they are collected they must be cleaned with a wet rag, and smeared with good butter or soaked in silicate of soda (water glass) for about a day, when all the pores get closed. The eggs are placed on their broad end downward and stored in a cool room. Where there is a Co-operative society, these may be collected and marked by the Society before packing off to a market like Madras or Bangalore. If the Industry is increased, they may even be sent to foreign countries.

Birds that are meant for table should be killed by dislocating the neck and feathers plucked when still warm. At present there are machines for carrying out this operation. Soon after plucking, they are placed on a board with breast downwards, a weight placed on their backs and left till cold. The latter process greatly improves the appearance as they look plumper. When there is market which appreciates, the birds may be dressed and trussed. By this, birds are carefully signed and cleaned without in any way blemishing the skin; expose the neck by making incisions, removal of the vent and internal organs, and stitching up of the birds with string, giving them a compact appearance. They are now ready for wrapping and shipping.

POULTRY PRODUCTS AS FOODS

It has already been stated at the outset that the egg has been recognised as a wholesome food. The feeding values of the poultry and products are hereunder given so as to compare with milk and rice, the most well-known human foods. The values have been taken from Hock.

		Water	Protein (N x 6.25)	Fat	Ash	—	Calories Per lb.
Chicks.	Broiler	74.8	21.5	2.5	1.1	...	492
	Fowl	63.7	19.3	16.3	1.0	...	1,016
Eggs.	White	86.2	12.3	0.2	0.6	...	231
	Yolk	49.5	15.7	33.3	1.1	...	1,643
	Entire edible portion.	73.7	13.4	10.5	1.0	...	672
Milk		87.0	3.3	4.0	0.7	5.0	314
Rice (Boiled)		72.5	2.8	0.1	0.2	24.4	498

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- (1) Ainsworth and Davis ... *Fream's Elements of Agriculture.*
- (2) Brown ... *Poultry Keepers' Text Book.*
- (3) Hock (1927) ... *Practical Physiological Chemistry.*

A NOTE ON E. C. 47 RAGI

By N. NARAYANAN

(Assistant Farm Manager, Central Farm, Coimbatore).

This short note gives particulars of the performance of a variety of Ragi known as E.C. 47, evolved by the Millets Specialist and tried on the Central Farm during the two seasons 1929-30 and 1930-31. Raised on 2.3 million acres out of a total 34.38 million acres under cultivation in the Presidency, Ragi is next to Cholan, the chief millet crop and its importance to the ryot is considerable. Any method adopted to improve the quantity or the quality of the grain is a step taken in the right direction.

In 1930-31, this variety was cultivated over a fairly large area on the Central Farm. The seed was sown on well prepared nurseries by the 2nd and 3rd weeks of May 1930 at the rate of 1 lb. per cent of nursery area.

The seedlings were ready for planting by the 1st week of June and they had made a very good growth by then. The fields were brought into a state of fine tilth by summer ploughings and well manured with farm-yard manure and well-rotten estate sweepings at 10 tons and 15 tons per acre respectively.

The seedlings were 20 to 25 days old, when they were removed and planted in the prepared fields. The usual attention was given. The seedlings established themselves very well within 10 days after planting.

Due to the failure of the South-West monsoon this year, the crop had to be maintained by being irrigated once in 7 days. June received about 1.16 inches of rain, July was disappointing with only .44 inches, August fared much worse with only .05 inches; September witnessed a fall of 1.66 inches which was not of much use as 0.91 inches fell on the 19th when most of the Ragi crop had almost become ready for harvest; so during the growing period of the crop only 1.65 inches fell and this alone could be utilized by the growing crop. Hence the mhothe and engines were kept constantly going during the trying period to keep the crop up. The continued dry weather began to tell upon the crop to a certain extent. Weeds were removed often as they appeared and a hoeing was given when the crop was about 30 to 40 days old. The plants began to tiller about 30 to 40 days after planting. Tillering was profuse, the number of tillers ranging from 20 to 25. The crop flowered when the plants were 70 to 75 days old. The flowering was uniform producing 6 to 7 spikes per head. The spikes were also considerably longer than the local ragi spikes. Maturity of ear-heads was more even. Even with adverse weather conditions the variety pulled up and with the liberal dosage of manure given, easily yielded over 3,500 lbs. grain in a few cases and about 2,500 lb. in others.

From these details one can easily find that while the average yield of Ragi on the Central Farm from an area of 20 to 30 acres is ranging from 1,400 to 1,900 lb. per acre, this year E. C. 47 has easily given more than 2,700 lb. an acre on a total area of 24 acres.

YIELD OF E. C. 47 RAGI IN 1930-CENTRAL FARM, COIMBATORE

Field No.	Area in Acres	Manure per acre	Planted on	Cut on	Yield per acre		Previous crop
					Grain in lbs	Straw in lbs	
15a	2.66	10 tons Farm yard manure	9-6-30	24-9-30	3,492	11,756	Fodder, Maize and Sunhemp.
40	2.50	15 tons well-rotten Estate sweepings	11-6-30	23-9-30	3,368	11,248	Fodder Cholan.
43a	2.00	12 tons well-rotten Estate sweepings	12-6-30	22-9-30	3,253	12,091	Fodder Maize.
54	5.00	15 tons well-rotten Estate sweepings	13-6-30	25-9-30	2,951	9,468	Pusa Wheat.
65	1.00	15 tons well-rotten Estate sweepings	10-7-30	26-10-30	2,741	9,155	Elephant Grass.
69	3.50	10 tons Farm yard manure	14-6-30	27-9-30	2,425	11,859	Cambodia Cotton.
74	2.95	7 tons Farm yard manure	12-6-30	28-9-30	2,370	5,949	Local Wheat.
45	3.25	...	22-6-30	29-9-30	1,816	9,090	Cambodia Cotton.
Insectary	0.25	...	2-7-30	10-9-30	1,728	3,840	Fallow.
P. M. Old	0.43	...	21-6-30	8-10-30	819	3,293	Cambodia Cotton.
	23.54			Average	2,713	9,821	

THE PROMOTION OF POULTRY KEEPING IN VARIOUS COUNTRIES¹

The ever increasing importance of poultry-keeping as a branch of agriculture and as a source of national income has led the various Governments to foster the industry with all the means at their disposal. The poultry industry needs the interest of public institutions all the more that for the most part it is in the hands of the small farmer. Government support and direct official promotion—indirect assistance in the shape of protective tariffs, etc., will not be considered here—may take different forms.

Most of the States maintain poultry-keeping schools, which are often in close connection with research Institutions. Instructions and training are of great importance to the industry. Many States in recognition of this are not content with establishing training centres but employ also travelling instructors and advisory experts who visit the various farms. In the United States there is such a service which is giving excellent results. Other countries also which are interested in poultry are organizing similar services. As regards teaching in schools, it extends to all degrees of agricultural training; thus there are at the present time in nearly all countries poultry-keeping courses in all the primary agricultural schools and in the agricultural colleges. In this connection may be specially mentioned the propaganda carried out by the United Provinces Poultry Association in India and that of the Union of South Africa, which send on tour a train carrying a complete poultry farm for demonstration purposes.

Parallel to the teaching institutions are the Research institutes and Specialist firms which aid in the promotion of poultry-keeping. They carry out experiments (of recent years the special studies have been in connection with problems of heredity, nutrition and incubation) obtaining results from which the breeders profit; they produce good breeding stock which is made available without charge or at reduced prices to poultry keepers. There are such Institutes in Northern Ireland, the Irish Free State (which distributes valuable eggs from certain of its stations), Hungary, New South Wales, etc. etc. Other countries offer awards for good results in poultry-keeping or maintain specialized establishments with grants.

Shows have always been an effective means of propaganda for stock raising in general and they are also of great use in the poultry industry. They have been of such importance that poultry have sometimes been bred solely for show purposes, aiming at satisfying the standard requirements without any regard for practical considerations. But, fortunately, of recent years this state of things has been changing and now in many countries laying trials take the place of shows.

The organization of poultry breeders' and keepers' associations and co-operative marketing societies also aids the progress of the industry.

¹ Reproduced from the *International Review of Agriculture*, xxi, No. 8, part i, August 1930.

The following notes will give some idea of the activities in each country for promoting poultry-keeping.

Germany.—The poultry industry is encouraged by the formation of Institutes for research and instruction, by poultry-keeping courses in the agricultural colleges and schools, by employing advisory experts and by organizing specialist firms. There are several selection inspections during the year and poultry shows with as many as 12,000 exhibits. The poultry keepers' associations number a membership of about 250,000.

