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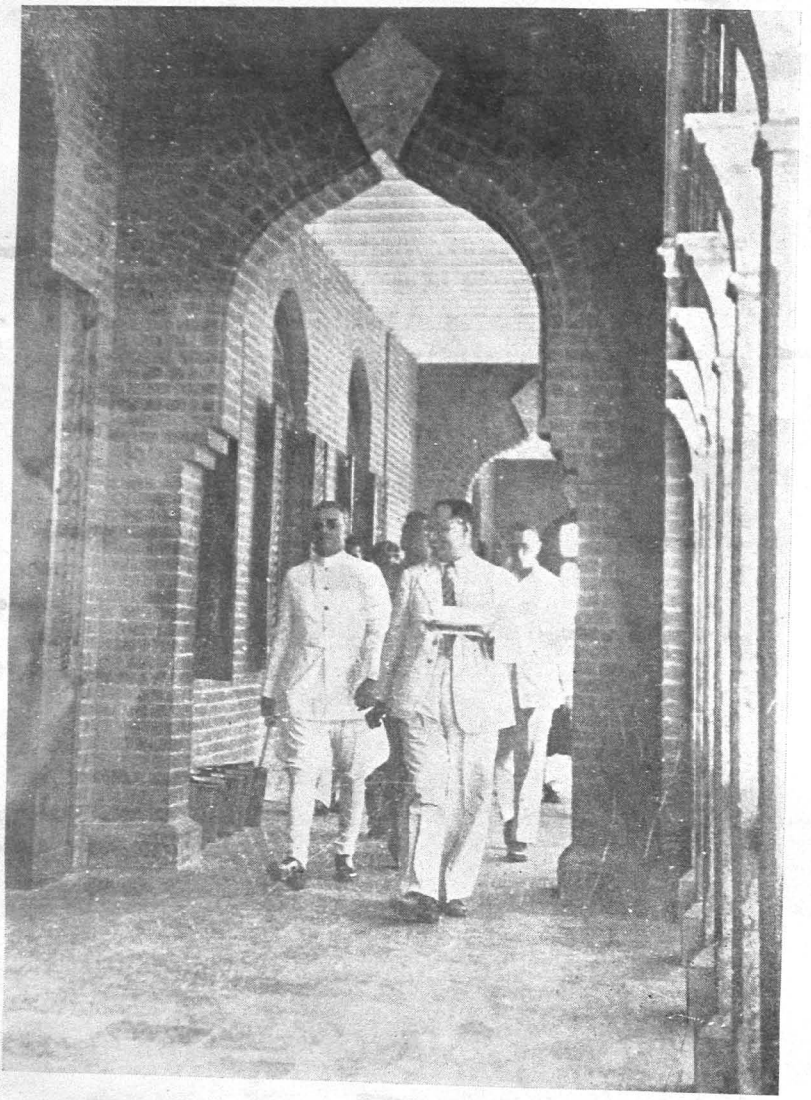

His Excellency The Maharaja of Bhavnagar, Governor of Madras was shown round the college on 13—6—1949.

The Madras Agricultural Journal

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Editorial

Model Farms: Speaking at a conference of businessmen of Nagpur Mr. Ratanchand Hirachand, a Bombay industrialist has made the interesting suggestion that the Provincial Governments should in the event of the abolition of the Zamindari system, take over the land themselves and organise agriculture on sound business lines instead of leaving it in the hands of small cultivators. We offer no comment on the political aspect of the question but there is much to be said in favour of large scale farming either by Government or other agencies in the interests of national economy.

The need for exploring the possibilities of organised large scale farming is now greater than ever before, as according to the final decision of the Government of India, all food imports should cease by 1951.

Two factors more than any other have been responsible for the slow progress of the Agricultural Industry in this country. They are lack of capital for investment on improvement of land and its scientific cultivation on modern lines and lack of enterprise on the part of cultivators, an inevitable consequence of their general poverty. The high cost of modern agricultural machinery and equipment the risk involved in taking up new methods precluded the ordinary cultivator from deriving any benefit whatsoever from the progress of agricultural research. The situation is not much changed even to-day in spite of strenuous efforts for the last few years, of the entire Governmental machinery to make him interested in agricultural improvements. The plantation crops like Tea and Coffee and Tobacco in the Circars have been raised on commercial lines and yielded high dividends, showing what capital and organisation could do to make farming a paying proposition. Recent developments in the Coimbatore District where large scale farming has been attempted by individuals with adequate capital at their disposal have shown that farming even

of food crops will pay in the long run if proper attention is paid to permanent land improvement. In these cases production has been increased manifold and both the owners of the land and the community at large have been benefitted. No attempt has been made by Government in any of the Provinces so far, as we are aware, to raise crops on a commercial basis. All the Agricultural stations and Government Farms have been maintained either for research or educational purposes.

The time appears opportune for undertaking large scale enterprise in commercial farming both by Government and other agencies with adequate capital and a capacity for organisation. The Agricultural Colleges are turning out each year more Graduates than could be absorbed by the Agricultural Departments, and these would provide the technical personell required to run these farms.

Large farms run on modern lines by Government, besides bringing increased returns themselves would be serving as model farms to other cultivators, who are now apathetic towards improved agriculture. The country as a whole will therefore benefit by this enterprise.

The suggestion of Mr. R. Hirachand would therefore appear to merit the serious consideration of the Government.

Effect of Summer Ploughing on the Germination of Korai Weed (Cyperus Rotendus)

By

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At the Millets Breeding Station, Coimbatore, certain fields were very badly infested with the Korai weed (Cyperus). The fields are red sandy loams. The rainfed crop of Cumbu (Pearl millet) in Field No. 2 was harvested towards the middle of January 1949, and the field was deep ploughed on 24—1—1949. The ploughing was done by the turn-wrest plough drawn by 2 pairs of bullocks. The depth of furrows varied from 7 inches to 8 inches. Large clods were lifted by the plough. The ploughing was done closely so that there was no unploughed land left behind. From 24—1—1949 till 9—3—1949 (i.e. about 45 days) the field was fallow and in a cloddy condition and received no cultivation being fully exposed to dry weather. The sun and wind had their full play on the ploughed field. The range of temperatures during the months January, February and March along with the rainfall conditions are given below :—

Month	Mean Maximum	Mean Minimum	Lowest Minimum	Highest Maximum	Date on which lowest min. was recorded	Date on which highest max. was recorded	Rainfall in inches.
January	84·5	61·6	52·8	88·8	20th	30th	nil
February	90·1	62·9	36·0	95·0	20th	23rd	nil
March	95·7	65·7	58·8	100·4	12th	15th	nil

There was no rain during the period. Advantage was taken of this condition to study if the tubers of Korai left in the ploughed field retained germination capacity after this period of dessication in the field. 10 tubers of cyperus were picked from the ploughed field at random on 9—3—1949 i. e. 45 days after ploughing. 10 bulbs were also picked on 9—3—1949 from an unploughed portion of the field and both the sets of bulbs were kept for germination in a pot. Every tuber picked from the unploughed land germinated and gave a number of

sprouts from each tuber while those picked from the ploughed field completely failed to germinate. A similar picking was made on 24—3—1949 (i. e. 60 days after ploughing) in which also all the tubers picked from the unploughed field germinated while there was no germination at all from those picked from the ploughed field as shown below :—

Germination test of Cyperus tubers from ploughed and unploughed fields (Ploughing on 24—1—1949.)

	I set sown on 9—3—1949.		*II set sown on 24—3—1949.*	
	From unploughed field	From ploughed field	From unploughed field	From ploughed field.
Tuber No.	No. of sprouts from each tuber	No. of sprouts from each tuber	No. of sprouts from each tuber	No. of sprouts from each tuber.
1	One sprout		1 One sprout	
2	Two sprouts		2 One ,,	
3	Two ,,		3 One ,,	
4	Two ,,	Germination	4 No sprout	Germination
5	Two ,,	nil	5 Three ,,	nil
6	One ,,		6 One ,,	
7	One ,,		7 One ,,	
8	Two ,,		8 One ,,	
9	Four ,,		9 One ,,	
10	One ,,		10 Two ,,	

The pots were sown on 9—3—49 and 24—3—49 and were watered daily. Within 10 days of sowing all the tubers picked from the unploughed field germinated vigorously. The watering was continued for 1½ months for both the sets of pots. There was no germination at all in the pot in which tubers picked from the ploughed field were sown, while in the pot in which tubers from unploughed field were sown, the cyperus plants have come to flower.

The tubers picked from the ploughed field after 45 and 60 days of exposure in the field after ploughing, were somewhat shrivelled and when broken showed mealy contents. The fresh bulbs picked from unploughed fields were full and fresh and when crushed showed hard moist contents like kernel. Both of them had the same flavour.

Deep ploughing in summer with a mould-board plough and subsequent exposure to sun for a period of 45 days without rain completely killed the cyperus bulbs that were present in the depth of ploughed soil in the fields. These months are usually rainless months in this tract. It is not claimed that deep ploughing kills all the Korai tubers in the entire depth of soil in the field. It is well known that korai tubers are deposited at greater depths in the soil than 8 inches which is the depth of ploughing in this case. The tubers deposited deeper than the ploughing depth, in course of time and with the help of sub soil moisture or subsequent rains, make their appearance in the field. These can only be controlled by working the blade harrow periodically as they come up. But a large mass of them have already been killed by the deep summer-ploughing, as a majority of tubers are located in the top 6 inches of soil. The object of this paper is to draw attention to the function of deep summer-ploughing in the control of cyperus weed occuring in the red sandy loams.

A Note on Calcining of Bones as a Village Industry

By

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Manuring of crops for increased production without disproportionate increase in the cost of production is aimed at by all producers, and in this endeavour, simple process of conversion of bones as a cheap phosphatic manure is presented below for adoption in villages. By a judicious combination with, green manures, compost, farm yard manure, oil-cakes and nitrogenous fertilisers, it has been established, that the phosphate manure plays a very important role in higher crop yield. Different crops remove from the soil varied quantities of phosphates, and unless the loss is recouped, the gradual decline in fertility with consequent low yields will be obvious. The Government in their Government Order No. 2693, dated 10—7—'46 ordered publication of work on calcination for the benefit of ryots. This article it is hoped, will stimulate the village Industry and benefit the ryots.

Cheap and simple process of phosphate manufacture:

Though raw bone is easy to collect and cheap in the villages, by the time it reaches the cultivator as bonemeal it becomes too expensive for the cultivator. The raw bones are hard and by a simple process they can be rendered brittle. The factory process involves sulphuric acid treatment which is expensive and requires scientific knowledge. The process described below needs paddy husk, or groundnut husk or saw dust or chaff of grain which are available in the villages. The village tanner has no use for the bone. He throws them away. The agriculturist should see that he utilises the bones of his cattle as much as he cares for the hides by adopting the simple process. Three processes are described below:

A. Heap process:

A layer of bones is laid flat and round on a bedding of husk. A row of bricks is arranged leaving a 6″ wide and 4″ high gap along the diametre for air inlet or outlet. This channel should be in line with the direction of the wind of the season. The channel is covered with parallel arrangement of bones. Husk is spread over this and another layer of bones is arranged. Again this is covered with husk. All the bones are put similarly one over the other forming into a steep pyramid. In this arrangement hard bones of the legs and the vertebra should be placed in the centre, and light bones like the ribs and skulls towards the sides, because as the heat moves up, the former would get sufficient heat at the centre and the latter less heat at the sides. Heat is thus uniformly utilised and there may remain no unburnt or over burnt bones when done

with. When all the bones are piled up a final layer of husk is spread and a 3" thick moist earth put all over the heap, leaving the inlet and outlet at the base. One-fourth the weight of the bones is the husk required. Fire is introduced in at the inlet. The husk and the bones inside catch fire after a few minutes. In about an hour copious smoke with characteristic odour will emit which is a sign that brisk heat is at work. Now close the bottom smoke outlet and open 3 or 4 small outlets on the top of the pyramid. The heat is thus forced upward and the smoke will now emit at the top holes. If the wind blow is fast, regulate the air inlet at the bottom with a brick. All that is required is, steady heat; too much heat will result in more of calcium carbonate and loss of phosphate. The process should not be hurried through. In three or four days the process will be complete. During the course of the second day a few cracks may develop on the heap which should be closed up then and there with mud. The completion is indicated by the absence of smoke at the outlets and the heap is luke-warm to touch. The mud plaster is removed. Properly heated bones are ashy brown in colour, over heated ones, white, and imperfectly heated ones, black. The bones are now quite brittle and can be powdered in mortar and pestle or rolled in chunam mortar.

B. Cattle kiln process:

Like the *chunam* kiln a permanent structure with unburnt bricks or stones is suggested when continuous manufacture is needed. A kiln 4' in diametre and 5' in height will hold a ton of bones. As in the heap process the bones are piled up till they are a foot above the wall, and the top portion mud plastered. A few smoke exit holes are made at the top. Due to the vertical move of the heat calcining is effected quicker than the heap process. The air inlet at the base of the kiln can be used to remove the calcined bones. After removal the kiln is ready for the next charge.