Austria.—The State gives official aid to the associations and grants for the organization of poultry farms and poulterers, the distribution of breeding stock and packing cases, veterinary work and training of experts. There are laying trials at Klosterneuburg, where courses of instruction are also given. Entries for the exhibitions have become less since poultry-keeping has become more practical in outlook. There are three Associations with 4,786 members, eight regional societies with a total membership of 886 and 116 provincial societies.

Spain.—The Spanish Government has for some years past shown an interest in the poultry industry. Subsidies are given to aid poultry-keeping instruction, grants for exhibitions purposes, and everything possible done to favour the industry.

Poultry-keeping instruction was introduced into Spain by Prof. Salvador CASTELLO, who formed a poultry-keeping school on his estate at Arenys de Mar, near Barcelona. After passing the examinations the students receive the title of 'Peritos Avicultores.'

Research work is carried out mainly at the Royal Poultry-Keeping School, which has a farm of 4,000 birds at the minimum, and is provided with the most up-to-date equipment. It uses Mammoth incubators holding 16,000 eggs and intensive brooders of the latest American model. In Madrid, attached to the Agricultural Research Institute, there is also a small Experiment Section run by Government Agronomists.

Many regions of Spain, such as Madrid, Catalonia, Valencia, the Balearic Isles, Cordoba and the North have poultry keepers' societies, but they are all affiliated to the General Association of Spanish Poultry Breeders.

France.—For over fifty years the Ministry of Agriculture has encouraged poultry-keeping by:—

(1) providing special classes for poultry in all the agricultural exhibitions with important awards;

(2) according grants to poultry-keepers' societies for their upkeep as well as for organizing shows and competitions;

(3) an annual grant to the Poultry-Keeping School at Gambais and more recently by:—

(a) organizing (since 1920) a National Egg Laying Competition for showing the results of selection of different breeds (National Egg Laying Trials at Versailles, directed by M. Ch. VOITELLIER, Professor at the Agricultural Research Institute);

(b) organizing Poultry Research Centres at the *Ferme des Ménils*, near Metz (Moselle) and at the *Ferme Extérieure*, at Grignon (Seine-et-Oise) (1928);

(c) organizing a Poultry Selection Station at Veulettes (Seine, Inférieure);

(d) extending the poultry husbandry instruction in the *Ecoles Normales d'Instituteurs*, and in the *Ecole Normale d'Enseignement ménagers* at Coëtlogon, near Rennes.

There are sixty regional or departmental societies with a total membership of about 25,000. The most important are the *Société Centrale d'Aviculture de France*, 34 rue de Lille, Paris, which has about 4,000 members, the *Société des Aviculteurs du Nord*, Lille, and the *Fédération d'Aviculture d'Alsace*.

Most of the poultry keepers' societies have an annual or biennial exhibition. The *Société Centrale d'Aviculture*, organizes shows in Paris in November of each year with an average of 3,000 exhibits, and in February an International Show, with from 9,000 to 12,000 exhibits representing about 800 or 900 exhibitors.

Great Britain and Northern Ireland.—There is the National Institute of Poultry Husbandry at Newport and poultry departments in the Small Animal Breeding Research Institute and Animal Nutrition Research Institute, Cambridge and at Wye Agricultural College, etc. There are poultry farms producing breeding stock scattered throughout the country and there are County Poultry Instructors (47 men and women). There are also courses in poultry-keeping at some of the Agricultural Colleges and Institutions, and numerous egg-laying trials and poultry shows.

Hungary.—The Royal Hungarian Government subsidizes poultry keepers by creating poultry breeding farms under State control. The selected birds are bought by the State and distributed to the peasants. The State maintains poultry research stations and schools at Gödöllő and Pápa and encourage poultry keepers' associations and exhibitions. Numerous lectures are organized every year for the rural population on poultry husbandry, artificial incubation, cross-breeding and feeding.

Poultry shows are held annually; an international show at Budapest and other local shows in different parts of the country. There are about 20 Poultry Keepers' Associations. The Central Association of Hungarian Poultry Keepers at Budapest has about 2,000 members. The other Societies are provincial or local.

Italy.—For the development of poultry-keeping an Experimental Station was opened in 1921 at Rovigo which carried out research on scientific and practical problems connected with poultry. On September 3, 1926, the formation of a Poultry Centre in each province was legalized; now there are 40 provincial poultry farms, half of which are in full operation for the distribution of eggs, chicks and fully-grown birds, particularly White Leghorn cocks, to farmers.

National and local exhibitions are held each year at Milan, Verona, Padua and Bologna in connection with the large fairs. The National Farmers' Confederation has formed a Poultry Section which has special

branches for each province and a central office and provincial branches for propaganda work and the organization of poultry-keeping.

Irish Free State.—Courses in poultry husbandry are given in 9 schools of domestic economy and in the Agricultural Colleges. There are 43 Trapping Stations, which distribute first-class eggs for hatching. The breeding of the American Bronze turkey is also encouraged.

The most important exhibition is the Royal Dublin Society Show, Ballesbridge, Dublin. The largest societies are the Irish Poultry Keepers' Co-operative Association, Ltd. and the Cork and Kerry Poultry Keepers' Association.

The Netherlands.—Poultry-keeping is assisted by the official Experimental Institute and extensive instruction is given by authorized Experts. There are several associations. The chief is the 'Aviculture,' with 4,000 members. The largest union of poultry breeders' associations is the 'Nederlandsche Pluimvee Federatie,' which has a membership of 100,000.

Poland.—There is effective propaganda for poultry-keeping; there are a special school at Julin, courses in poultry husbandry and experts for giving instruction to the rural population. Poland possesses research stations in Julin, Remokow, Posnano, Swisdo, Jaroslaw and other towns, which also organize laying competitions. The number of shows varies. All the associations are united into a single one called the Central Committee of Poultry Husbandry, which has about 20,000 members.

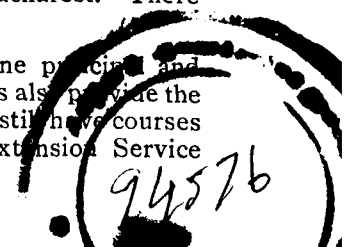
Czechoslovakia.—Poultry-keeping is helped financially by the State and by the provinces. The former maintains some small poultry farms, mostly for demonstration purposes in connection with the poultry husbandry schools; it gives grants also for the purchase of purebred breeding stock and eggs for hatching, and for the organization of shows and organizes courses of instruction in practical poultry-keeping. In accordance with the regulations an annual inspection of the products is held.

There are exhibitions of the societies and associations of greater or less importance. There are a large number of societies (about 335) which are for the most part composed of small poultry farmers; these societies are combined into associations of which the five most important have a total membership of about 10,660.

Roumania.—The State measures are mainly for the organization of poultry shows which are arranged by the Chambers of Agriculture. There are no special lecturers in poultry husbandry but the agricultural experts give advice also about poultry matters. The State has given various grants to poultry societies for the purchase of foreign breeding stock.

Poultry shows are generally organized each autumn in the towns where there are poultry breeders' associations. The number of exhibitors varies according to the size of the town where the show is held; there are 20 to 30 exhibitors in the small towns, as many as 50 or 60 in Bucharest. There are 14 poultry breeders' associations with 640 members.

United States.—The Department of Agriculture has one principal and two secondary Research Stations. The Research Institutes also provide the 48 States and Hawaii with many birds. Most of the States still have courses in poultry husbandry in the colleges. The Agricultural Extension Service



in 1928 engaged 3,682 local officials who are obliged to give 80 per cent of their time to poultry work. There are about 75 poultry experts who give all their time to poultry. Various scientific societies are concerned with poultry and there are also private commercial poultry breeders' societies the scientific staff of which carry out work in connection with poultry husbandry. The Poultry Research Society has established Agronomical Colleges for studying special problems. There is a special Agricultural Service entirely occupied with the instruction of the rural population. The societies of breeders, poultry keepers and incubators have a large expert personnel. The poultry experts give instruction in the most outlying districts; some are connected with the Sub-Committees of Agriculture.

There are 30 egg-laying and incubation stations which, although they are not bound by special regulations, are officially controlled. These Stations record the total egg production and the quantity of food required; some also keep records of the weight and production of each bird. Poultry shows are not now as popular as they were ten years ago, but there are exhibitions showing, from 2,000 to 5,000 birds as well as State and departmental shows.