C. Conduction heat process:

In the above two processes, the bones come in direct contact with fire and the resultant product loses 3% nitrogen. To minimise this loss it was devised to render the bones brittle enough by heat conduction. The bones are arranged in several narrow rows parallel and close to one another. An inch of wet-earth is put over the bones. It was noticed above, two and a half times the weight of bones is the quantity of husk required. Fire is set to the husk in line with the direction of the wind. The husk as it burns conducts the heat to the bones inside through the thin layer of mud plaster. When groundnut husk is used it should be moistened with water lest it should run into flames and thus burn away quickly. The burning must be slow and steady. When the husk is completely burnt the mud plaster is removed. The bones are brittle but not so

brittle as in (a) and (b) processess. On analysis 2·5% nitrogen is retained, but the total and citric soluble P_2O_5 contents are less than the other two products. It is easier to adopt the heap and the kiln processes, and the loss of nitrogen is minimised by reducing the quantity of husk used.

Analysis:

Head of analysis	L. No. 340		L. No. 341		L. No. 342		L. No. 343		L. No. 344	
	Air dry basis	Moisture Free basis	Air dry basis	Moisture Free basis	Air dry basis	Moisture Free basis	Air dry basis	Moisture Free basis	Air dry basis	Moisture Free basis
Moisture	3·74	...	3·08	...	3·29	...	3·83	...	2·53	
Loss on ignition	9·21	9·57	19·67	20·30	20·23	20·92	16·87	16·85	6·21	6·37
Insolubes	0·85	0·89	1·09	1·12	0·82	0·85	2·03	2·09	1·49	1·53
Nitrogen	1·12	1·16	2·54	2·52	2·48	2·56	2·05	2.11	0·45	0·47
Total P_2O_5	36·00	37·41	31·47	32·46	32·22	33·25	32·72	33·67	37·24	38·20
2% citric soluble P_2O_5	26·11	27·13	24·74	25·50	24·36	25·20	25·70	26·45	22·56	23·15

Cost of Production: At the outset it may be said the village should be the centre of manufacture of the manure. Village labour may be employed for the collection of the bones and doing the rest of the job. This will give them additional income. At present the bone collectors are advanced small sums by the town agents of the bone exporting concerns and head loads of bones are brought to the agent's depot in the town. The head-loads are cursorily judged, of their weight, or weighed with a hand spring balance. Deductions for moisture in the bones from 40% to 60% are made and the head-load fetches Re. 0—4—0 to 0—8—0 per 56 lbs.

Below the details of cost of production include the cost of bones purchased in Nellure Town and the labour costs and other charges incurred. In actual practice the value can be roughly put at half or even less than the figures given below :

A. Particulars 1943.	Value.
Cost of 2,126 lbs. of raw bones	Rs. 50—0—0
Carting to work site	2—8—0
Cost of paddy husk-332 lbs. (1/4 the weight of bones will suffice)	2—8—0
Weighing the bones and arranging them in heap	2—8—0
Watchman, weighing the final produce	1—4—0
Powdering in mortor and pestle	2—4—0
Total	Rs. 61—0—0

2,126 lbs. of raw bones yielded 1,400 lbs. of calcined bonemeal. Therefore 1,400 lbs. costs Rs. 61/- which works out to Rs. 97—9—7 or Rs. 98/- per ton or Rs. 4—9—5 per cwt.

B. Demonstration in 1947. at Madaraju-gudur (Nellure Taluk).

Particulars.		value.
Cost of bones 15,500 lbs.	Rs.	519—0—0
Cost of paddy husk 6,500 lbs.		16—0—0
Weiging bones and husk		0–12—0
Heaping and plastering		6—0—0
Fixing and weighing		0–12—0
Removing the heap and weighing		3—8—0
Total	Rs.	546—0—0

15,500 lbs. raw bones yielded 9,920 lbs. of calcined bones.

Therefore recovery = 64%.

Cost of 9.920 lbs. of calcined bones	Rs.	546—0—0
Cost per ton	Rs.	122–10—0
Cost per cwt.	Rs.	6—2—0 or
	Rs.	6—3—0

I feel the authorities would be convinced that decentralization of bone utilisation so as to limit the collection and use within each taluk area would be cheaper than centralizing bonemeal manufacture at a few Provincial factories.

A comparative analysis figures of the following phosphatic manures show that calcined bonemeal has good percentage of total and citric soluble P_2O_5. The market prices and the unit prices of the P_2O_5 are compared. The fear of competition and consequent reduction of costs of factory made phosphates need not be entertained as the method of procurement of bones in the villages, the simple process employed in its preparation, and, the absence of costly technical guidance remain the factors in its favour.

Comparative Analysis of Different Phosphates and Unit Prices:

The unit prices worked out below clearly show that calcined bonemeal is the cheapest of all phosphatic manures and therefore worthy of general adoption in villages.

Kind of phosphatic manure.	nitrogen %	Total P_2O_5.	Citric soluble P_2O_5 % to total P_2O_5.	Market value per ton.	Unit prices.
Steamed bonemeal	4·4	23·6	50	Rs. 160/-	Rs. 6–12–6
Bone super ordinary	...	22·0	...	200/-	9—1–6
Bone super concentrated	...	43·0	95	300/-	7—0-0
Basic slag	...	17·2	80	200/-	...
Rock super	...	16·1	...	200/-	...
Calcined	0·47	38·20	...	...	...
Bonemeal	0·56	33·25	...	98/-	3–10–0

The value and the unit price of calcined bonemeal in actual practice will be a fourth in the villages where the value of bones is negligible, and the waste material and labour are part and parcel of the cultivation.

Below is given the analysis of calcined bonemeal from different demonstrations in Nellore District. It may be seen that P_2O_5 could be maintained at about 38%.

	L. No. 373. (a)	L. No. 929. (b)	L. No. 930. (c)	L. No. 931. (d)	L. No. 932 (e)
Moisture content	2·64	4·73	5·71	6·22	3·50
Loss of ignition	2·99	1·55	19·28	8·48	1·74
Insolubles	1·24	0·41	1·05	1.12	1·13
Nitrogen	...	0·11	2·04	0·98	0·14
Phosphoric acid	37·15	37·88	29·72	33·28	37·54

Samples (a) (b) and (e) are grey in colour and contain only small quantities of nitrogen and organic matter, indicating calcination has been complete. Sample (d) is dark grey in colour and sample (c) is almost black in colour at the bone chard stage.

Bones which are merely charred are less readily decomposed in the soil than completely calcined bones.

Grain Storage at Avadi

By

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The following is an account of the measures adopted at Avadi for the proper preservation of the large quantities of food grains that are received for storage as Provincial Reserve stocks. Twenty-five sheds with a storage capacity of 3,500 tons each are in use for this purpose. They are of the hanger design and of three different types, the Lahore, the Indian and the Avadi type.

Each had a cement concrete floor of about 330 x 100 sq. ft The roofing was semi-circular, 18 ft. high and formed of galvanised iron sheets. Valley gutters were provided between two bays for drainage. These were lined with prefabricated bituminised rolls supported on wooden planks to prevent leakage. Each shed had eight double doors, one on either side of each bay, opening outwards over a platform running over the whole length of the shed. Drains were provided along the margins on all the four sides. The other two types had fourteen bays with a gabled roofing covering each bay. The intervening valley gutters were supported on wooden planks spread over seven brick pillars erected at intervals along the length of each valley gutter. The effective storage surface in each bay was 21 x 95 sq. ft. The Indian type had brick walls on all the four sides with the roofing made of Mangalore tiles. Each shed was provided with ten sliding double doors, four on either side along the length and one in each of the other two sides. A covered verandah was provided on the loading side for the entire length. In the case of the Avadi type sheds, the walls and the roofing were made of galvanised iron sheets and the doors were hinged and opened outwards on an open platform.

Among these three types of sheds, the Lahore type was found to be the best. The doors on either end helped proper aeration for all the stacks since it was possible to arrange two rows of stacks with a central gangway in each bay. The semi-circular roofing gave sufficient room for the easy handling of bags in the top layers. In the other two types only four bays out of fourteen had doorways and only one stack could be arranged along the width in each bay. This resulted in insufficient aeration for the stacks in the interior. The handling of bags in the top layers was also difficult because of the tie beam of the gabled roof.

All these sheds were provided with a network of railway lines on one side and metalled roads on the other side running along the length of each shed. This facilitated the despatch of grains by road and rail.

The arrangement of the stacks inside the godowns was designed so as to give sufficient alleyways around each stack. In the Lahore sheds each bay had two rows of four stacks, 14 x 20¼ sq. ft. in area, with a gangway of 3 ft. between the two rows, 2½ feet on either side along the bay margins, 2 ft. between two stacks in the same row and 6 ft. clear space in front and back immediately behind the doorways. The stacking was done to a height of twelve tiers. The bags were arranged brickwise. The base of the stack was made a little broader than the top to ensure stability. Each stack consisted of 6 rows of 5 x 10 alternating with 6 rows of 7 x 8 bags with an additional 4 bags on the top to make 640 bags. In the case of the Indian and Avadi types each bay had four stacks of 17 x 19 sq. ft. area with a margin of 3 ft. on one side and one foot on the other side along the bay margins, 3 ft. between two stacks and 6 ft. clear space on either ends. Each stack consisted of 6 rows of 6 x 10 ft. alternating with 6 rows 8 x 8 ft with 6 additional bags on the top to make 750.

The disinfestation of stacks was done with gammexane D.034 containing 4% deodrised benzine hexachloride with 0·5% of active gammexane. The dosage used as 8 ounces for 100 sq. ft. of surface area with 10% extra allowance for the space between bags. The first application of the dust was commenced on the 23rd March and continued as the maize stocks were received in the several godowns and was completed by the 16th May 1948. Six cyanogas foot pumps were used in this dusting. A uniform coverage of the dust was obtained by holding the delivery end of the pump, at an angle two feet away from the stack.

During the operation, the workers covered their mouths and nostrils with kercheifs. Twentyfive pounds of gammexane could be applied with each pump in a day or eight hours providing sufficient intervals for the workmen. The entire stock of maize 3,10,677 bags (26,033 tons) were dusted with 2,060 lbs. of gammexane.

The foot pumps were subsequently replaced with rotary pattern dusters, (Root crank dusters model C–3, A) during the second application of the dust. The duster could be operated by one man and it was possible to cover 800–1,000 tons a day using 100. lbs of gammexane. An extra man was provided to relieve him at intervals. The disinfestation work was commenced on 14 th June and completed

by the 27 th. in all the godowns. The stocks ear-marked for immediate despatch were not treated. 2,87,050 bags (about 23,921 tons) were treated with 1,944. lbsof gammexane in all the nine godowns.

The third and final dusting was done in the last week of July and the application of dust was confined to 70,180 bags (5,848 tons) which were likely to remain in storage till the end of August. 471.lbs of gammexane were used for disinfestation. A powder duster known as "Tornado marvel" worked by a "Villiers" 4–stroke air–cooled engine run on petrol was tried in these godowns The machine was mounted on a chassis and fitted with pneumatic tyre wheels and pram handle and could be easily moved between stacks along the alleyways and gangways. It was possible to cover the four sides of the stack with this duster. The top surface required an extended hose. The rate of dusting with this machine was calculated as about 500 tons a day using 500 lbs of gammexane.

Disinfestation of empty godowns was done side by side with stack disinfestation as and when the godowns become empty after the releases. The dosage used was 8 ounces of gammexane for 100 sq. ft. of surface. This was commenced in the first week of July and continued till the end of August. 868 lbs. of gammexane were used in all the nine maize godowns.

The approximate cost of disinfestation worked out to 1 anna 3 pies per ton for a single application. At the Avadi godowns 5,443 lbs. of gammexane were used for the three applications and for disinfesting empty godowns. The cost spread over for the entire quantity of maize stored works out Rs. 0 — 2 — 8 per ton.

The stocks were examined at the time of receipt at the harbour and once a month in the godowns in May, June and July 1948 to note the insect population and percentage of tunnelled grains. Samples were drawn with a sampling pin 8 inches long from 3% of the bags selected at random in each stack collecting a handful of grains from each bag. The insect population in the sample was noted and was reduced to one pound. The collected maize was then spread out and about 1,000 grains were sampled out to note the percentage of tunnelled grains. Observations were recorded for each stack and the average insect population and percentage of tunnelled grains of a consignment were worked out. 716 samples were examined from May to July. Further examinations were discontinued from August as the stocks were despatched from the godowns. The result of examination are given in a separate statement.

The population counts showed the presence of the rice weevil (*Sitophilus oryzae*) and the flour beetle (*Tribolium castaneum*) in all the consignments at the time of their receipt in the Madras Harbour. The number of weevils (*Sitophilus oryzae*) did not increase to any appreciable extent during the first examination of the stocks in the godowns in May. Their number was definitely low in the June observations and in July live insects were absent in several godowns. This was mainly due to disinfestation with gammexane D. 034 which reduced the weevil population to a great extent. The first application of the dust in March – April resulted in a large number of dead insects along the stack margins and on the bags. These were brushed and cleanly swept before the second application. The activity of weevils beyond this period was considerably reduced and the insect population in subsequent counts consisted largely of the flour beetles. The effect of gammexane on these beetles was comparatively less. The percentage of tunnelled grain showed considerable variation and inconsistency in the different readings.

The maize stocks remained in storage for over five months 26, 033 tons of maize were received from the middle of March to the end of April and 25, 788 tons were despatched to several districts of the province from May to September. 26½ tons of maize were separated as damaged stocks due to leakages in some of the godowns during rains. About 12 tons out of this quantity were auctioned as starch and the rest disposed off as manure. Thus the over-all shortage for the entire stock of maize was 218½ tons for 26, 033 tons handled or 0·84%. The grains at the time of receipt were weighed at the Madras Harbour after a long voyage and must have weighed more. These were standardised at Avadi in the hot months from April to July when the grains must have weighed less. Therefore the shortage of 218½ tons might be mainly due to the fluctuations in the weight of the grains on account of climatic conditions. It could be claimed that this loss in storage was negligible.

Previous experience of maize storage at Madras had shown that the weevils (*Stophilus oryzae*) infesting the grains multiplied very rapidly. In the case of maize stocks received in December and January the weevils were seen to be swarming in all the godowns by the end of February and their population multiplied 10 to 12 time by the end of May 1948. The low insect population at Avadi and the complete control of weevils were the results of adopting timely preventive measures.

STATEMENT SHOWING THE DEGREE OF INFESTATION IN DIFFERENT MONTHS.

Name of the Consignment	Date of receipt into the Harbour	Examination at the Madras Harbour						Examination in the Avadi godowns during May, June and July 1948.																	
								May 1948.						June 1948.						July 1948.					
		Numbers of samples examined	Setsphilus alive	Silophilus dead	Tribolium alive	Tribolium dead	Percentage of tunnelled grains	Number of samples examined	Sitopilus alive	Sitopilus dead	Tribolium alive	Tribolium dead	Percentage of tunnelled grains	Number of samples examined	Sitopilus alive	Sitopilus dead	Tribolium alive	Tribolium dead	Percentage of tunnelled grains	Number of samples examined	Sitopilus alive	Sitopilus dead	Tribolium alive	Tribolium dead	Percentage of tunnelled grains
1. Ciclope ...	14/3	18	5	1	3	...	4·7	13	1	1	15	7	13·9	22	...	1	7	17	7·2	7	...	2	4	9	5·7
2. John Owen ...	21/3	19	1	2	2	2	3·5	39	3	...	3	6	6·3	34	...	2	8	7	6·7	113	...	1	6	5	7·7
3. Castlebianco ...	27/3	15	1	...	3	...	10·4	103	1	1	16	17	15·2	69	...	1	8	19	9·2	7	5	3	33	18	11·4
4. Patagonia Victory	1/4	11	1	1	3	...	12·5	67	1	2	17	13	16·2	32	...	1	7	19	7·0	...	...	...	...	...	...
5. Rajput ...	28/3	2	7	8	2	2	4·5	51	2	7	17	17	13·1	42	7	6	8	25	13·5	28	9	4	32	16	10·4
6. Shahzada ...	7/4	4	1	...	7	3	9·8	6	...	4	15	14	17·2	3	...	1	5	15	6·4	...	...	...	...	...	...
7. Tonjor ...	9/4	4	1	...	4	6	3·7	29	...	3	13	16	13·6	7	...	3	7	19	4·4	...	...	...	...	...	...
8. Havildar ...	27/4	5	...	...	4	...	5·1	...	...	...	...	...	...	44	1	6	25	16	15·2	...	...	...	...	...	...

A Soil Survey for Fruit Development in the Ceded Districts (Contd.)*

By

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APPENDIX II.

Results of mechanical analysis (Results expressed on moisture free basis)

Area	Pit No.	Depth	No. of samples	Moisture %	Clay %	Silt %	Fine sand %	Coarse sand %	Fine Fractions (clay silt)	Coarse Fractions (F. sand C. sand.)
1	2	3	4	5	6	7	8	9	10	11
Kottur	2	0'—1'	4	4·21	33·2	5·2	21·2	40·7	38·4	61·9
	,,	1'—2'	5	5·80	49 8	10·5	22·5	17·9	60·3	40·4
	,,	2'—3'	6	5·58	37·7	18·2	22·1	21·6	55·9	43·7
	,,	3'—4'	7	4·38	37·6	6 8	16·3	39·2	44·4	55·5
	,,	4'—5'	8	6·53	43·6	11·2	10·1	31·2	54·8	41·3
	4	0'—1'	16	3·98	44·8	6·7	16·5	30·2	51·5	46·7
	,,	1'—2'	17	4·27	47·8	5·2	13·2	33·2	53 0	46·4
	,,	2'—3'	18	4·57	51·6	4·4	13·7	29·2	56·0	42·9
	,,	3'—4'	19	4·74	51·4	7·7	11·8	28·5	59·1	40·3
	,,	4'—5'	20	4·59	49·5	7·4	12·0	30·3	56·9	42·3
	,,	5'—6'	21	4·69	48·8	8·9	12·5	29·6	57·7	42·1
	,,	6'—7,	22	4·54	39·8	6·0	13·8	39·2	45·8	53·0
	7	0"—9"	31	1·32	16·2	4·1	35·8	44·8	20·3	80·6
	,,	9"—18"	32	0·83	11·9	2·5	19·6	67·1	14·4	86·7
	,,	18"—30"	33	1·32	17·5	3·5	24·3	56·2	21·0	80·5
	,,	30"—40"	34	1·76	20·1	4·6	16·6	59·5	24·7	76·1
	,,	40"—41"	35	2·88	29·3	6·0	15·3	50·1	35·3	65·4
	,,	4'—5'	36	2·02	23·0	5·1	18·0	54·8	28·1	72·8
	,,	5'—6'	37	5·44	51·9	7·6	12·8	28·7	59·3	41·5
	9	0'—1'	40	2·86	37·6	4·4	19·7	39·0	42·0	58·7
	,,	1'—2'	41	3·17	38·2	7·0	19·7	36·0	45·2	55·7
	,,	2'—3'	42	3·17	39·0	6·2	18·2	37·6	45·2	55·8
	10	0'—1'	43	1·75	23·9	3·6	16·7	56·6	27·5	73·3
	,,	1'—2'	44	2·65	35·4	5·4	13·8	46·8	40·8	60·6
	,,	2'—3'	45	3·46	48·8	6·1	12·7	32·8	54·9	45·5
Rudravaram	18	0'—1'	72	4·91	53·1	17·1	15 7	14·8	70·2	30·5
	,,	1'—2'	73	4·96	56·3	19·7	13·1	12·0	76·0	25·1
	,,	2'—3'	74	4·99	56·8	16·9	13·4	13·9	73·7	27·3
	,,	3'—4'	75	5·14	55·1	14·0	11·5	20·7	69·1	32·2
	,,	4'—5'	76	5·34	55·5	13·8	12·0	20·2	69·3	32·2
	20	0'—1'	82	0·44	7·0	1·8	45·3	46·7	8·8	92·0
	,,	1'—2'	83	0·53	9·6	1·7	43·1	46·6	11·3	89·7

* Continued from Vol. XXXVI, No. 5, P. 234.

APPENDIX II—Contd.

Area	Pit No.	Depth	No. of samples	Moisture %	Clay %	Silt %	Fine sand %	Coarse sand %	Fine Frections (clay silt)	Coarse Fractions (F. sand C. sand)
1	2	3	4	5	6	7	8	9	10	11
	,,	2'—3'	84	1·36	17·5	7·1	36·3	39·8	24·6	76·1
	,,	3'—4'	85	1·77	24·4	10·0	28·3	38·3	34·4	66·6
	22	0'—1'	91	8·57	16·1	11·4	29·6	43·0	28·2	72·6
	,,	1'—2'	92	2·87	30·9	19·3	16·4	33·5	50·2	49·9
	,,	2'—3'	93	3·75	39·7	18·0	18·6	20·0	57·7	38·6
	,,	3'—4'	94	4·76	47·5	14·2	16·7	19·2	61·7	35·9
	,,	4'—5'	95	5·12	46·0	17·1	15·2	21·5	63·1	36·7
	24	0'—1'	101	4·13	35·7	20·6	32·8	10·7	56·3	43·5
	,,	1'—2'	102	4·40	39·2	20·4	29·2	9·7	59·6	38·9
	,,	2'—3'	103	4·46	41·6	23·6	27·3	7·8	65·2	35·1
	,,	3'—4'	104	4·76	46·7	23·6	26·3	1·9	70·3	28·2
	,,	4'—5'	105	4·82	44·4	23·4	7·5	4·1	67·8	31·6
	25	0'—1'	106	1·30	13·7	5·0	63·8	17·5	18·7	81·3
	,,	1'—2'	107	1·37	14·2	4·1	77·6	3·7	18·3	81·3
	,,	2'—3'	108	1·29	13·7	4·5	75·5	6·8	18·2	82·3
	,,	3'—4'	109	0·84	8·8	2·8	73·6	15·4	11·6	89·0
	,,	4'—5'	110	1·07	12·1	2·3	62·3	24·2	14·4	86·5
	27	0'—1'	115	3·72	38·7	10·9	22·6	26·4	49·6	49·0
	,,	1'—2'	116	3·57	34·5	8·3	35·4	20·6	42·8	56·0
	,,	2'—3'	117	4·70	41·7	15·7	27·1	14·0	57·4	41·1
	,,	3'—4'	118	5·13	46·1	13·7	23·4	15·5	59·8	38·9
	,,	4'—5'	119	5·00	30·5	14·5	34·1	20·7	45·0	54·8
	,,	5'—6'	120	3·59	42·8	13·2	24·1	18·5	56·0	42·6
	,,	6'—7'	121	4·53	41·1	16·2	22·9	18·5	57·3	41·4
	,,	7'—8'	122	3·66	34·4	11·7	22·7	29·8	46·1	52·5
	31	0'—1'	142	3·76	32·6	14·1	22·5	29·7	46·7	52·2
	,,	1'—2'	143	4·90	42·3	11·9	15·9	30·0	54·2	45·9
	,,	2'—3'	144	5·54	36·5	7·4	22·5	33·5	43·9	56·0
	,,	3'—4'	145	5·01	41·3	5·8	7·3	44·2	47·6	51·5
Giddalore	34	0'—1'	155	4·68	38·6	19·6	22·6	16·0	58·2	38·6
	,,	1'—2'	156	5·06	42·1	20·0	22·0	12·6	62·1	34·6
	,,	2'—3'	157	5·43	44·4	23·3	20·3	8·5	67·7	28·8
	,,	3'—4'	158	5·67	43·8	25·4	20·6	6·9	69·2	27·5
	,,	4'—5'	159	5·75	42·2	21·5	18·0	11·2	63·7	29·2
	,,	5'—5'	160	5·41	42·5	19·3	19·9	14·3	61·8	34·2
	37	0'—1'	173	1·85	18·1	6·4	39·7	36·0	24·5	75·7
	,,	1'—2'	174	4·18	37·8	15·6	30·1	14·7	53·4	44·8
	,,	2'—3'	175	4·15	38·3	18·8	27·9	13·8	57·1	41·7
	,,	3'—4'	176	4·23	38·1	18·0	27·9	15·0	56·1	42·9
	,,	4'—5'	177	3·91	33·3	19·5	28·7	18·0	52·8	46·7
	,,	5'—'6	178	3·73	31·9	16·9	29·7	19·5	48·8	49·2
	,,	6'—'7	179	3·07	26·8	14·2	25·2	32·4	41·0	57·6

APPENDIX II—Contd.

Area	Pit No.	Depth	No. of samples	Moisture %	Clay %	Silt %	Fine sand %	Coarse sand %	Fine Fractions (clay silt)	Coarse Fractions (F. sand C. sand)
1	2	3	4	5	6	7	8	9	10	11
	39	0'—1'	185	2·32	20·5	7·4	35·2	35·6	27 9	70·8
	,,	1'—2'	186	2·77	23·7	10·8	26·6	35·7	34·5	62·3
	,,	2'—3'	187	2·67	28·3	11·6	33·1	25·4	39·9	58·5
	,,	3'—4'	188	2·73	27·5	13·1	31·3	27·9	40·6	59·2
	,,	4'—5'	189	2·90	34·5	16·8	27·5	20·7	51·3	48·2
	,,	5'—6'	190	3·09	31·7	10·3	33·4	24·4	42·0	57·8
	,,	6'—7'	191	3·04	25·8	13·9	27·0	25·6	39·7	52·6
	,,	7'—8'	192	2·92	26·3	12·0	31·4	27·3	38·3	58·7
	40	0'—1'	193	3·60	34·5	16·8	27·5	19·7	51·3	47·2
	,,	1'—2'	194	3·71	31·2	14·0	34·9	18·5	49·2	53·4
	,,	2'—3'	195	3·23	23·5	29·5	41·8	6·6	53·0	48·4
	,,	3'—4'	196	2·18	22·5	13·8	43·5	19·0	36·3	62·5
	,,	4'—5'	197	4·39	40·0	14·9	23·2	19·4	54·9	42·6
	,,	5'—6'	198	2·49	23·6	12·1	43·2	20·9	35·7	64·1
	42	0'—1	207	3·61	38·4	18·2	36·2	8·5	56·6	44·7
	,,	1'—2'	208	3·76	38·2	18·5	38·2	6·0	56·7	44·2
	,,	2'—3'	209	3·50	37·3	17·6	36·9	7·6	54·9	44·5
	,,	3'—4'	210	2·78	30·9	10·7	30·4	29·7	41·6	60·1
	,,	4'—5'	211	3·64	37·6	13·8	27·0	20·6	51·4	47·6
	44	0'—1'	217	2·84	19 3	26·2	30·3	20·2	45·5	50·5
	,,	1'—2'	218	2·07	16·6	18·2	28·1	35·3	34·8	63·4
	,,	2'—3'	219	1·78	17·8	8·6	41·0	30·9	26·4	71·9
	,,	3'—4'	220	1·93	12·2	5·6	29·8	53·7	17·8	83·5
Vontimitta	48	0'—1'	231	2·04	21·4	11·8	39·3	25·8	33·2	65·1
	,,	1'—2'	232	2·54	26·7	11·5	33·5	28·1	38·2	61·6
	,,	2'—3'	233	4·09	45·6	12·0	17·7	25·2	57·6	42·9
	,,	3'—4'	234	4·84	53·6	14·2	16·1	17·7	67·8	33·8
	,,	4'—5'	235	4·99	56·4	13·7	16·9	14·4	70·1	31·3
	,,	5'—6'	236	3·30	36·2	19·4	24·7	14·9	55·6	39·6
	49	0'—1'	237	3·02	33·8	22·9	29·5	13·4	56·7	42·9
	,,	1'—2'	238	3·06	32·3	21·1	34·3	13·4	53·4	47·7
	,,	2'—3'	239	3·09	31·0	18·3	34·3	16·6	49·3	50·9
	,,	3'—4'	240	3·96	43·0	19·4	26·9	11·2	62·4	38·1
	,,	4'—5'	241	5·55	58·8	14·3	14·9	11·2	73·1	26·1
	50	0'—1'	243	3·38	35·7	18·6	30·0	12·6	54·3	42·6
	,,	1'—2'	244	4·37	51·8	12·2	15·2	21·6	64·0	36·8
	,,	2'—3'	245	3·48	35·0	16·8	23·3	19·4	51·8	42·7
	,,	3'—4'	246	3·52	35·2	16·9	24·8	17·9	52·1	42·7

APPENDIX II—Contd.