There are 14 National Poultry Breeders' Societies, and many local societies the exact membership of which is not known but must be well over 20,000.

Union of South Africa.—Several Sections of the Agricultural Department are specially concerned with problems of veterinary science, nutrition and incubation. There is a well-organized system of instruction on poultry management throughout the country. There are 5 Colleges, but farmers are also visited by poultry experts who give advice on the choice of breeds, breeding stock, etc. The Department also maintains a demonstration train, testing stations, etc. and protects the export trade. The good effect of these arrangements is seen in the extension of overseas trade, which last year increased by 20 per cent.

Annual exhibitions are held in which about 2,000 people take part. There are also periodic laying trials with about 1,000 entries.

The South African Poultry Association has over 82 branches and 6 Co-operative 'egg circles.'

New South Wales.—The Government poultry expert and his assistant give instruction and advice to breeders. There are 4 research stations serving also for demonstration purposes; laying trials are organized at the Hawkesbury Agricultural College on the 'single pen system.' Good breeding birds are distributed to poultry farmers to improve their stock. Since the nomination of the Poultry Expert in 1913 poultry-keeping has developed from a secondary occupation to a very profitable industry.

The most important association is the Poultry Farmers' Union, with 1,000 members; there are also smaller ones, such as the Poultry Club of New South Wales, etc. The largest of the numerous exhibitions is the Royal Agricultural Society's Show which has about 750 exhibitors showing about 3,000 birds.

New Zealand.—Good breeding stock is distributed at moderate prices from the Government Experimental Station. There are 4 poultry Experts who give advice. The industry is also helped by special periodicals which are State aided.

Three laying trials are held in the Dominion and numerous shows in different parts of the country, exhibiting from 300 to 1,500 birds.

British India.—The Central Government takes no measures for the development of the poultry industry, but leaves them to the Provincial Governments. But the Government of the United Provinces of Agra and Oudh is the only one concerned with poultry interests; it gives financial assistance to the industry amounting to 2,000 pounds sterling annually. The United Provinces Poultry Association, which is the most important, gives lectures in rural districts and has a demonstration train. Missionaries often go in for poultry-keeping. The U.P.P.A. has held laying trials for 5 or 6 years but there are only about 50 competitors and there is little interest in them. The All-India Poultry Show has about 400 exhibitors; there are also smaller shows, specially in the United Provinces, at which there are now several thousand native exhibitors.

Notes and Comments

The Y.M.C.A. Summer School of Rural Service.—We are in receipt of a copy of the prospectus of the 7th Summer School of Rural Service organized and managed by the Y.M.C.A. The School meets at the Rural Reconstruction centre at Ramanathapuram from 1st May to 6th June, and theoretical and practical training is given during this period in principles of rural work, adult education, rural health and sanitation, elementary agriculture, bee-farming, poultry-rearing, etc. We are sorry we did not receive the prospectus sufficiently early to have it published in the April issue, and thus enable such readers as were willing, to take advantage of the Course. During the past 6 years of its existence, the School has been doing excellent work and we wish it all success.

Cheerio: Final Years!—The results of the B.Sc. degree examinations in Agriculture are just out and we are very sorry to note that there is nearly 50 per cent of failures this year. To those who have come out successful we offer our congratulations. To the others we wish better luck next time and invite their attention to the fact that examinations are not everything in life and that many a lad who found the examination a stumbling block, has been quite a success in life. We appeal to all these young men, whatever walk of life they choose in future, to cherish a love for the *Alma mater*, to take a fostering interest in our Union, and work for increasing its sphere of usefulness.

The Retiring Director.—Mr. G. R. Hilson, our Director, goes on leave preparatory to retirement from the 13th of May. During his two years of tenure as Director of Agriculture, Mr. Hilson evinced great interest in our Union and in the Journal, and it is no exaggeration to say that it was mainly his efforts that whipped our Departmental officers and others to contribute to the Journal and help the Union in several other ways. It was due to him, that the Union revived after a period of inertia, and it is due to

him again and to his encouragement, that we are flourishing now and look forward with hope towards the future. A man of great common sense, with a keen eye for details, coupled with the real scientific spirit and outlook, Mr. Hilson earned the respect and regard of all his subordinates, and many will miss his towering personality, amongst those who strive to improve the poor ryot's lot. We wish him and Mrs. Hilson all happiness and trust he will continue to have a warm corner in his heart for the College and the Research Institute, for the Madras Agricultural Students' Union and for our Journal.

Gleanings

Interrelations of climate in India and Canada.—Why unusually dry summers in India mean mild winters for Canada six months later and wet summers in India foretell hard, cold winters in Canada, is a mystery calculated to tax the ingenuity of United States Weather experts to explain data recently from Fred. Groissmayr of Passau, Germany, and Dr. C. F. Brooks, of Clark University.

Examining weather reports for a period of forty-four years, Mr. Groissmayr found a remarkable correlation between climates separated by oceans of distance and months of time. Throughout all the period studied when India was unusually wet or dry, winters in Saskatchewan and Alberta have been below or above normal in temperature with but four exceptions.

Measuring the other factors of the Indian climate which might be significant in determining the Canadian winter, Mr. Groissmayr also charted the temperature in various portions of India. Unusually cool autumns in N.-W. India were always followed by a severe winter at Winnipeg.

Such decided relations led to further study of tropical factors influencing Winnipeg's winters and indicated that not only India's monsoons, but also the flood of the Nile in Egypt, have a measurable effect on distant Canada, while high pressure over India, Egypt and Batavia was later reflected by correspondingly high temperature in Canada. Thus the highest India pressure of 1877 was followed by the mildest winter at Winnipeg. And throughout the period studied, temperature maximum in India was associated with highest temperatures over an immense part of Canada and of the United States as well.

Dr. C. F. Brooks of Clark University, recommended the findings of Mr. Groissmayr to the attention of Canadian and United States Weather Bureau meteorologists. He said, 'The extraordinary high correlation found by Mr. Groissmayr between pressures, temperatures and rainfall of certain tropical regions and the later winter temperatures in the interior of Canada challenges North American meteorologists, (1) to test Mr. Groissmayr's claims by applying his formulas to the years after the period he used in making them, (2) to study the physical basis for such a correlation and (3) to explore other possibilities not only for predicting winter mean temperatures but also for other seasons and for all parts of the Continent.'

In *The Monthly Weather Review* of November, 1929, Dr. Brooks predicted on the basis of the Indian summer, that the average temperature

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in Winnipeg from December, 1929, to February, 1930, would be slightly above normal. Reports subsequently obtained from the Canadian Meteorological Service proved this forecast, based on Groissmayr's formula, to be correct.

The forecast of a Canadian Winter is the sixth which Dr. Brooks has made on the basis of the previous summer in India. Of these six, two were nearly perfect, two reasonably successful, one good, and one poor.

One of Dr. Brook's students is now engaged in formulating a forecast of the weather in store for Winnipeg during the winter of 1930-31.—(*Science*, Vol. LXXII, No. 1875).

The Functions of the Human Skin.—Human skin is more than a mechanical protection against infectious diseases. It is an efficient external organ for killing pathogenic micro-organisms, or disease germs. Drs. Harry A. Singer and Lloyd L. Arnold, of the Research Laboratory, State Department of Health, Chicago, applied broth cultures of disease-producing bacteria to skin surfaces. They found that within ten minutes from 90 to 95 per cent of all the bacteria were killed. The germs of typhoid fever were among the bacteria most readily killed by human skin. These results, however, were obtained only with clean skin. On dirty or greasy skins the same bacteria survived for many hours. The finger-nail region was deficient in bacteria-killing power.—(*Science*, Vol. LXXIII, No. 1881).

The Indian Veterinary Journal

(The Official Organ of the All-India Veterinary Association)

This journal is the only English Veterinary Journal of its kind in India devoted to the cause of Veterinary Practice, containing standard articles on all branches of clinical veterinary medicine, surgery and kindred subjects. It also contains a review of current Veterinary Literature, and is valuable alike to veterinarians and agriculturists.

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26, Wallajah Road, Mount Road P.O., MADRAS.