Area	Pit No.	Depth	No. of samples	Moisture %	Clay %	Silt %	Fine sand %	Coarse sand %	Fine Fractions (clay silt)	Coarse Fractions (F. sand C. sand)
1	2	3	4	5	6	7	8	9	10	11
	53	0'—1'	258	1·75	19 1	17·3	42·6	21·5	36·4	64·1
	,,	1'—2'	259	3·01	43·8	14·7	22·8	15·2	58·5	38 0
	,,	2'—3'	260	3·80	56·4	15·1	14.1	15·9	71·5	30 0
	,,	3'—4'	261	3 88	52·3	13·0	13·9	21·7	65·3	35·6
	56	0'—1'	270	2·85	30·1	17·3	31·3	18·5	47·4	49 8
	,,	1'—2'	271	3·68	37·1	14·3	28·7	15 6	51·4	44·3
	,,	2'—3'	272	4·03	38·8	16 2	27·6	14·4	55·0	42·0
	,,	3'—4'	273	3·90	38·5	14·8	25·8	20·0	53·0	45·8
	,,	4'—5'	274	3·93	33·1	22·3	20·9	22·0	55·6	42·9
	57	0'—1'	275	2·10	24·7	11·1	39·3	24·9	35·8	64·2
	,,	1'—2'	276	1·66	21·1	10·4	52·5	17 0	31·5	69 5
	,,	2'—3'	277	2·06	25·3	10·4	36·4	28·8	35·7	65·2
	,,	3'—4'	278	1·90	19·6	10·7	36·6	34·1	30·3	70·7
	,,	4'—5'	279	1·96	20·7	9·9	40·0	29 9	30·6	69 9
	60	0'—1'	290	3·44	28·2	7·8	26·0	31·4	36·0	57·4
	,,	1'—2'	291	3 68	29·9	7·0	25·1	29·7	36 9	54·8
	,,	2'—3'	292	3·85	30·7	8·6	21·7	31·4	39·3	53·1
	,,	3'—4'	293	3·66	32·0	7·7	19·3	32·1	39·7	51·4
Kodur	64	0'—1'	310	1·82	21·1	13·5	58·8	7·6	34 6	66·4
	,,	1'—2'	311	2·12	29·4	12·5	58·3	5·5	41·9	58·8
	,,	2'—3'	312	2·91	35·5	13·1	47·9	4·6	48·6	52·5
	,,	3'—4'	313	3·08	38·7	13·7	44·2	4·1	52·4	48·3
	,,	4'—5'	314	2·98	36·7	15·5	44·9	4·6	52·2	49·5
	,,	5'—6'	315	3·06	37·2	14·2	43·5	5·6	51·4	49·1
	,,	6'—7'	316	3·15	35·1	11·4	36·1	16·9	46·5	53 0
	,,	7'—8'	317	3·29	32·3	11·6	44·4	9·6	43·9	54·0
	66	0'—1'	324	2·14	30·7	11·7	50·4	8·7	42·4	59·1
	,,	1'—2'	325	3·01	37·2	13·4	42·2	7·6	50·6	49·8
	,,	2'—3'	326	3·12	37·7	13·4	41·9	6·9	51·1	48 8
	,,	3'—4'	327	3·41	38·8	13·0	39·3	9·1	51·8	48·4
	,,	4'—5'	328	3·41	41·4	13·7	37·1	7·3	55·1	44 4
	,,	5'—6'	329	3·40	41·4	14·5	37·5	6·6	57·2	44·0
	,,	6'—7'	330	3·26	42·2	15·0	39·0	5·0	57·2	44 0
	,,	7'—8'	331	3·10	40 3	15·5	41·2	4·8	55·8	46·0
	68	0'—1'	340	1·80	26·0	8·9	43·0	22 1	34·9	65·1
	,,	1'—2'	341	3·35	49·7	14·2	26·7	10·0	63·9	36·7
	,,	2'—3'	342	2·81	45·8	12·6	30·2	13·4	58·4	43·6
	,,	3'—4'	343	3 62	49·6	12·9	23·3	14·5	62·5	37·8
	,,	4'—5'	344	3·56	50·0	10·9	21·8	18·7	60·9	40 5
	,,	5'—6'	345	3·55	49·0	14·3	21·6	16·0	63·3	37·6
	,,	7'—8'	347	3·43	47·7	11·9	22·0	19·6	59·6	41 6

APPENDIX II—Contd.

Area	Pit No.	Depth	No. of samples	Moisture %	Clay %	Silt %	Fine sand %	Coarse sand %	Fine Fractions (clay silt)	Coarse Fractions (F. sand C. sand)
1	2	3	4	5	6	7	8	9	10	11
	70	0'—1'	355	0·45	9·1	5·0	66·0	21·2	14·1	87·2
	,,	1'—2'	356	0·79	13·9	9·3	57·0	20·3	23·2	77·3
	,,	2'—3'	357	1·81	30·6	8·6	45·5	16·5	39·2	62·0
	,,	3'—4'	358	2·35	36·4	9·7	37·6	16·6	16·1	54·2
	,,	4'—5'	359	2·60	41·1	7·9	36·0	16·4	49·0	52·4
	,,	5'—6'	360	2·71	43·2	9·7	29·0	16·6	52·9	45·6
	,,	6'—7'	361	2·22	38·3	8·2	37·4	15·2	46·5	52·6
	,,	7'—8'	362	2·16	33·0	9·9	38·0	20·1	42·9	58·1
	71	0'—1'	363	0·81	13·1	7·8	65·1	13·1	20·9	78·4
	,,	1'—2'	364	1·80	28·3	14·5	47·0	10·6	42·8	57·6
	,,	2'—3'	365	2·46	36·3	16·0	39·1	8·9	52·3	48·0
	,,	3'—4'	366	2·78	38·9	18·2	33·4	9·4	57·1	42·8
	,,	4'—5'	367	2·45	41·3	16·0	31·5	10·6	57·3	42·1
	,,	5'—6'	368	2·88	38·9	19·0	31·9	10·4	57·9	42·3
	,,	6'—7'	369	3·94	49·4	15·6	27·4	9·5	65·0	36·9
	,,	7'—8'	370	3·55	46·7	19·1	26·9	8·9	65·8	35·8
	75	0'—1'	386	1·53	24·6	11·7	54·3	7·9	36·3	62·2
	,,	1'—2'	387	1·95	29·3	15·3	48·0	7·4	44·6	55·4
	,,	2'—3'	388	2·73	38·0	14·7	34·7	13·1	52·7	47·8
	,,	3'—4'	389	3·29	39·5	16·0	27·0	18·3	55·5	45·3
	78	0'—1'	403	0·95	15·2	5·8	71·6	7·3	21·0	78·9
	,,	1'—2'	404	1·46	1·46	9·4	63·6	6·4	31·2	70·0
	,,	2'—3'	405	1·61	1·61	9·8	60·7	5·7	34·3	66·4
	,,	3'—4'	406	1·74	1·74	8·6	59·9	5·6	35·6	65·5
	,,	4'—5'	407	2·21	2·21	7·7	55·3	4·6	39·9	59·9
	,,	5'—6'	408	2·03	2·03	10·4	56·9	4·4	38·8	61·3
	,,	6'—7'	409	2·18	2·18	11·2	56·1	4·4	39·6	60·5
	,,	7'—8'	410	2·56	2·56	10·0	52·7	3·8	43·9	56·5
Panyam	79	0'—1'	411	0·89	3·0	6·6	12·1	75·5	9·6	87·6
	,,	1'—2'	412	2·22	17·0	7·3	19·2	53·6	24·3	72·8
	,,	2'—3'	413	1·98	15·8	7·4	15·4	61·2	23·2	76·6
	,,	3'—4'	414	1·83	16·0	7·1	13·9	63·8	23·1	77·7
	,,	4'—5'	415	1·71	13·7	6·2	12·7	67·2	19·9	79·9
	,,	5'—6'	416	2·32	17·7	11·2	18·2	52·1	28·9	70·3
	,,	6'—7'	417	2·53	18·5	10·2	27·2	40·8	28·7	68·0
	,,	7'—8'	418	0·90	7·8	2·5	2·2	87·5	10·3	89·7
	80	0'—1'	419	3·92	30·7	12·7	16·0	34·1	43·4	50·1
	,,	1'—2'	420	4·63	35·7	13·4	14·4	32·7	49·1	47·1
	,,	2'—3'	421	5·12	38·7	11·4	13·7	30·0	50·1	43·7
	,,	3'—4'	422	5·99	46·0	16·5	14·7	16·8	62·5	31·5
	,,	4'—5'	423	5·60	44·5	17·5	17·1	12·5	62·0	29·6
	,,	5'—6'	424	4·91	34·4	21·1	17·7	13·9	55·5	31·6
	,,	6'—7'	425	3·98	26·6	15·3	19·7	25·0	41·9	44·7
	,,	7'—8'	426	3·15	24·3	9·8	15·6	38·9	34·1	54·5

APPENDIX III

Results of analysis of 35 selected surface samples of soils.

No. of samples	Locality	Loses on Ignition	Nitrogen	Lime (Gao)	Total Potash K_2O	Total phosphoric acid P_2O_5	Available potash K_2O	Available Phoricacid P_2O_5	PH
4	Kottur	2·63	·042	0·52	0·31	·005	·008	Trace	7·41
9	,,	4·22	·051	0·41	0·42	·002	·011	,,	7·05
16	,,	4·96	·056	1·05	0·59	·002	·025	,,	8·06
31	,,	1·42	·029	0·34	0·24	·002	·011	,,	7·61
40	,,	3·87	·048	0·27	0·46	·002	·006	,,	6·72
43	,,	2·77	·034	0·22	0·31	·001	·017	,,	6·77
72	Rudravaram	5·34	·044	0·63	1·26	·006	·009	,,	7·71
82	,,	0·65	·018	0·08	0·16	·002	·015	,,	7·18
91	,,	1·70	·028	0·18	0·26	Trace	·011	,,	7·70
101	,,	2·96	·025	0·53	0·81	,,	·014	,,	8·29
106	,,	1·20	·012	0·36	0·34	,,	·018	,,	8·48
111	,,	6·17	·022	4·29	0·71	,,	·008	,,	8·58
142	,,	4·86	·007	0·61	0·85	,,	·014	,,	8·73
155	Giddalore	3·20	·036	4·25	1·19	,,	·023	,,	8·55
173	,,	1·49	·041	0·24	0·63	,,	·017	,,	8·57
185	,,	1·86	·023	1·67	0·63	,,	·008	,,	8·76
193	,,	3·09	·015	4·49	1·27	,,	·012	,,	8·92
207	,,	29·7	·025	0·38	0·99	·004	·008	,,	8·47
217	,,	4·55	·022	6·06	1·09	·009	·015	·001	8·85
231	Vontimitta	3·45	·064	1·07	1·38	·144	·034	·104	8·57
237	,,	4·79	·108	1·91	1·91	·078	·039	·043	8·74
242	,,	4·18	·041	4·07	1·69	·005	·015	Trace	8·82
258	,,	3·75	·055	2·60	1·51	·075	·027	·031	88·7
270	,,	3·91	·056	3·24	1·85	·146	·030	·099	8·81
275	,,	2·59	·031	1·50	1·05	·028	·024	·015	8·71
290	,,	2·90	·084	4·17	0·87	·051	·028	·017	8·64
310	Kodur	1·78	·064	1·26	0·46	·017	·026	·013	8.66
324	,,	2·19	·034	0·19	0·57	·002	·019	Trace	7·90
340	,,	2·75	·032	0·11	0·54	·002	·019	,,	7·24
355	,,	0·61	·016	0·10	0·22	·002	·015	,,	8·16
363	,,	1·29	·028	0·11	0·35	·003	·015	,,	7·95
386	,,	2·69	·048	0·17	0·61	·011	·019	,,	7·64
403	,,	1·33	·029	0·12	0·52	·002	·025	,,	8·48
411	Panyam	0·95	·012	1·43	0·35	·022	·010	·010	8·48
419	,,	4·27	·115	3·71	0·98	·548	·035	·329	8·63