Correspondence—Queries and Answers

I

Prickly-Pear Coccineal

To

The Editor, The Madras Agricultural Journal,

Dear Sir,

Reference to pages 61-62 of the Villagers' calendar 1931 (English Edition) gives information regarding the above insects. These insects are being introduced in my division (North Arcot and Chittoor). I have addressed the District Board Presidents and the Collectors to fully co-operate with me in destroying prickly-pear by the introduction of these insects. As it is, prickly-pear is found to infest tank bunds, village roads and other places. The non-removal of this pear from tank bunds and village roads gives room for the enforcement of Kudimaramath Act and the consequent unpleasantness. I have been introducing these insects for the last 3 months. But there are enquiries from interested parties regarding the possible danger of these insects to cultivated plants. To set at rest the above fears, the following information is culled from an article in the *Tropical Agriculturist* for August 1930 by F. P. Jepson, M.A., Assistant Entomologist, Department of Agriculture, Ceylon, on the above subject :—

'Mr. Lester-Smith also learnt that there is now some reluctance, on the part of cultivators, in this quarter of the island to encourage the further distribution of the parasite on account of the fear that it might turn its attention to cultivated plants. As he pointed out, there is no foundation for this fear which appears to have arisen owing to the superficial resemblance of this insect to some of the injurious mealy-bugs, and it should be the duty of the agricultural officers in this division to relieve the minds of the cultivators on this point. *D. tomentosus* was not introduced into Ceylon before the most careful inquiries had been made regarding its habits and behaviour and there is no danger of this beneficial introduction becoming a pest of cultivated plants. It is most important that this fact should be realized in this locality, otherwise there is a grave danger of this successful campaign against *Opuntia dillenii* receiving a severe set-back.

'About the same time a similar application was received from the Manager of the Madura Co., Ltd., Tuticorin, South India, and consignments were despatched to him in December, 1926, January, 1927, and a third in the following month, all of which yielded living material from which a very successful undertaking has developed. Recent information has been received which indicates that the progeny of the original cultures obtained from Peradeniya have now been established over an area of 40,000 square miles, that very large tracts of land in the southern portion of the Madras Presidency have been cleared of pear through the agency of this insect, and that the land so liberated was now under cultivation for the first time for many years. In the opinion of one landowner, an area of country valued at

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one lakh of rupees, had been set free for cultivation in the Tuticorin district alone. Further, it was estimated that by the year 1940 an area of 1,14,000 square miles of country, now occupied by pear, would be liberated for cultivation by the agency of this introduced insect.

'If there is any prospect of this prediction materializing, this exploit promises to become a classic example of the control of weeds by biological methods.

'A recent official report states that this insect has become firmly established in Madras but some doubt is expressed as to the desirability of further assisting its dissemination in view of the value of the plant as a live hedge and for manurial purposes.'

Yours etc.,
R. SWAMI RAO.

II

Pine-Apple

To

The Editor, The Madras Agricultural Journal.

DEAR SIR,

May I request you to kindly have an addendum issued in the next issue of the Journal to my article on *Pine-apple Cultivation* (February 1931) in which hint No. 3 under para. 3 was left over. It should be as follows:—

'3. Dig trenches 12 to 15" wide and 9 to 12" deep, 8' from centre to centre and throw the earth removed on the spaces between, thus raising their level.'

VIZAGAPATAM,
April 5, 1931.

Yours faithfully,
G. JOGI RAJU.

III

Sugarcane Crushing

Query by Mr. A. R. Nagappa Gounder in the February issue of the Madras Agricultural Journal.

'We find it difficult to spare our bullocks for cane-crushing continuously for more than a month.' 'How far is it economical to maintain power crushers when there are 70 acres of land under cane?'

Answer

The Madras Industrial Department has carried out a number of trials with power crushers for manufacture of jaggery. The results are found in the various reports issued by the Department. But a definite pronouncement does not seem to have been authoritatively made, as regards the suitability and profitableness of the installation of power crushers under varying conditions of cane cultivation of this Presidency.

It must however be said that in these days of mechanical advancement, power crushers ought to be found useful for dealing with fairly large areas ranging from, say, 100 to 200 acres.

In the Bombay Department of Agriculture, trials have been made on a fairly large scale, and at present a number of power-crushing plants are working in the Bombay Deccan, especially in the new canal areas where sugar-cane is grown extensively. A Bulletin published by the Bombay Department in 1927, records over 44 power-crushing plants working in these areas. This number should have certainly increased by now.

The Chattanooga Company of America has introduced a number of mills of different sizes both for bullock and mechanical power. Their mill, known as Chattanooga No. 92, is popular with the Bombay sugar-cane growers. It has three rollers of cast iron with annular grooves, two of 12" x 12" and one of 8" x 12". Of course, the rollers work horizontally. The power is supplied by an oil-engine of 18 B.H.P. The output per hour is 1½ tons of cane. Extraction is very nearly 70%. This plant is capable of dealing with 40 to 85 acres of canes of different types in a working season of about 4 months.

Two sets of multiple furnaces, each set consisting of 3 broad rectangular pans arranged in ascending series are required for boiling down the juice.

Capital expenses for the whole equipment will come up to Rs. 9,000. The Bombay figure puts it down as Rs. 8,200.

There are other mills like the Manlove mill and Ruston Proctor. These are fairly heavy types of machines and deal with acreage from 80 to 110 in about 100 days. Capital expenses will come up to Rs. 14,000. Three multiple furnaces are required to deal with the juice.

For an acreage of 70 which the author of the question wants to deal with, Chattanooga No. 92 will be a suitable type. This is a light type of machine and can be easily and profitably managed.

70 acres of cane at an estimated average yield of 25 tons per acre. will give 1,750 or, say, 1,800 tons. At 1½ tons per hour, 15 tons could be crushed by the mill in a day of 10 hours. So the whole quantity of cane can be milled and made into jaggery in 120 days. Allowing for stoppages and off-days, a working period of 140 days would be required. A statement extracted from the Bombay Bulletin No. 139 of 1927 showing capacity and efficiency of this mill, is furnished.

Name of mill 1	Diameter and length of roller 2	Capacity per hour 3	Extraction 4	Power required to run the mill 5
Chattanooga No. 92	12" × 12" 12" × 8"	3,600 lb. or 1½ tons	68 to 71	18 B.H.P.

Total daily labour require- ments for crushing and making gul. 6	Furnace required 7	No. of pans per day 8	Average area handled in 100 days 9	Remarks 10
Men 54 Women 13 Bullocks 6	Multiple fur- nace 2	20 to 32	40 to 85 acres	100 to 120 days season

In column 9, a varying area is given; it is because canes of several types differing in size, hardness, ripening, etc., will have to be dealt with. A fairly soft cane of the *Poovan* type from 70 acres can easily be crushed in about 4 months (120 days).

If the engine is of a portable type, it could be used in other seasons for lifting water from wells, or the engine may be so fixed up that it may serve several purposes such as crushing canes, irrigating crops, hulling rice, or decorticating ground-nut.

FARMING CALENDAR FOR THE COIMBATORE DISTRICT

June

The month of June ushers in the South-West monsoon. What is known in Malabar as '*Idavapathy*' rains (rains of the 2nd half of Rishaba Vaikasi), indicates the commencement of the monsoon in the first week of June.

The intense heat of April and May suddenly becomes assuaged and moisture-laden winds from the South-West blow steadily.

Mrigasirapravesa, i.e., the Sun's entry into the Lunar mansion *mrigasira* which is about the 6th or 7th of June, coincides with this period, and in the Telugu districts of the Circars, farmers hail with joy the advent of this annually-recurring astronomical event, as it is always associated with the bursting in of the monsoon and the sudden cooling down of the atmosphere.

The rainfall for the month is about an inch and a half and ordinarily characterized by drizzles and light showers. Towards the last week of the month, the monsoon current becomes stronger on account of the heavy rains in the West Coast, known as *Tiruvadirai* rains.

It may be of interest here to point out that these terms of *Mrigasirapravesa*, *Tiruvadirai* rains and such other current popular sayings are highly suggestive of the importance of these periods to the farmer.

The year is divided into 27 Solar periods each denoting the apparent motion of the Sun along the 27 mansions of the Zodiac beginning from the first point of the *Arics*. These 27 periods are popularly named after the chief constellations occupying the particular mansions beginning with the star *Aswathi*. Of these, 13 periods beginning from *Mrigasira* (7th June) and ending with *Anuradha* (about the 30th of November) are the most important agricultural periods. The various agricultural operations from sowing to harvest, are closely associated with definite weather conditions and rainfall of these different periods known as *Karthis* in Telugu. And several sayings and proverbs have naturally originated, linked with farming experiences of ages under these various weather conditions.