APPENDIX IV

Results of analysis of water samples (Results expressed in parts per 100,000) and depth of water table in feet in summer and rainy season

Area	Kottur—Ujjini						Rudravaram—Sirvel			
Serial No.	1	2.	3.	4.	5.	6.	7.	8.	9.	10.
Particulars	Maruru Vanka	Kottur Tank	Step well Harkanahalu near pit No. 16	Step well Kalapuram near pit No. 11	Draw well Ujjini near pit No. 14	Draw well Ujjini near pit No 15	Okkileru-vagu.	Well in Ibrahim's Chini garden	Nagireddi-palli. Chintalabhavi	Rudravaram well in Chini garden
Total solids at 405°C	15·1	45·0	67·8	109·2	153·4	87·4	24·8	24·6	23·4	33·4
Calculated salts:										
Calcium bicarbonate	8·1	15·4	25·1	19·4	33·2	29·2	16·2	17·0	19·4	12·1
Magnesium ,,	4·5	8·5	18·6	29·6	38·7	20·4	7·2	2·2	6·9	7·4
Sodium ,,	3·2	2·9	19·6	31·5	...	...	1·9	...	0·5	15·8
Calcium carbonite	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	...	...	...	...	...	...	...	...	...	...
Sodium ,,	...	...	...	...	...	...	...	...	...	...
Calcium sulphate	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	...	...	...	...	4·3	3·2	...	...	...	...
Sodium ,,	1·5	4·5	2·7	6·1	6·7	4·3	2·2	1·0	1·1	1·8
Calcium Chloride	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	...	...	...	...	...	...	...	...	...	...
Sodium ,,	3·5	23.5	15·3	29·4	92·8	37·6	7·0	4·7	3·5	5·9
Depth of water in summer	...	...	50	50	60	55	...	15	15	15
Depth of water table in rainy season.	...	...	45	40	50	50	...	...	7	7

APPENDIX IV—Contd.

Area	Rudravaram—Sirvel				Diguvameta					
Serial No.	11	12	13	14	15	16	17	18	19	20
Paticulars	Rudravaram well in Chinna Ramayya's Mango garden.	Well in Mango tope near pit No. 26	Rudravaram well in Reddy's tope	Negireddipalli Draw well	Kanchipalli step well	Kanchipalli step well	Giddalorepalli Bhavi-step well	Giddalore Virannabhavi	Krishnnan Safiy palli draw step well	Krishnan setty palli draw well of choultry
Total solids at 105°C	32·0	48·4	51·6	12·4	33·2	37·6	73·5	74·8	192·3	98·6
Calculated salts:										
Calcium Bicarbonate	16·2	25·1	6·5	9·7	12·1	7·3	24·3	25·9	5·7	4.9
Magnesium ,,	14·8	6·6	5·0	2·9	15·1	9·3	...	12·0	10·9	7·9
Sodium ,,	6·5	...	42·9	...	2·0	20·4	...	...	104·2	64·9
Colcium carbonate	...	...	...	...	...	...	40	...	...	...
Magnesium ,,	...	...	...	...	...	...	...	5·9	...	...
Sodium ,,	...	...	...	...	6·4	6·4	...	...	42·4	24·3
Calcium sulpate	...	...	...	...	...	...	6·0	...	...	...
Mangnesium	...	3·7	...	1·1	...	...	...	3·0	...	...
Sodium ,,	1·1	3·5	0·6	...	...	...	...	0·7	1·3	3·5
Calcium Chloride	...	...	...	...	...	...	1·2	...	...	...
Magnesium ,,	...	...	...	...	...	...	16·9	...	...	...
Sodium ,,	3·5	21·2	14·1	...	4·7	5·3	9·6	21·1	61·4	12·9
Depth of water table in summer (ft)	15	20	15	...	35	40	50	60	45	40
Depth of water table in rainy season	6	10	6	...	25	30	45	40	30	35

APPENDIX IV—Contd.

Area	Giddalore					Vontimitta				
Serial No.	21	22	23	24	25	26	27	28	29	30
Particulars	Modarupallimora saguranna step well	Giddalore Mission school draw well	Krishnam setty village well	Giddalore taluk office draw well	Giddalore river Sagileru	Pachapalli near Pit No. 51	Salabad near Pit No 52	Mangampet near Pit No. 56	Polubuchayya galipalli Venka near Pit No. 53	Nadimpalli near pit No. 54
Total solids at 105°C	46·8	71·2	120·6	59·1	20·7	43·0	40·0	48·0	19·0	42·0
Calculated salts :										
Calcium bicarbonate	11·7	16·6	8·1	29·1	10·5	23·5	24·3	31·6	11·3	26·7
Magnesium ,,	11·4	24·5	25·5	5·9	8·1	22·3	19·0	21·2	0·9	24·4
Sodium ,,	...	...	37·9	...	...	...	...	...	0·7	24·4
Calcium Carbonate	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	1·7	2·9	...	4·2	1·3	...	...	...	...	...
Sodium ,,	...	4·8	...	17·0	0·4	...	...	...	...	...
Calcium sulphate	...	...	...	...	...	...	...	...	...	...
Magnesim ,,	...	...	...	2·5	...	...	0·4	2·5	...	1·4
Sodium ,,	...	2·4	8·1	...	0·9	3·4	3·1	...	...	...
Calcium Chloride	...	...	..	...	..	...	...	...	...	...
Magnesium ,,	2·2	...	...	9·0	...	...	...	1·3	...	0·3
Sodium ,,	25·9	25·7	35·7	7·7	4·1	7·0	5·9	6·0	2·9	4 3
Depth of water table in summer	50	55	50	55	...	20	30	30	...	15
Depth of water table in rainy season	40	40	35	45	...	15	20	20	15	3

APPENDIX IV—Contd.

Area	Vontimitta							Kodur			
Serial No.	31	32	33	34	35	36	37	38	39	40	41
Particulars	Cherlopalli near pit No. 55	Chelam Reddi's natural garden near pit No. 57	Chellama Reddy's made up garden near pit No. 59	Mantapampalli waste land near Pit No. 61	Vontimitta out skirts	Vontimitta town	Vontimitta tank water	Mallapalli Kondayya's garden	Rachapalli Obili Reddi's garden	Balli Reddipalli Iswara Reddy's garden	Satram Rapupalli Sitaramayya's garden
Total solids at 105°C	27·0	33·0	44·0	22·0	63·0	68·0	11·0	27·0	50·0	60·0	38·0
Calculated salts :											
Calcium Bicarbonate	13.8	25·1	21·1	15·4	30·0	59·1	5·7	11·1	28·3	34·8	19·4
Magnesium ,,	12·2	13·9	18·3	10·3	0.7	...	5·1	17·1	26·3	22·7	23·4
Sodium ,,	7·0	...	...	2·5	...	...	...	0·6	0·6	...	...
Calcium Carbonate	...	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	...	...	...	...	...	...	...	...	...	...	...
Sodium ,,	...	...	...	...	...	...	...	...	...	...	...
Calcium Sulphate	...	...	...	...	...	93·1	...	...	...	...	...
Magnesium ,,	...	1·8	2·1	...	6·3	25·0	...	...	4·1	2·5	0·4
Sodium ,,	1·0	...	...	0·7	...	...	...	0·8	...	...	...
Calcium Chloride	...	...	...	...	...	...	...	...	...	...	...
Magnesium ,,	...	0·3	1·1	...	7·6	61·0	0·6	...	1·0	6·0	1·4
Sodium ,,	4·1	5·5	6·2	2·9	7·6	87·5	0·7	2·3	9·9	10·8	3·6
Depth of water table in summer (ft)	15	20	20	15	30	35	...	40	40	30	40
Depth of water table in rainy season	3	10	10	4	20	25	...	30	30	20	25

APPENDIX IV—Contd.

Area	Kodur									Panyam	
Serial No.	42	43	44	45	45	46	47	48	49	50	51
Particulars	Reddivaipalli Mannuri Sitaramaya's garden	Well of Rami Reddi Kondayya & Co. of Kichamma Agraharam	Chiyyavaram Venkata Reddi's garden	Tirupatiyeru	Anantarajupeta Sivarami Reddi's garden	Anantaraju petta Anavama	Sattigunta Samba-sivan's	Janakipuram Lakamma's garden	Panyam tank	Panyam draw well	
Total Solids at 105°C	41·0	55·0	26·0	10·0	29·0	49·0	14·0	20·0	19·0	38·0	
Calculated salts:											
Calcium Bicarbonate	21·9	25·9	19·4	4·9	21·1	20·2	6·5	13·8	12·1	31·6	
Magnesium ,,	18·3	25·6	9·9	2·9	14·3	30·5	0·7	3·7	7·1	8·8	
Sodium ,,	...	...	...	...	...	1·5	...	...	5·3	...	
Calcium carbonate	...	...	...	...	...	...	...	...	...	...	
Magnesium ,,	...	...	...	...	...	...	...	...	...	...	
Sodium ,,	...	...	...	...	...	...	...	...	...	...	
Calcium sulphate	...	...	...	...	...	...	...	...	...	...	
Magnesium ,,	2·4	2·5	0·3	1·3	1·0	...	0·5	0·3	...	...	
Sodium ,,	...	...	...	...	...	6·8	...	...	0·6	3·5	
Calcium chloride	...	...	...	...	...	...	...	...	...	...	
Magnesium ,,	1·3	3·9	0·2	0·1	...	...	0·8	3·0	...	...	
Sodium ,,	5·4	7·5	3·2	1·7	4·1	13·7	5·4	1·6	4·1	1·0	
Depth of water table in summer (ft)	30	25	25	30	25	25	25	25	...	45	
Depth of water table in rainy season	15	15	15	15	10	10	10	10	0	35	

*Selected Article**

Agricultural Research : A Review

By

R. L. SETHI and I. B. CHATTERJEE

The Indian Council of Agricultural Research has now been in existence for well nigh 20 years. The Royal Commission on Agriculture recognised that the problem of improving agriculture was really the problem of improving the village life and this must be studied as a whole. The council kept this point in view and on the one side it organized widespread ramification of co-ordinated research and on the other it subsidized village project schemes embracing important aspects connected with agriculture and animal husbandry in the villages. These schemes on the one side emphasized the importance of scientific aid to agriculture and on the other were so conducted that they have led to a substantial increase in the income of the cultivator. As a matter of fact wherever these schemes have been tried the neighbouring cultivators have also been enthused to adopt many of the methods.

It is difficult to present in a small compass all the varied activities in which the Council has been engaged since 1929. Only a brief description taken at random of some of the more notable items will be given here just to present an idea of the nature and quality of the work that has been and is being conducted under its aegis.

RICE :

In the field of crop production rice occupies the foremost place. The Council gave great impetus to its improvement by subsidizing a chain of schemes at Berhampore, Cuttack, Chinsur, Nagina, Raipur, Habibganj, Bombay, Madras, Mysore, Kashmir, Travancore and Baroda. The major number of these schemes terminated between 1941 to 1945. As a result of investigations on the breeding side, a large number of varieties have been produced which are suitable for varying conditions, such as high and low-lying areas, suitable for resistance under flood, drought and saline conditions, resistant to the attack of insect pests, diseases and so forth.

In parts of Central Provinces and Bihar the evolution of purple-pigmented varieties has solved the menace of wild rice weed which was indistinguishable. This has led to a saving of about 20 lakhs of maunds of paddy equivalent to at least 60 lakhs of rupees in the Chattisgarh Division alone, whereas the cost of research was about a lakh of rupees.

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The percentage increase amongst the important varieties has been 20 to 25 per cent in Bihar, 30 to 52 per cent in Orissa, 17 to 23 per cent in Travancore and 55 to 70 per cent in Kashmir. The results in Bengal and Madras have also been of similar order.

WHEAT:

In wheat the most intriguing problem has been that of rust, which recently devastated a large area in Central India, Central Provinces and Berar, Bombay and Hyderabad, etc. during 1946—47. In Central Provinces and Central India the entire crop was lost leaving nothing even for seed purpose and in the former province, the Government had to import 40,000 tons of wheat for distribution as seed. The situation had become so serious that three meetings were called by the Government of India and held at Delhi to consider measures of control and a Wheat Rust Control Committee with the Agricultural Commissioner with the Government of India as a convener was formed. The Indian Council of Agricultural Research also convened a special Wheat Rust Committee in December 1947 in Delhi and again in the Crops and Soils Wing meeting held in April 1948 in Madras.