Sowings of redgram, gingelly and cumbu left over in May are continued in dry areas. In the light-soil tracts of parts of Coimbatore, a white cholam variety known as *Thalaivirichan* which takes 6 months to mature, is sown in the second fortnight, the monsoon drizzles sufficiently saturating these soils. Castor is also sown at about this time.

In gardens, transplantation of *ragi* goes on briskly. Summer cholams are fast maturing and the harvest begins in the last week.

The cane plantings of February are now 5 months' old and are given the last dose of manure which generally consists of oil-cakes and green leaves like wild indigo or *Erukham* (*Calatropis*). The crop is finally ridged up after this manuring.

In river-valleys of the Noyyal, Amaravathi and Bhavani, freshes are received and rice cultivation begins; wet nurseries are prepared and seedlings raised—main fields are plodded and puddled; green leaves are brought from outside and applied. Green manure crops grown in fields are cut and ploughed in.

In Erode and its neighbourhood where there are very good plantations of plantains in the canal area, deep trenches are dug in this month between plantain rows—a special operation done with a view to drain away the seepage water and thus keep the crop in healthy condition.

In general, the agricultural labour population get very busy from this month onwards, harvesting, sowing, planting and manuring and general cultivations in different areas as indicated above, afford him ample scope for employment of all kinds.

College News and Notes

The Students' Club.—The students were all busy with their examinations which closed about the 3rd week of April. Athletic activities were thus at a standstill. The number of candidates who appeared for the Degree examination is the largest for the past so many years, as many as 62 appearing for Part II alone. The practical examinations were thus conducted in batches and to both the examiner and examinee it must have been a continuous strain. The Easter holidays which intervened between the theory papers and the practical tests afforded a little respite.

The Officers' Club.—On Tamil New Year Day (14th April), there was a Harikatha Kalakshepam on 'Sathi Anasuya' by P. Ramaswamy Bhagavathar of Madras. The performance was largely attended by the residents of the Estate, both ladies and gentlemen.

Mr. Venkobachari, M.A., a pupil of the Poet Chattopadhyaya, gave at the Club premises a delightful exhibition of mono-acting which was very much appreciated.

Visitors.—Messrs. I. Raman Menon, V. Krishnamoorthy Ayyar, C. S. Ramachandra Ayyar, Rao Bahadur D. Ananda Rao and Drs. B. Narasimha Ayyangar and C. J. George were here in connection with the B. Sc. examinations.

Mr. Mahzar Hussain, Director of Agriculture, Hyderabad, who is collecting information on the statistics of Agriculture in the South, was here on a three-days' visit from the 19th to 21st of April.

Rao Bahadur K. S. Venkataramayyar of Negapatam, an Honorary Visitor to the College, paid a visit on the 30th April.

Weather Review

APRIL 1931

Rainfall data

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars ...	Gopalpore ...	...	- 0.8	0.5	South ...	Negapatam...	10.1	+ 9.5	11.8
	Vizagapatam.	1.2	+ 0.5	1.3		Madura ...	2.2	- 0.1	2.8
	Cocanada ...	...	- 0.6	...		Pamban ...	0.5	- 1.1	7.4
	Masulipatam.	...	- 0.6	...		Palamcottah.	0.1	- 2.5	1.4
Ceded Districts.	Kurnool ...	0.1	- 0.5	0.5	West Coast	Trivandrum.	4.6	- 0.1	5.3
	Bellary ...	0.7	- 0.1	0.7		Cochin ...	8.6	+ 3.7	11.4
	Anantapur ...	0.2	- 0.1	0.2		Calicut ...	0.7	- 2.8	0.7
	Cuddapah ...	...	- 0.4	...		Mangalore ...	2.7	- 1.4	2.8
Carnatic...	Nellore ...	...	- 0.4	...	Mysore and Coorg ...	Bangalore ...	0.1	- 1.3	0.2
	Madras ...	1.5	+ 1.0	1.6		Mercara ...	2.7	+ 1.4	3.0
	Cuddalore ...	7.9	+ 7.2	10.8					
Central ...	Vellore ...	1.2	+ 0.2	1.2	Hills ...	Kodaikanal ...	6.2	+ 1.7	8.1
	Salem ...	1.8	- 0.1	1.8		Coonoor ...	2.4	- 1.9	4.1
	Coimbatore Town ...	1.8	+ 0.3	1.8					
	Coimbatore Res. Inst. ...	1.6	- 0.2	1.6					
	Trichinopoly.	4.9	+ 3.1	5.4					

General summary of Weather conditions :

Pressure conditions were of the hotweather type for the first ten days of the month and were associated with high temperatures over the east of the presidency. Between the 10th and the 17th, weather was unsettled in the S.W. of the Bay, and though no depression actually formed, the unusual distribution of pressure gave rise to heavy rain on the Coromandel coast and sporadic thundershowers in the interior of the South. Pressure distribution after that period was variable and for a time was dominated by a ridge of high pressure extending from the Bay, and this gave rise to fine dry weather over the greater part of the area. During the second half of the month, though temperature was high over the Deccan, the indraught of sea winds was feeble and thus thundershowers were practically absent from over the whole area except in the vicinity of the West coast and the Hills.

Rainfall was heavy on the Coromandel coast to the south of Madras, and moderate in the Central and Southern districts and Malabar. Practically no rain fell in the Circars and a few sporadic showers in the Deccan. Negapatam reported 6.0" and Cuddalore 4.4" on the 14th, and Trichinopoly 3.7" on the 15th. Total rainfall was in large excess on the south Coromandel coast, in moderate excess in the South and in the Central districts, and parts of Malabar, and in defect elsewhere.

Temperature was below normal or nearly normal for the first week and then rose briskly in the Carnatic till the period of unsettled weather set in, when a sharp fall set in coincident with the incidence of rainfall when, very low day-temperatures were recorded. Trichinopoly reported a maximum of 82° and Salem 85° on the 14th and were 19° and 16° below normal respectively. After the 20th, temperatures were very high and markedly above normal in the Deccan, Cuddappah and Kurnool recording maxima of 109° and 108° on several days in the month. Towards the end of the month, temperature rose in the Circars and Mysore and the Central districts, Cocanada reporting 105° and Bangalore 101° on the 30th.

Weather Report for the Research Institute Observatory :

Absolute Maximum in shade	...	100°·2
Absolute Minimum in shade	...	72·0
Mean Maximum in shade	...	97·2
Mean Minimum in shade	...	74·7
Total rainfall in month	...	1·58"
Mean rainfall for April	...	1·84"
Heaviest fall in 24 hours	...	0·56" (17th)
Number of rainy days	...	4
Mean wind velocity, daily	...	2·4 m. p. h.
Mean wind velocity at 8 hours	...	2·4
Mean percentage of Humidity 8 hours	...	71·9 %
Total hours bright sunshine	...	274·2
Mean daily hours bright sunshine	...	9·14

Summary of weather conditions :

The weather was fine and hot during the first week of the month, but with the unsettled weather in the Bay, there was a drop in the pressure and thunderstorms appeared about the 10th. The second half of the month was hot and dry.

Lightning was recorded on 20 days though actual thunderstorms occurred only on four days and gave some rain. The storms were feeble in character though of the 'linesquall' type moving from the N.-E.

Rainfall totalled 1·58" against an average of 1·84" for the month.

Temperature was high for the greater part of the month and reached 100° on four days. Night-temperature was also high throughout the month.

P.V.R.
B.S.N.

THE 'GUPTA' MEMORIAL FUND

[We have received the following for publication in the Journal.—Ed., M. A. J.]

Readers of this journal might have been aware of a fund started in memory of the late Mr. K. Satyanarayana Gupta, by some of his friends and others of the Department who were acquainted with him. The original object of the fund was to utilize the interest thereon for a medal or prize to be awarded to the best outgoing student of the Agricultural Middle School, Anakapalli. But unfortunately, the School was abolished, and at a meeting of some of the donors (14) who assembled at Vizagapatam on 4th June 1930, it was resolved to award the prize to the best outgoing student of the Labour School at Anakapalli. As all the donors were, however, not present, and as another proposal to the effect that the amount might be

handed over to the Agricultural Officers' Club at Anakapalli on certain conditions, was also made, a circular mentioning the two proposals was sent round to all the donors to elicit their opinions. The majority of the donors having been of opinion that the fund be given to the Agricultural Officers' Club at Anakapalli, the same, which amounted to Rs. 325-5-7 (including interest), was handed over to the Secretary of that Club on 4th April, 1931. The members of the Club have agreed to have a portrait of the late Mr. Gupta made and put up in the Club Hall to be constructed and thus commemorate his name.