There are three types of rust, viz. black, red and yellow; each having several physiological races. These physiological races (for each type of rust) cannot be distinguished from their outward morphological characters. Their main difference lies in the power of attacking different varieties and strains of wheat or other cereals and/or plants. The problem here is to evolve by breeding, hybridization, etc. such strains as will be immune or resistant to one or more or, if possible, all of the physiological races. The Council has for the last 18 years (since 1930—31) been subsidizing a comprehensive scheme of research on this highly important work. Although the results have not reached the final stage yet it has been highly instructive. The study on the life-history of the different rusts along with their behaviour on alternate hosts, have thrown much light on their possible role. The work suggests that the persistence of rust from year to year is probably not due to alternate hosts but to the over-summering of the disease on volunteer (i. e. self-sown) crop and early-sown wheat in the hilly areas of Nepal in the North and Nilgiris in the South. The disease from there is carried by wind to the plains where the standing crop is infected resulting in bad years, the complete destruction of the entire crop. In normal years the loss may be about five per cent involving about six crores of rupees in both Indian Dominion and Pakistan. The ameliorating measures lie in breeding rust-resistant types and adoption of control measures. In both these Council is concentrating attention. In this connection work has been going on in Bombay, Central Provinces, Central India, Simla, Bhowali, Karnal and Agra.

MILLETS :

In connection with investigation on millets under the aegis of the Council the results show in the case of *jowar*

(i) an increase of 20 per cent yield of *jowar* in areas of scanty rainfall by dry farming methods,

(ii) control of fungus attack of *jowar* by treating the seed with copper sulphate and powdered sulphur, and

(iii) control of *jowar*-borer by mechanical methods of cleaning the stubbles after harvest and burning them.

In addition to these, investigations on control of *jowar* Striga is also in progress. *Jowar* malt has been produced and its use as a supplementary food for infants has been suggested.

In respect of maize which is a highly prolific crop, it can play a very important role in making good the deficit in our food supply if arrangements can be made for the production of hybrid maize seed. Considerable work, both of fundamental research and production of hybrid vigour on a commercial basis has been done in America. Work has been initiated under the grants of the Council at the Indian Agricultural Research Institute and in important maize-growing Provinces in India. Some work was also conducted under its grant at Lyallpur now in Pakistan.

Co-ordinated schemes have also been started on *bajra* and *ragi*, etc. yielding useful results. Trials in Baroda with *bajra* have yielded as high a yield as 731 lb. as against 531 lb. (local). In Mysore they have recorded 30 per cent more yield over the local variety. In Mysore some exotic *oodule* (millet) has yielded 1,520 lb. as compared to 360 lb. of local varieties.

PULSES :

In the case of pulses, India is very rich in species and varieties. In view of the bulk of the population being vegetarian and in order that the urgent protein requirements of the people can be met from this source, at the recommendation of Sir John Russel, the Council initiated a co-ordinated research scheme in almost all Provinces and States, on grams, horse-grams, *arhar*, *mung*, *guar*, peas, *urd* and other pulses. Already important results from different places have been obtained; for instance, in Poona eight selected varieties of gram have given 10 to 30 per cent increase over local type. In Central Provinces one variety gave 726 lb. per acre against 226 lb. and another 1,100 lb. against 818 lb. of the control. A study of the protein content has shown that the white-seeded gram has the highest percentage of protein (23 per cent) whereas the bold-seeded variety has 20 to 21 per cent and brown-seeded variety 16 to 17·5 per cent. Wilt is a severe disease which

causes considerable damage to this crop. Work has been in progress in many places to evolve varieties resistant to this disease. Successful results have been obtained in some centres. In the case of *arhar* which is also susceptible to wilt it has been found that when it is mixed with *jowar* the incidence of wilt was much reduced, the mortality in *arhar* being 32 per cent as against 88 per cent when *arhar* was sown alone as a single crop. Mixed sowing has thus proved of great advantage.

OILSEEDS:

In oilseeds high-yielding strains have been evolved in schemes sanctioned in different provinces and varieties with higher percentage of oil have been obtained.

In Madras in the case of groundnuts selection No. AH 678 yielded 10 per cent more than AH 25 and was found superior in shelling percentage and weight-volume relationship. It also gave a saving of 25 per cent in the seed rate as its kernels are smaller in size.

FRUITS:

The importance of fruits requires no emphasis in a country like India, and here the Council has been subsidizing schemes in Madras, the United Provinces, the Punjab (now East Punjab), Bihar, Bengal (now West Bengal), Central Provinces, Assam, Hyderabad, Mysore, Coorg, etc. Investigations are carried out on various types of fruits such as mangoes, papayas, peaches, banana, etc. Fruits require a long range investigation and sometimes years must lapse before practical results can be expected. The Council has a Fruit Development Adviser to advise on fruit research.

In the Punjab in regard to the quality of Malta orange it was noted that the quality of the fruit in respect of soluble sugars and acidity was greatly improved by the application of ammonium sulphate and farmyard manure.

At Chaubattia phosphates increased the vigour of apples significantly.

Some mention should also be made of the work on cold storage, preparation of recipes and syrups, cordials, juices, candy products, etc. Canning of fruit and preservation of fruits, is conducted in Madras and at the Indian Institute of Fruit Technology in the Punjab, now at Delhi.

POTATOES:

Due to the initiative taken by the Council there has been valuable collection of potato varieties in Simla. Many of them have been brought from their original home in South America (Chile, Peru and Bolivia). These have formed material for evolving improved types of hybridization. Work on potato has been conducted from various points of view, one of

which deserves special attention, viz. the development of the tuberless sowing, by which immense saving of seed can be possible. Each tuber is capable of producing 20 to 40 plants by this method. The investigation of potato will be passed on to the Indian Central Potato Institute.

In view of the recommendations of the Famine Inquiry Commission the Council has also initiated measures to develop other root crops like sweet potato, tapioca, etc.

FODDER CROPS AND GRASSES:

For improvements of these crops the Council has sanctioned combined Agricultural and Animal Husbandry Research Schemes in different Provinces and States.

MANURIAL EXPERIMENTS:

On the manurial and cultural side the investigations initiated by the Council have led to results of enduring value. One of the first that the Council undertook soon after it came into being was the examination of the previous manurial experiments conducted all over India. These have since been embodied in voluminous publications and also bulletins and papers. These experiments however suffered from the fact that in those days the modern satistical methods were not known and the designs of experiments did not permit critical examination. Since then at the initiative of the Council manurial experiments on statistical basis have been undertaken in all the Provinces and States thus giving more reliable basis of information. In this connection investigations have been conducted with organic and inorganic manures, farmyard manure, cattle-dung, compost, oilcakes, etc. Along with these, chemical fertilizers have been tried and in all some 5,000 manurial trials have been conducted, on various crops including paddy, wheat, *jowar*, groundnuts, millets and other oilseeds and pulses. The most important conclusion is the great need for the application of nitrogen in some form or other. There is no place where the application of nitrogen has failed. Under irrigated conditions, wheat showed a universal response to nitrogenous fertilizers and manures. Under unirrigated conditions there were fluctuations but in spite of these the tendency was for a general response. In the case of paddy 20 lb. of nitrogen per acre appears to be minimum dose and there are indications that the doses can be profitably increased to 60 or 80 lb. in areas where the level of fertility is high. Oilcakes have been found as good as or often better than ammonium sulphate. The increased yield through ammonium sulphate has varied from 21 to 24 per cent in Bengal to 70 per cent in the United Provinces and Kashmir. With oilcakes the maximum increase has been as high as 110 per cent, 120 per cent, 150 per cent and even 190 per cent.

Considering that in green manuring the cost of nitrogen is only a fraction of its cost as compared to other manures like inorganic fertilizers or oilcakes, the practice of green manuring has been encouraged in all areas where water supply is assured and particularly in irrigated areas. An application of 30 to 40 lb. of nitrogen through green leaves is likely to increase the yield by 22 to 30 per cent whereas heavier doses of 60 to 80 lb. of nitrogen have given in certain cases over 100 per cent increase.

The investigations further point that there is no critical evidence to show that repeated application of the fertilizer without organic manure does harm to the soil or that repeated applications of ammonium sulphate alone over a series of years cause a fall in the yield.

In Bengal a manurial schedule has been worked out at six different price levels of paddy and four levels of ammonium sulphate. The schedule shows that manuring is paying even at the peak price of ammonium sulphate at Rs. 250 per ton if the price of paddy at Rs. 5 per maund is assured and moreover, of the two doses, viz. 20 lb. and 40 lb. of nitrogen per acre the double dose is more remunerative. In the case of some of the other provinces statistical equations have been worked out for forecasting the possible return under certain sets of conditions.

In the case of wheat manurial experiments have given increased yield varying from 6 to 63 per cent.

The experiments were not generally confined to the limited objective of only finding out the nature of response under different doses. Investigations in many cases included other important matters. Thus it was found in Central Provinces, in the case of wheat, that ammonium sulphate was very effective when applied with seed whereas soidum nitrate was best at top-dressing. The drilling of fertilizers further showed that the response per unit of fertilizer was double as compared to broadcasting. In the case of *jowar* the trials at Poona suggest that the application of nitrogen at showing time is preferable to latter application. Trials at Coimbatore on *jowar* showed that there was a depression in yield by the application of inorganic nitrogen or phosphate singly but there was a phenominal increase obtained by joint application of nitrogen and phosphate, the increase being largest on poor land. In the case of *ragi* also it has been found that phosphate is an essential supplement to nitrogen under rain-fed condition in Mysore. At Dharwar in the case of *jowar* the response to oilcakes was increased threefold or more when they were applied on a basal dressing of farmyard manure. In Bihar where the soil is generally deficient in phosphate the response to phosphate under wheat takes place only when it is added as a supplement to nitrogen. In the black soil tract as well as in the Gangetic alluvium under irrigated

conditions on wheat, August has been found to be the best month for applying farmyard manure and is to be preferred to October. It has been further found that a combination of organic and inorganic nitrogen is more effective than either applied singly and that bulky manures like farmyard manure cattle-dung, compost, etc. have a lower efficiency of nitrogen as compared to that of oilcakes.

Green manuring experiments on wheat in the United Provinces show that ploughing of sand after seven to eight weeks' growth and *guara* after twelve week's growth was better than burying earlier and that if sand was allowed to manure by burying there was a depression in yield. Experiments at Lyallpur showed that green manuring supplemented by 10 lb. of nitrogen as ammonium sulphate gave per acre more grain than green manuring plus 10 lb. of nitrogen as soidum nitrate. In the case of groundnut there was an appreciable response to nitrogen from ammonium sulphate but its application at showing time yields better results than divided application. It has been found in the Punjab that correct spacing may increase the yield by 25 per cent. The response of groundnut to a combination of nitrogen and phosphate was considerable in Madras, Bombay and Central Provinces.

An interesting feature has been found in the case of linseed both in Central Provinces and the United Provinces. There was little or no response to nitrogen or phosphate singly or in combination with cattle manure. It is proposed to investigate the cause of this. In the case of *toria* it has been found in the Punjab that ammonium sulphate at 40 lb. of nitrogen per acre applied half at sowing time and half at flowering produced 1,026 lb. against 700 lb. in unmanured plot. It has been further found that if in the normal rotation in which *toria* follows wheat, the land is green manured with *guara* before sowing wheat the yield of *toria* is considerably increased due to the residue of green manure.

In the case of fruits it has been found at Sabour that ammonium sulphate and farm-yard manure applied on mangoes after harvest gave significant increase in flowering in the following season and that nitrogen significantly increased growth.

It has been found in Madras that biennial bearing in mangoes is not the inherent feature of most of the varieties and optimum crops can be secured every year provided the tree in the preceding season has made normally vegetative growth.

OTHER WORK:

The other work of the Council includes soil survey, investigation on dry farming agricultural meteorology, village project scheme. All-India Compost Scheme, investigations on medicinal and other miscellaneous plants, etc.

As regards soil survey the Council decided that before a comprehensive soil investigation was undertaken all existing information on the different soil types occurring in India should be collected and collated. Accordingly the All-India Soil Survey work was started in 1942 and the information thus collected is now ready for publication. In agricultural meteorology the Crop Weather Co-ordination Scheme deserves special mention. This work contemplates organization of a net work of stations for detailed observations of crop growth, yield and environmental and weather factors to build up crop weather statistics on scientific lines. Questionnaires were circulated to the districts and according to the replies received, crop weather calendars have been prepared for each important crop. These are of great value to the weather forecasters in issuing the *Farmers Weather Bulletin*. On this basis the weather services for agriculture have commenced with the issue of daily *Farmers Weather Bulletin* in Indian languages through All-India Radio.

It will be seen from the above that since the inception of the Council, work of far-reaching magnitude has been undertaken and the results so far achieved have been of a very high order. It may of course be asked as to how far results achieved have been adopted in the country. Here also the Council has tried within its limited funds to initiate organizations for work like seed multiplication but the major part of this work devolves on the Provinces and States and it can be reasonably expected that as days pass this will be taken up more and more vigorously. A large number of newer problems are also awaiting solution and the schemes on some of them are already under consideration of the Council.

In order to keep the work up-to-date the Council has been inviting experts from abroad to review the work in progress and lay down lines for future guidance. Sir John Russel visited the country in 1936–'37 and his report has since served as a useful guide to the Council for sanctioning schemes in different parts. Dr. Shuhart was invited in 1944 to advise on soil conservation of the country. Now Dr. A. B. Stewart of the Macaulay Institute for Soil Research, Aberdeen, who was invited to make a report on the soil fertility investigations in India with special reference to manuring, has suggested ways and means of bridging the gap between research and practice and the Council is considering a scheme to implement his recommendations.