G. JOGI RAJU,

Secretary, Gupta Memorial Fund.

1st May, 1931.

Departmental Notifications

Gazette notifications.—Mr. S. N. Venkatramanan to be Agricultural Officer for 3 months for collecting data on manurial experiments. Mr. K. M. Thomas to be Assistant Mycologist for 3 months *vice* Mr. S. R. Venkatakrishna Mudaliar on leave.

Promotions.—(Agricultural Section): V. G. Dhanakoti Raju from II to I Grade; C. S. Madiar from III to II Grade; T. R. Venkaswami Rao, IV to III Grade. *First Circle.*—T. Paramanandam, A.D., Rajahmundry, granted l.a.p. for 18 days from 18-4-31. P. Krishnamurti, A.F.M., A.R.S., Anakapalli, granted l.a.p. for one month from 20-4-31. *Second Circle.*—B. Venkataraman, A.A.D., Guntur, granted l.a.p. for one month from 10-5-31. *Third Circle.*—Bagirathi Padhy, A.D., Allagadda, will relieve M. Satyanarayana, A.D., on Cotton work, Nandyal, to enable the latter to join duty at the College, Coimbatore, on 1-5-31. K. Sanjiva Shetty, A.D., Hospet, granted l.a.p. for one month from or after 22-4-31. N. Annaswami, A.D., Kadiri, granted l.a.p. for one month from 27-4-31. *Fourth Circle.*—B. Siva Rao, A.D., Madanapalli, granted l.a.p. for one month from 16-4-31. M. Narayana Ayyar, A.D., Villupuram, granted l.a.p. on m.c. for 3 months from date of relief. K. Varadachary, A.D., Vellore, granted l.a.p. for one month from 16-4-31. S. Ramachandran, A.D., Tirupattur, granted l.a.p. for one month from 23-4-31. *Fifth Circle.*—P. S. Athmaramier, A.D., Kumbakonam, granted l.a.p. for 3 weeks from 2-5-31. *Sixth Circle.*—Transfers: K. K. Subrahmanya Ayyar, A.D., Paramakudi, transferred to Dindigul. A. H. Muthayya Nattar, A.D., Dindigul, to Madura. A. K. Ganesha Iyer, A.D., Madura, to Sholavandan. A. Ramdas, A.D., Sholavandan, to A.R.S., Koilpatti. V. Chidambaram Pillai, F.M., A.R.S., Koilpatti, granted l.a.p. for 11 days from 20-4-31. *Seventh Circle.*—K. W. Chakrapani Marar, F.M., Kasargod, granted l.a.p. for 22 days from 18-4-31. S. Krishna Naik, A.D., Moodabidiri, granted l.a.p. for one month from 26-4-31. *Eighth Circle.*—T. A. Rangaswami Ayyangar, A.D., Rasipuram, granted l.a.p. for one month from 1-5-31. *D. D. L. S.'s Section.*—M. V. Narasimha Sastri, A.A.D., Ongole, granted l.a.p. for 15 days from 16-3-31. T. S. Lakshmanan, F.M., L.R.S., Guntur, transferred to L.R.S., Chintaldevi, to relieve R. Ananthapadmanabhan, F.M., on 6-4-31. In cancellation of the above order, T. S. Lakshmanan, F.M., L.R.S., Guntur, to report for duty at Hosur on 18-4-31, *vice* K. T. Benjamin, F. M. Hosur. A. K. Annaswami Ayyar, F.M., Chintaldevi, granted l.a.p. for one month from 28-4-31 or date of relief. K. Acyuthan Nayar, F.M., will be in charge of the L.R.S., Chintaldevi, during the absence of A. K. Anna-swami Ayyar, on leave, as a temporary measure. M. V. Narsimha Sastri, A.A.D., Ongole, transferred to Chintaldevi. *Curator's Section.*—M. Arogyaswami Pillai, Upper Subordinate, I Grade, who will attain the age of 55 years on 10-3-31, will retire from that date. *G.A.C.'s Section.*—M. Sundaram, Assistant, granted l.a.p. for 15 days from 1-5-31. Mr. T. Rajagopalan, Assistant, granted l.a.p. for 3 weeks from 11-5-31. *G.M.'s Section.*—C. Krishnan Nayar, Assistant, granted extension of l.a.p. for 3 days. C. S. Gopalaswami Rao, Assistant, granted extension of leave for 3 months from 8-5-31. *G.E.'s Section.*—M. S. Subbayya, Assistant, V Grade, confirmed with effect from 1-5-1929. *G.S.B.'s Section.*—T. R. Naganathan, Sub-Assistant, granted l.a.p. on m.c. for one month and 18 days from 24-3-31. *P.S.'s Section.*—V. M. Ramunni Kidavu, F.M., Pattambi, granted l.a.p. for one month from 5-5-31. S. Muthuswami, F.M., A.R.S., Aduturai, l.a.p. for 2 months from 20-4-31. C. Rajasekara Mudaliar, Assistant, Pattambi, granted l.a.p. for 24 days from 9-4-31. *M.S.'s Section.*—U. L. Srinivasa Rao, A.F.M., M.B.S., Coimbatore, on relief by A. Kunhikoran Nambiar, transferred to VIII Circle. *C.S.'s Section.*—M. Kesava Ayyangar, Assistant, transferred to A.R.S., Hagari, to join duty on 1-6-31. On relief, P. Abraham, Assistant, to Cotton Breeding Station, Coimbatore.

APPENDIX—EXAMINATION PAPERS

UNIVERSITY OF MADRAS

B. Sc. Ag. Degree Examination, 1931

PART I

AGRICULTURAL ENGINEERING

WEDNESDAY, 18TH MARCH. 7 A.M. to 10 A.M.

Six questions are to be answered. Questions 1, 2, 4, 5, and 7 are compulsory

1. (a) During a simple chain survey a deep river has to be crossed. Assuming that a boat can ply across the river, how can the survey be carried out?
(b) In what circumstances is surveying with a plane table more advantageous than with a compass?
2. A circus tent is cylindrical at bottom and conical above. The cylindrical portion is 300 ft. diameter and runs up to 12 ft. above ground level. The highest point of the cone is 32 ft. above ground level. Calculate the cost of the tent, if the canvas including stitching, etc., costs Rs. 3-0-0 per square yard.
If 1,200 cub. ft. of space should be allowed as a minimum to each spectator, how many will the tent accommodate?
3. (a) What are the characteristics of a good well-burnt brick?
(b) Describe the constituents ordinarily met with in the common clays employed for brick-making and their effect on the quality of the bricks.
4. (a) Explain the terms—(i) modulus of elasticity, and (ii) bending moment.
(b) The teak joists carrying a terraced roof of a verandah are 10 ft. long, and spaced 1 ft. 8 in. apart. Determine a suitable section for the joists, assuming that the terrace weighs 80 lb. per sq. ft.
5. (a) Describe briefly how masonry structures generally fail and how safety from such failures can be ensured.
(b) Determine the section of a masonry retaining wall for holding 12 ft. of water.
6. Determine the length of the surplus weir of a tank which has a catchment area of 8 square miles. Assume a coefficient of 1,000 in the formula $\theta = CM_3$, and M.W.L. to be 12 in. above the crest of the weir.
7. (a) Explain the terms—hydraulic gradient, and hydraulic mean depth.
(b) A channel is 40 ft. wide at bottom having side slopes 1 to 1, bedfall 1 in 2,000, and depth of water 4 ft. What is the channel capable of discharging? Assume $C = 100$ in the formula $V = C\sqrt{mi}$.

AGRICULTURAL BOTANY

WEDNESDAY, 18TH MARCH. 1 P.M. to 4 P.M.

Answer THREE questions in A and THREE questions in B. Questions 2 and 6 are compulsory. Write answers to sections A and B in separate answer books.

A

1. Give a simple classification of fruits. Illustrate your answers with suitable sketches and familiar examples.
2. Write a short essay on transpiration, indicating the influence of external factors on this process.
3. Write short notes on (a) plasmolysis, (b) heliotropism, (c) karyokinesis, (d) synergids, and (e) guard cells.
4. Explain the process of secondary thickening in the stem of a dicotyledonous tree and fully describe the tissues involved, giving a diagram.

B

5. Illustrate and tabulate all the characters that help in the separation of the natural orders of (a) Gramineae and Cyperaceae, (b) Solanaceae and Convolvulaceae.
6. What are the essential elements in plant food? How are they absorbed and transported?
7. Discuss the ecology underlying the practice of growing Italian millet between rows of cotton in black-cotton soils.
8. Mention the peculiarities of structure found in hydrophytes.

AGRICULTURAL CHEMISTRY

THURSDAY, 19TH MARCH, 7 A.M. to 10 A.M.

Answer only THREE questions in A and THREE questions in B. Question 1 is compulsory. Write answers to A and B in SEPARATE ANSWER BOOKS.

A

1. Describe briefly the different methods by which the empirical and constitutional formulæ of compounds are determined, and state how you would establish the constitution of acetic acid.
2. Discuss the points of similarity and dissimilarity between sodium hydroxide and ethyl alcohol.
3. Explain and illustrate any four of the following terms:—(a) allotropy, (b) metamerism, (c) isomerism, (d) homologue, (e) reversible reaction, (f) optical activity, (g) unsaturation, (h) ortho-, meta-, and para- compounds.
4. Describe briefly either the manufacture of sulphuric acid, or modern views on alcoholic fermentation, or modern methods of glycerine manufacture.

B

5. Give in general terms the composition of gneiss, hornblende, dolerite, and trap stone. Describe how they weather into soils, and point out any differences that may exist in the soils so formed from each.
6. Describe the principles on which the mechanical analysis of a soil is based, and state how a mechanical analysis of a soil is useful to the soil chemist.
7. Explain how Kankar and alkali are formed in soils. How far is alkali harmful to crops like ragi, cholam, and sugar-cane? How would you get rid of it from a field?
8. Write what you know about base exchange in soils and its importance to plant nutrition.

AGRICULTURAL ZOOLOGY

THURSDAY, 19TH MARCH. 1 P.M. to 4 P.M.

1. *Either*, Discuss the relationship of the class Insecta to other Arthropoda.
Or, Describe the types of larvæ met with in Insecta, and indicate their evolutionary significance.
2. Write notes on any *three* of the following :—(a) reproduction in *Paramecium*, (b) Malpighian tubules and their function in insects, (c) adaptations occurring in insects for aquatic life, (d) Filariasis, (e) biological control of insect pests, and (f) suppression of sex in insects.
3. Give an account of the morphology, bionomics, and economic importance of any *one* of the following groups of animals :—(a) Thysanoptera, (b) Coccidæ, (c) Acarina.
4. Describe the life-history of *Schænobius bipunctifer* Wlk. (Paddy stem borer), and point out the lines on which the pest could be controlled.
5. What remedial measures would you adopt in case of incidence of the following pests :—(a) *Laphygma* in ragi nursery, (b) Aphides on cabbages, (c) Mosquitoes in a farm, (d) Ticks on cattle, and (e) *Calandra* in a storehouse.
6. Write an essay on stomach poisons and their use in insect control.

AGRICULTURE. I

SATURDAY, 21ST MARCH. 7 A.M. to 10 A.M.

Answer only **THREE** questions in A and **THREE** questions in B. Write answers to A and B in SEPARATE BOOKS.

A

1. State what you know of the origin of soils and subsoils. Describe the character of the soils derived from granite, gneiss, limestone, and laterite.
2. Enumerate the various breeds of cattle of South India, and state the localities in which they are found. Describe in detail a breed famous for milk and another for draught.
3. Describe, with sketches, the implements in use in the Ceded districts. What are their limitations? What are the directions along which improvements could be effected in them?
4. Describe *three* of the most important water-lifts you are familiar with. What lifts will you recommend as most efficient for depth of 10, 30, and 60 feet? Give reasons.

B

5. Briefly describe the various types of soils met with in the Madras Presidency, their special characteristics and the type of farming adopted in these soils.
 6. What do you understand by 'rotations of crops'? How are rotations useful to the farmer? Give an instance of rotation with which you are familiar, explaining fully the purposes served by that rotation.
 7. Compare the working of a typical indigenous plough with that of an up-to-date improved plough. What are the advantages of these ploughs? Give reasons for your answer.
- Write short notes on the following :—(a) monsoon, (b) duty of water, (c) sour soils, (d) warping, (e) marl, (f) disc harrow, (g) fallowing, and (h) dry farming.

AGRICULTURE. II

INCLUDING ANIMAL HYGIENE

SATURDAY, 21ST MARCH. 1 P.M. to 4 P.M.

Only **SIX** questions are to be answered. Questions 2 and 4 are compulsory

1. Describe with the aid of a diagram the circulation of blood in the ox.
2. Name the glands concerned in the digestion of food in the ox, and explain how the process of digestion is carried on.
3. Discuss the main principles you would observe in the feeding and watering of cattle.
4. Describe *either* anthrax, *or* hæmorrhagic septicæmia as regards ætiology, mode of infection, animals susceptible, and symptoms. How would you diagnose each, and what measures would you adopt in dealing with an outbreak of any *one* of them in a farm?
5. What is red water in cattle? How is it caused? Describe briefly its symptoms, mode of infection, diagnosis, and treatment.
6. Describe how you would treat the following :—(a) mammitis, (b) abortion, and (c) diarrhoea.
7. Give the actions, uses, and doses of the following drugs in cattle :—(a) ammonium chloride, (b) turpentine, (c) *Pulvis zingiberis*, (d) potassium iodide.
8. What are the signs of approaching parturition in a cow? Describe briefly how you would take care of her before and after parturition.

PART II

AGRICULTURAL BOTANY. I

MONDAY, 23RD MARCH. 7 A.M. to 10 A.M.

Answer only **FIVE** questions. Question 4 is compulsory

1. Give a comparative morphological description of *Eleusine Corcana* (ragi) and of *Eleusine ægyptiaca*, pointing out the economic disabilities of the latter.
2. Bring out the main botanical structures, internal and external, of *Hibiscus cannabinus* and *Hibiscus esculentus*, and discuss their fitness for their respective economic purposes.
3. Mention the physiological principles and structural changes involved in the vegetative propagation of plants.
4. Narrate in detail the methods of formation and storage of fatty oils and the part they play in the life of the plant.
5. Describe the structure of a fern, and contrast it with that of a flowering plant.
6. Sketch, with illustration, the life-history of *Chara*.

AGRICULTURAL BOTANY. II

MONDAY, 23RD MARCH. 1 P.M. to 4 P.M.

Only **FIVE** questions are to be answered. Question 6 is compulsory.

1. What do you understand by the term 'pure line'? Discuss the value of 'pure line' selection in the improvement of cultivated crops.
2. Describe briefly what do you understand by evolution.
3. Two straw-glumed varieties of paddy may give a black-glumed F_1 when crossed. Give a genetic explanation of this, and deduce the types to be expected in the F_2 , and their proportion and behaviour in F_3 .

4. Explain the process of grafting. At what season is grafting carried out, and what precautions must be observed to ensure successful results?
5. Write short notes on—(a) *Colletorichum falcatum*, (b) *Xenia* (c) reduction division, (d) virus disease, and (e) parthenogenesis.
6. Describe as completely as possible the life-history of the fungus responsible for any one of the following diseases, and state briefly the methods of combating it:—(a) paddy blast, (b) ground-nut wilt, and (c) cholam smut.

AGRICULTURAL CHEMISTRY. I

TUESDAY, 24TH MARCH. 7 A.M. to 10 A.M.

Only FIVE questions are to be answered.

1. What is the difference between *cholam* straw, *cholam* hay, and *cholam* silage in their methods of preparation, composition, and feeding value?
2. Describe the successive changes and the ultimate fate of nitrogen in ground-nut cake fed to milch cows.
3. State (a) why the value of nitrogen is multiplied by 6.3 in arriving at the protein content of a feeding stuff, (b) how albuminoid nitrogen is distinguished from amide nitrogen, (c) the principle underlying the estimation of crude fibre in a sample of straw, and (d) why in estimating the nutritive ratio of a feeding stuff the value for fat is multiplied by 2.3.
4. You have the following food materials and the information available:—

	Digestible protein per cent.	Digestible carbo- hydrate per cent.	Fat per cent.
Cholam straw	1.2	35.5	0.75
Ground-nut cake	43.0	23.5	7.50
Fresh grass	3.0	11.0	0.50

Work out a ration for a bullock on heavy work.

5. Compare and contrast the action of acid and of rennet on the coagulation of milk.
6. What is the composition of cow's milk? What are the factors that influence the quality and quantity of milk?
7. State the chemical constitution of fats. On what does the hardness of fats depend?

AGRICULTURAL CHEMISTRY. II

THURSDAY, 24TH MARCH. 1 P.M. to 4 P.M.