The Council has also launched a model scheme to develop 20 villages in Delhi Province by co-ordinating work of different aspects on agriculture and animal husbandry. This is likely to serve as a guide as to how by the development of agriculture other aspects of rural life which are so intimately linked up with it, can be improved.

The total number of schemes which have been so far financed by the Council exceeds 200. On the agricultural side the total amount involved is 1·02 crore rupees.

It may as well be asked as to what value has been obtained from the expenditure of such an amount. It will however be seen from the description given in the foregoing that improved strains to suit different conditions of soil and climate have been evolved in rice, wheat and other crops. In view of the limited funds allotted to the agricultural research compared to some of the more progressive countries of the world, the work here could not be as much as should have been, but in spite of it the results have been really considerable.

The increased yield due to improved varieties have varied broadly up to 25 per cent. But even if we make a conservative estimate of only 10 to 15 per cent of return, it will show how much it has been possible to achieve within the limited funds spent. The total estimated acreage of cereals and millets in the undivided India was of the order of over 200 million acres, out of which rice and wheat in the then India occupied about 81 million acres and 35 million acres respectively. If we take the case of only these two areas the estimated production is 27 million tons of rice equal to 739 million maunds and 9 million tons of wheat equal to 243 million maunds. If we assume only a very small increase, viz. only $\frac{1}{4}$ of a maund per acre due to improved varieties (actually it is considerably more in some cases it exceeds double the normal yield) it works out to an extra yield of about 29 million maunds which even at Rs. 10 per maund offers a return of 29 crores of rupees. Compared with this the amount spent annually by the Council has been 0·56 crores and is expected to reach 1·025 crores when the schemes terminate.

As a matter of fact the amount annually spent on agricultural research in India has been very little, viz. about $\frac{1}{4}$ of an anna *per capita* per annum of 1/10th of an anna per acre of the total area. The total sum thus spent was less than two-thirds of that spent on agricultural research in the United Kingdom where the population is $\frac{1}{8}$th and area only 1/20th of that of undivided India. It may be stated here that the Central Government of the present Indian Union in its budget for 1948-'49 have allotted a much larger sum of about Rs. 2,02,50,000 for agricultural work and improvement. This works out at 11 pies *per capita* as compared to Rs. 2 for United Kingdom, Rs. 20-14-5 for Canada and Rs. 77-9-11 for the United States of America and the amount is only 0·8 per cent of the total budget expenditure of the centre. The provinces too have allotted a higher sum and it is indeed a happy sign that the improvement of agriculture is being gradually recognized. But in order that the problems can be tackled from all angles greater scope and larger funds are an urgent necessity.

HINTS TO FARMERS

The cultivation of seedless grapevine: The variety grapevine known as seedless or Kismiss was introduced in Madura District during the year 1938 from Kabul, by the Agricultural Department, Madras and planted at Pattiveeranpatti. Gradually, the cultivation spread and to-day this crop covers an area of nearly 40 acres in Madura District and to a small extent in Ramnad and Tirunelveli Districts.

Soil: This variety grows well in well drained red loam tolerating a small mixture of gravel.

Climate: The vines are able to withstand heat but the crop fails in those places where the rain-fall is more than 40" per year. The influence of strong wind should be considered and good and proper wind break should be provided to save the crop from Southwest and Northeast monsoons.

Planting: Pits 3' x 3' x 3' are dug ten feet apart either way and two cuttings are planted in each pit and this is known as 'Square System' of planting, and when the vines reach the pandal, they are trained in opposite direction so that they may grow and cover the entire pandal. Another method of planting known as 'Trench System' is done by digging long trenches 3' x 3' at a distance of 30' to 35' apart and cuttings are planted 6' to 8' apart along the trench and when the vines reach the pandal they are trained in opposite directions. Cuttings 1' long with 4 or 5 good healthy buds are selected during the June – July or December – January pruning, and if they are taken in June – July, the cuttings are planted for striking roots in a well prepared raised nursery formed close to any water source and these can be transplanted in the prepared pits during December – January. Cuttings taken during December – January can be directly planted in the permanent pits already prepared in the garden, without growing them in the nursery as being done for the June – July cuttings.

Manuring: The pits in both the systems are three-fourth filled up with well decomposed cattle manure, tank silt and green leaves in alternate layers and the remaining one-forth top portion is filled up with soil removed while digging the pits. Manuring of pits should be done three months before planting, allowing sufficient time for the green leaves inside the pit to rot completely.

Irrigation: The vines are watered once in two days just after planting and when well established, watering is done twice a week.

After-care and pruning: Two months after planting, a bamboo stick is planted close to the vine for support. Within seven months

after planting the vines grow to a height of 6′ to 7′ when they are trained on a pandal constructed for the purpose with Malakiluvai (*Balsodendron Berii*) as live standards and Agathi (*Sesbania grandiflora*) as cross posts.

Care should be taken to keep the vines free from pests and diseases appearing during different parts of the year. Twelve months after planting, the vines are given the first pruning — the important operation without which there will be no fruiting of vines. It is found by experience that vines growing vertically do not bear so well as the branches that grow horizontally, and the best results are obtained by the 'Bower' or pandal system in which the vines are allowed to spread over a pandal shaped and trained to convenience. By the process of pruning the sap is diverted to flow to the fruiting area, keeping the vines in manageable shape and makes them bear heavily. Fruits are borne near the base of the growing shoots of the season, shoots which spring from the wood of last year's growth, and vines are pruned following this principle.

Harvesting: Three months after pruning, grapes are harvested when fully ripe, and texture of the pulp and taste alone will give correct indication of ripeness, and since the colour varies according to varieties that alone is not a conclusive proof of ripeness. Grape bunches when once harvested do not ripen afterwards. Bunches should be carefully handled by the stem while harvesting, trimming and packing. Enough quantity required for daily despatch should alone be harvested. Unless facilities for cold storage are provided fruits will be unfit for despatch after twentyfour hours.

Packing: Bunches are examined and after trimming of useless cracked, unripe and rotten fruits, they are packed in bamboo baskets. Paddy straw is used as padding between each layer, and each basket holds 25 pounds or 1 maund. Small earthern pots are also used in packing grapes intended for places where there is transhipment.

Marketing: This is the most important item and unless there are facilities to market one's produce (this fruit being succulent has no keeping quality and should be disposed of as early as possible) it is not advisable and also not profitable to grow this crop on a commercial scale. There should be easy and quick transport facilities from the garden to the railway station and from there to the different parts of the Presidency. Another important factor in getting good profit is to avoid middlemen, and arrangements should be made to have Fruit Growers Association and Co-operative Societies with whose aid the produce of the various gardens may be sold with advantage. Contributed by Sri. C. Rangaswami, Plant Protection Assistant, Mycology, Madura.

REVIEW

I

W. Wouters — Contribution a l'etude Taxonomique et Caryologique du Genre *Gossiypium* et application a l'amelioration du contonnier au Congo Belge. Contributions to the taxonomic and karyological studies of the genus *Gossypium* and its application in the improvement of the cotton plant in Belgian Congo; Taxonomy of the cotton; study of the species indigenous to Belgian Congo and the cytology and phylogeny of *G. arboreum* L. and *G. hirsutum* Mill.) *Publications de I' Institute National pour L' elude Agronomique du Congo Belge. Serie Scient.* No. 34; 1948, pp. 383; bibl. with 5 plates and many figures. The work has been dealt with in three parts viz. Part I the revision of the systematics of the cottons, Part II. the study of the cotton species indigenous to Belgian Congo and Part III. Contributions to the phylogeny of the cottons—Section NeoGossypium (the tetraploid cottons.) The stages in the evolution of the different systems of classification from the time of Linnaeus 1753 to that of Hutchinson 1939 and Konstantinov 1939 has been traced. The author has critically examined the comparative merits and demerits of the different morphological characters employed in the classification of cottons. An interphyletic comparison of the genus *Gossypium* has been done and a hypothetical phyletic relationship arrived at. A chapter has been devoted to the discussion on the geographical distribution of the genus *Gossypium.* The second part is devoted entirely to the consideration of the cottons of Belgian Congo indigenous as well as wild species treated under :—

A. Cottons indigenous, diploid and Asiatico-African in origin,

B. Cottons American, tetraploid and American in origin.

The species that have been considered as truely indigenous and definitely of African origin are A. exclusively wild —

1. *Cienfuegosia triphylla* (Harv). Hoch.,
2. *Gossypium anomalum* Wavra et Peyr.,
3. *G. Kirkii* M. Mast. (*Kokia Kirkii* Skovsted).

B. cultivated —

4. *G. herbaceum* var. *acerifolium* subvar. *africanum* and
5. *G. herbaceum* var. *aceriflorium* subvar. *Wightianum.*

There are altogether 17 species cultivated and wild met with in Belgian Congo. Some of the wild species possess remarkable fibre lengths and rugosity even in unselected plants. (Staple length 27 to 28 mm). These useful species are under danger of extermination due to their being uncared for by the natives and the systematic destruction by the colonial agents. The introduction of the American cottons has taken

place along two converging but opposite direction, the older one from West to East, through the Atlantic ocean and the other more recent through the Pacific and Indian ocean. All the wild cotton plants of the Belgian Congo belong to three — different though related — South American groups. The North American group is not represented in the Belgian Congo among the wild species.

The majority of the wild cotton plants have qualities of resistance and adaptability, the fibre is rough and in some of an excellent quality, 1 to 16″ long. These allow of selection and isolation of sympodial and precacious types. The author recommends the back-cross technique to be followed in the improvement and introduction of useful characters. He pleads that these valuable wild species with their varieties should be properly preserved. The difficulty of combining the useful characters and at the same time preserving the precocity of the hybrids (seven months duration) owing to probable unfavourable linkage groups is realised. In such cases the hybrids would for the present not be useful; and one's efforts should be turned towards the production of an artificial Upland species and in increasing its variability. That objective may be attained by synthesising by paraphyletic processes of a plant as similar as possible to the Upland species. For this a more precise phylogenetic data is indispensable. In breeding cottons for Congo the immediate and future programmes should be:- (a) of first importance is to improve the Upland types of Congo (Triumph and U. 4.) by pedigree method and cross-breeding and the same time maintaining the variability of the Upland species. The study of the wild plants on a small scale and selection of sympodial and monopodial types should proceed on. (b) of second importance is the thorough selection of the types resulting from the back-crosses. (c) of next importance the creation of a more variable Upland species capable of producing types well adapted to the Congo.

In the third part the author critically reviews the earlier cytological works upto 1941, including the several interspecific hybrids, polyploids colchicine induced as well as spontaneous. The root tips for somatic study were obtained by germinating the seeds in petri dishes. Fixations were done in Navashin's fluid as modified by Dustin (1% charomic acid–75 parts; 40% comm. formaldehyde 20 parts; Glacial acetic acid 5 parts.) for 24 hours duration and stained in Haidenpeins Ironalum-Haematoxyline. A detailed account of the method employed in measuring the chromosomal lengths is given. The author finds that in *G. arboreum*, no corroborative evidence could be found to support the theory of secondary polyploidy of the $2n = 26$ species. In *G. hirsutum* Mill. the autopolyploidy of the species is more proboble but taking into account the variability in the chromosomes and errors in measurements the accuracy could be only of the order of 36%. The author supports the view that this species originated as an allopolyploid.

Morphologically, half of its chromosomes easily allow themselves to be homologated with the chromosomes of an Asiatic plant; the other half made of small chromosomes, would correspond to a yet unknown parent.

The macromorphological equivalence between the cultivated American plants and the cultivated asiatic ones, is undeniable. The morphological equivalence seems to us very high for half of the set; and as other authors have proved the *intrinsic* chromosomatic equivalence (by meiotic connection among hybrids in between these two groups). *The author feels that the hypothesis that an Asiatic plant* (*G. herbaceum L.* or some other near species perhaps extinct) *must be one of the two parental species of the allotetraploid species of G. Hirsutum* as perfectly justified.

The divergences among authors may be explained by the sole chromosomatic variability. A supplementary cause of error resides *in the difficulty of bringing into evidence the point of insertion,* which entails all the dangers of a subjective interpretation.

Satellites.— It seems premature to think of the interference in phylogeny of the number and morphology of those particularities, before their nature and behaviour have been clearly established.

Cytology:

1. *The chromosomes of Gossypium,* even as to their relative length with regard to each other (or idiogram) *are not constant.* They present on the contray, a variability which can be figured out, and which has to be taken into account when comparing idiograms with each other.

2. *Satellites:* With the Cotton plant no question would arise about the organites attached to the chromosomes by a filament and capable of showing or otherwise according as they are stained or not. There would rather be a question of stained extremities of chromosomes, preceded by a zone which can appear achromatic in conditions not yet defined. If the zone appears achromatic, it determines a chromosome apparently accompanied by a satellite; if it remaines stained during the differenciation, the chromosome will appear as an ordinary chromosome of the same length as the satellite chromosome — including both satellite and achromatic zone.

3. The various fixation agents produce on the chromosome variable morphological modifications, hence we cannot compare nuclear contents which have not been fixed in identical conditions.