Answer only FIVE questions

1. Explain the functions of iron, magnesium, chlorine, phosphorus, and potassium, in plant nutrition.
2. Describe the process of nitrogen assimilation by plants, and the formation of various nitrogenous compounds in them.
3. Discuss the importance of artificial manures in increasing crop production and maintaining soil fertility.
4. Describe two methods of finding out the manurial requirements of a soil.
5. What is the action of lime on cane juice? Describe the changes going on in cane juice while it is being boiled into jaggery.
6. What is meant by co-efficient of purity of a sample of cane juice? In what ways do soluble ash and glucose in cane juice affect the quality of jaggery and recovery of sugar?
7. How does animal nutrition differ from plant nutrition? Describe the function of proteids and fats in the animal body.

AGRICULTURE. I

WEDNESDAY, 25TH MARCH. 7 A.M. to 10 A.M.

Only FIVE questions are to be answered

1. *Either*, Why is farm-yard manure invaluable to the farmer? Explain with reference to recent researches how farm-yard manure is superior to other manures.
Or, What is meant by the 'unexhausted value of manures'? Name some manures which have such a value. State the annual manurial requirements of a garden land farm of 50 acres in the Coimbatore district, taking into account the utilization to the best advantage of the unexhausted value of the manures you propose to use.
2. Describe the various methods you would adopt for the improvement of local cotton or paddy.
3. How would you utilize the co-operative agency for the benefit of the ryots of this presidency, with special reference to milk and implements?
4. Organize a plan for the improvement of the local cattle of Tanjore and Malabar districts. How long will it take to see the effect of the improvement?
5. Discuss briefly the method of cultivating ragi in the presidency. Prepare a cultivation sheet, showing the cost of production, and gross and net return per acre.
6. Justify the statement that the irrigated dry crop cultivator is a better citizen than the swamp paddy cultivator.

AGRICULTURE. II

WEDNESDAY, 25TH MARCH. 1 P.M. to 4 P.M.

Only FIVE questions are to be answered

1. What are pastures? State how these can be managed and maintained in good condition. What types of grasses would you have in them?
2. What are the characteristics of good seeds? Give the seed rate of the following per acre:—(a) *cholam*, (b) ground-nut, (c) Cambodia cotton, (d) sugar-cane (e) potatoes, (f) ragi, and (g) chillies.
What precautions would you take in getting the seed ready for use in each case?
3. You are put in possession of 100 acres of good land adjoining a town. Supposing you want to supply milk to the town, state briefly (a) the type of cows you will maintain, (b) the type of farming you will adopt, and (c) the equipment that is required, including buildings and machinery.
4. What are the manurial resources of the Madras presidency? Are the ryots taking advantage of the existence of these resources? Can you suggest methods by which the ryots may be enabled to utilize these manures?
5. What is the nature of relationship between landlord and tenant in your own district or in any district with which you are familiar? Are there suitable laws defining such relationship? If there is no suitable legislation, on what lines would you suggest legislation?
6. What do you understand by 'money crops'? What is the general effect on the ryots of growing these crops? Has the growing of money crops resulted in any change in the outlook of the ryots? If so, in what directions?

AGRICULTURE ESSAY

THURSDAY, 26TH MARCH. 7 A.M. to 10 A.M.

Either, Write an essay on the present condition of the ryot of this Presidency and the lines along which he could improve.*Or*, Agricultural education in relation to rural prosperity.

(7)

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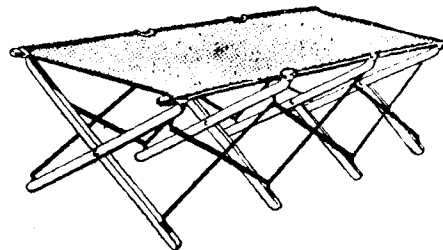
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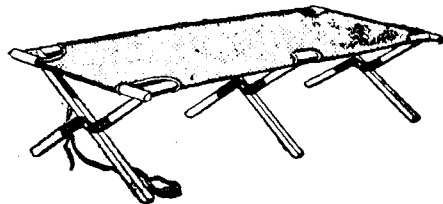


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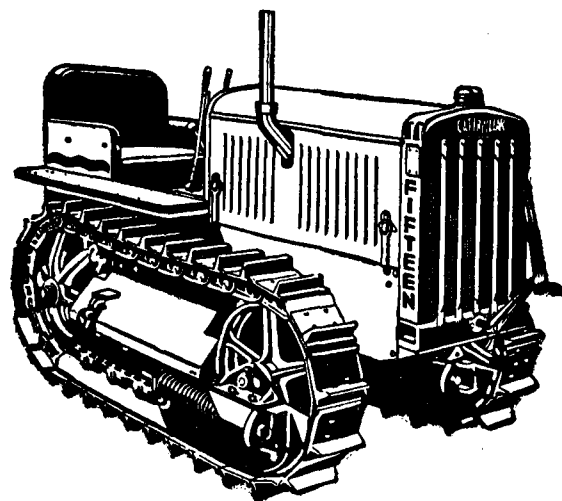
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Chief Editor: DR. B. NARASIMHA IYENGAR, B.A., Ph.D.

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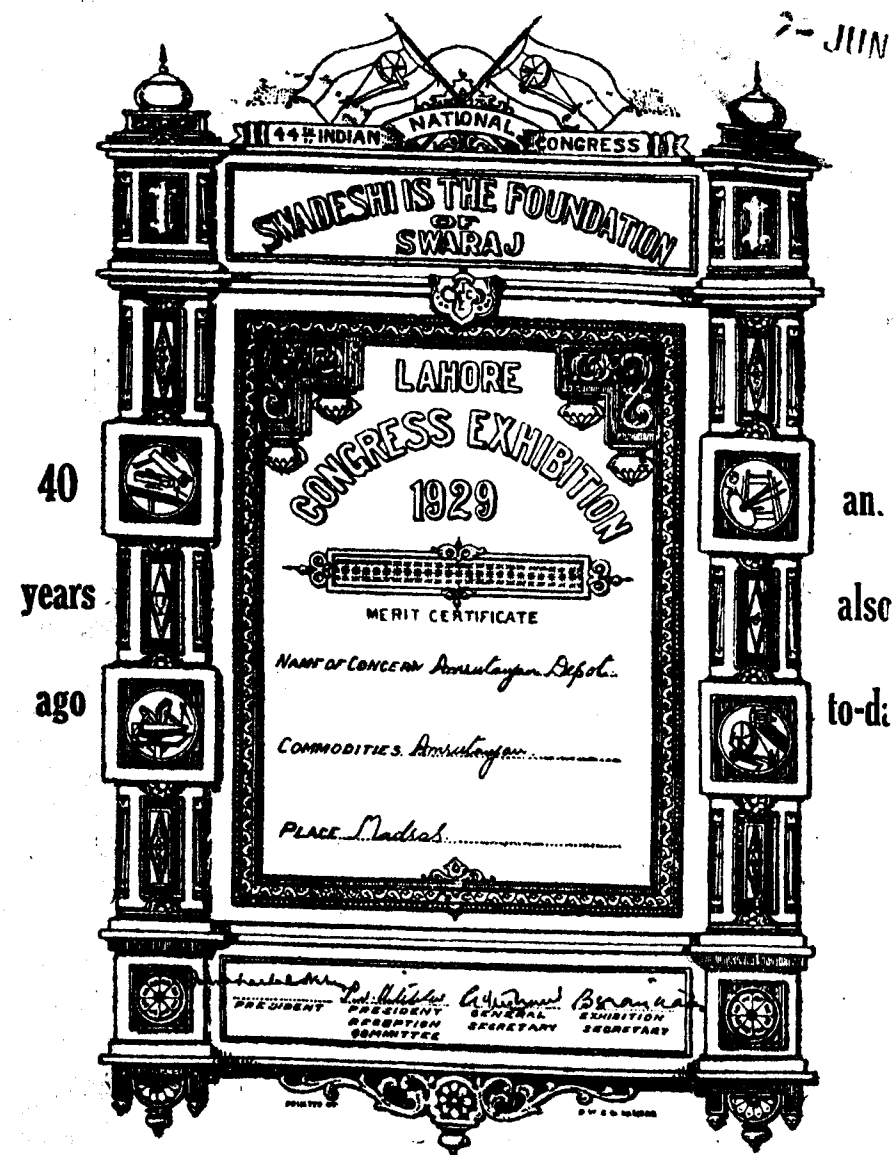
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