4. The subjective factor plays unhappily an important role in cytological observation, which it is sometimes possible to reduce, *but always impossible to completely suppress.* It seems therefore desirable: (a) to give as far as possible the preference to permanent preparations which alone allow to re-examine the interpretations a few weeks after the observation; (b) to number the preparations, drawings of which together

with observation accounts are consigned in publications; and to deposit them in a scientific Institution where they can be consulted, as a material for comparison, by the specialists.

That method, the most useful in Systematic Botany and in Entomology, would probably be most useful in cytological research. It would allow to show that the majority of the divergences and theoretical controversies, based on personal observations and experiments made separately, result in most cases from differences of interpretation. — REV. FR. LEEPEN, Kodaikanal.

II

CYTOGENETICS AND PLANT-BREEDING : By S. N. Chandrasekharan, M. A., and S. V. Parthasarathi, B. Sc. (Ag.) M. Sc., with a forward by K. Ramiah, L. M. Sc., Dip. Agri. (Cantab)., M. B. E., F. N. I., F. A. Sc., *Published by Varadachary, 1948. Price Rs. 12—8—0.*

The present century has witnessed the rapid advance of the science of genetics and its application to plant-breeding. In India a considerable volume of useful work in this field has been done, but the record of this work lie scattered in several publications, or unpublished reports, which are not readily accessible to the students and teachers of biology at our colleges.

Genetics and plant-breeding form an important part of the syllabus in the Agricultural Colleges and the lack of suitable text books on the subject dealing with Indian crop plants has been felt both by students and teachers.

"Cytogenetics and plant-breeding" by S. N. Chandrasekharan and S. V. Parthasarathi is an attempt to satisfy this need, and the authors deserve much praise for making this pioneer attempt and succeeding in bringing out a good text book on a very difficult subject.

They have taken great pains over the book, and have brought within its compass a large mass of relevant and useful information relating to Indian crop plants and the text is illustrated with a number of photographs and diagrams.

The matter is clearly presented in a readable form and the beginner or layman would find no difficulty in following the book and acquiring a basic knowledge of the fundamentals of the science of crop improvement.

The few chapters in the end of the book are devoted to 'statistics in relation to plant-breeding', and to explaining the technique of laying out field trials for the benefit of beginners.

The book is a useful addition to the few good text books on biological sciences published in India.

Extracts

Why India Starves and the Remedy.

Starvation of the soil is the root cause of our own starvation. Mother Earth is truly a living being and if we do not nourish her she cannot nourish us. Man must have noticed the invigorating effect on the earth of the dung and urine of his cattle and how the sweepings of his cow-sheds after they had rotted gave out a smell like rich vigur soil. In this way he must have arrived at the preparation and use of farm yard manure, the roughers and oldest form of "compost". In some countries this process developed naturally through age long intelligent practices of the peasantry into a highly advanced method of composting as in China where the cultivator has developed a record yield per acre. In others it remained at or reverted to the primitive stages as in the Indian villages to-day. With the advent of modern science and mechanisation of Agriculture came the introduction of artificial manures especially in the East. Gradually livestock got reduced and the countries which started the modern methods began to recognise their dangers and the scientists are now recommending compost manure as the best of all nourishments for the soil. It contains something of everything that is present in the artificial manures and in addition it is full of rich moisture retaining body building *humus*.

What exactly is this compost? It is simply rubbish mixed thoroughly with either cattle dung and cattle urine or with human excreta. It is easy to make, the necessary ingredients are all present in our village, the villagers ordinary tools are sufficient for the job and the preparation needs no special technical knowledge. Once the method of preparation has been explained, any peasant can prepare it successfully for himself. The only real obstacles in the way are lack of knowledge, indifference and laziness. Once the arch enemiers our progress are mastered we shall get over food shortage, high prices, insanitation and ill-health.

Is not such an achievement worth our fullest endeavour? (Extract from "Why India Starves" by Srimathi Miraben).

Prize for groundnut hand Decorticator. A prize of Rs. 2,000 will be awarded by the Indian Oilseeds Committee to any person or body who designs the best method of groundnut hand decorticator and demonstrates its working to the satisfaction of the Indian Oilseeds Committee or competent body to be appointed by it. Entries accompanied with diagrams showing details of the machine should be submitted to the Secretary, Indian Oilseeds Committee, Ministry of Agriculture, New Delhi, so as to reach him not later than October 31, 1949. Competitors should be prepared to demonstrate the working of the machine at such place and time as directed by the Committee.

The groundnut hand decorticator should fulfill the following conditions :—

1. The hand decorticator should as far as possible, be made of material easily available in the villages. It should preferably be made of wood and should have as little iron part as possible.

2. The construction should be simple enough so that repairs and spare parts can be provided in the villages by the village carpenter or the village blacksmith.

3. The grates or sieves used in the machine should be adjustable to enable proper decortication of groundnut pods of different varieties and sizes.

4. The turnover and cost of decortication should compare favourably to those of power decorticators.

5. The proportion of split and broken kernels, 'nooks' and unshelled pods in the decorticated produce should be as little as possible.

6. The cost of the hand decorticator should be reasonable and should not exceed Rs. 100. (Indian Farming—January 1949.)

Pruning Tomatoes. Tomato is one of the most valuable of the vegetables as it can be used in many forms and is an important source of vitamins. Tomatoes which ripen on the plant contain higher vitamin contents than those picked green and ripened indoors. Since ripened fruit is desirable in as large quantities as possible, the tomato plants should be pruned to a single stem and tied to stakes. This practice has proved best in North Eastern Saskatchewam (in Canada) in the production of early, larger and cleaner fruit in the less disease, injury and more convenient harvesting. Stakes of wood one inch by two inches and five feet long are satisfactory-small stakes may be cut from the bush and used. The stakes are driven a few inches from each plant to a depth of 10 to 12 inches and the plants are tied to them. The injury to the plant is less if the stakes are driven soon after planting. Tying the plant to the stake should be continued as the plant grows. Pruning the plants to one stem consists of cutting or pinching out all side or lateral branches as soon as they appear. During the growing period the plants should be examined at least once in a week and all the side and lateral branches should be removed. This tends to throw all the vigour of the plant into the formation and production of fruit. After three or four flower clusters have set fruits, the top of the plant should be pinched off or cut first below the next clusters of flowers that appears above the clusters to be retained. Any leaf overhanging a cluster of fruits may also be removed to allow sun and air to speed the development and ripening of the fruit. This practice has resulted in early production with larger fruits and heavier yield. Bush types are not adapted to staikng and pruning. (Extract from Indian Farming—November 1947).

Improved Production of Potatoes. In order to effect improved production of potatoes two points must be borne in mind.

(1) Growing of good varieties.

(2) Maintaining of the health of the crop.

It is of paramount importance to keep the crop free from disease. The plants while growing on the field are regularly inspected, rogues are culled to keep up the purity and diseased plants are removed from the field to prevent further continuation. For the same reason potatoes intended for seeds are lifted immature. Another method of great consequence for the production of seed potatoes in the Netherlands is keeping the tubers in stores mainly built of glass. The advantages resulting from this method are: No damage by pest, no fumentation, negligible amount of rotting and continuous control is possible. The seeds can be planted after sprouting. Short strong sprouts are developed under exposure to-day-light. Planting of sprouted sets results in regular germination, an advantage when examining the crop for the detection of diseased plants. (The Netherlands has a fairly mild marine climate with wild winters and cool summers, prevailing high relation humidity of the air, large amount of cloudiness (0·6—0·7) and little sunshine (31% of sunny days). The average temperature is 10°C with a maximum of 19°C in July and a minimum of 2°C in January. The average rainfall is about 700 mms. per year.)

(Extract from Dutch Agriculture—'Facts')

Agricultural News-Letter — Madras

Mixed Cropping of Groundnut and Cotton. Experiments conducted at the Agricultural Research Station, Lam, Guntur District, on mixed cropping of groundnut and cotton in the proportion of eight of the former to one of the latter showed that the yield of bunch groundnuts was not affected and that cotton recorded yields ranging from 260—380 lbs. of seed cotton per acre. Both cotton and groundnut were sown on July 22, 1948 and groundnut was lifted on November 12, 1948. Among the various varieties of cotton tested for mixed cropping, cotton types from U. P. happened to be the earliest and the next in order being 197—3 from East Khandesh and 881 F. from Adoni. U. P. types being early, shed flowers and bolls, while the others escaped this defect by their late maturity and are of better quality and ginning outturn. Farmers of the Ceded Districts, the Circars and Nellore are advised to give this mixed cropping a trial. Even at a modest estimated average production of 50 lbs , of lint per acre, it should be possible to produce two lakhs bales extra.

Pre-sowing Treatment to Wild Indigo Seed. Wild indigo (Tephrosia Purpurea) is a useful green manure crop for sandy and laterite soils, and the stand of the crop depends upon the quality of seed. Usually, the seed is procured indifferently and stocks are carried over from season to season. Further, the seed coat is hard. In order to increase the percentage of germination, the seed requires pre-sowing treatment. Wild Indigo seeds giving normally 25 to 40 per cent protracted germination, under untreated condition, record 75 per cent in about 4 or 5 days by steeping the seed in hot water of 80—90°C for five minutes. This method is preferable to the usual practice of pounding the seed with sand. However, old seeds which have lost their vitality do not respond to this treatment.

Co. 473. A New Variety of Cane. Co. 419 has been popular with the growers and sugar-mills for the past ten years, owing to its wide adaptability. It has been reported that in the Kirlampudi area Co. 419 was so highly infested with scale insects that ryots have been actively considering the replace Co. 419 with a better type of cane.

Among the varieties under trial at the Agricultural Research Station, Samalkot, Co. 473 has been marked out as a very promising cane, to replace Co. 419. Co. 473 has given 58—4 tons on an average for the past two seasons against an yield of 42·2 tons by Co. 419. Even in the month of March, the sucrose percentage of Co. 473 mounts to 20·95 per cent, as compared to 17·30 % in Co. 419. It is a greenish yellow cane with medium sized internodes. It can be distinguished by prominent traingular buds. Its rind is thick and does not form pith and hollowness. The rich sweet cane, POJ. 2878, the wonder cane of the world, being one of the parents, should afford sufficient confidence of its good performance to the cane-growers.

Seeds from Pods Prosopis Juliflora. Prosopis Juliflora, a fence plant, possesses a thick leathery pericarp, which impedes easy and quick extraction of seeds. The pericarp gets softened by moistening the pods with 1·4 sulphuric acid. In about 12 hours, the dilute acid acts on the pericarp. The disintegrated pods are then washed with water and dried in the sun. The dried stuff is pounded to extract the seed.

Co. 25 and 26. Blast Resistant Paddy Strains. In the 1948—49 season, the Taladi (Second) crop in the districts of South Arcot and Tanjore was observed to be severely attacked by *Stem-borer* and *Helminthos-porium*. In the middle of these affected areas, plots planted to Co. 25 and Co. 26 were found to be comparatively resistant to the pest and disease. These are recommended for a large scale cultivation in the Southern and Central Districts. Arrangements are being made to stock large quantities of seed for distribution in the next crop season.

Ideal Table Mangoes. A large number of crosses in the farm seedlings of mangoes has been produced at the Agricultural Station, Kodur, with a view to breed ideal table or juicy mango variety, with economic characters which are now dispersed in a number of commercial varieties. A study of the performance of such of the hybrid progenies as have now come to bearing, resulted in the making out of four hybrids, namely K. O. 3/9, K. O. 9/3, K. O. 9/3, K. O. 7/5, K. O. 11/13 for outstanding merit. A limited number of colonal progenies of the above are now under production at the Fruit Research Station, Kodur, for distribution.

Ducks for Combating Pests. A severe attack of the striped bug was noted on a compact block of 13 acres, at Kattuputtur in the Tiruchirapalli District. A flock of about 1,000 ducks was let into the field as an experimental measure. The result was astounding. Each duck was capable of accounting for about 500 insects in the course of a day. The whole field, infested with the insect, was cleared of the pest in the course of five days. There was no need for treating the field with chemical insecticides.

Gammexane Saves Paddy from Caterpillar. During the month of January, reports were received of the appearance of the swarming Caterpillar (Spodoptera mauritia) pest in the second crop (dalva) paddy seed-beds in the Bhimavaram taluks of the W. Godavari District and Amalapuram and Razole taluks of the East Godavary District. Due to the remedies of flooding kerosination and letting in ducks approximately 60 acres of seed-beds distributed in small patches over the area, were saved. But the pest re-appeared in the broadcasted and transplanted fields. The usual mechanical methods could not be adopted in the transplanted crop, because the bunds were not high. To meet this rapid spread of the pest in the transplanted fields, Gammexane D. ·025 was rushed to the area. The success with the use of Gammexane D. ·025 against swarming caterpillers was so telling that ryots regretted that this was not tried earlier. A total area of 600 acres was estimated to have been treated with the insecticides (Gammexane). It is effective on young caterpillars. It was used at the rate of 12 to 20 lbs., per acre, costing Rs. 1—14—0 to Rs. 3—2—0 for the insecticide and Rs. 3 for manual labour to dust. It is estimated that on an average 7½ bags of paddy, costing Rs. 80/-per acre, was saved by spending Rs. 5/- to 6 in the control of the pest. In addition to the direct saving of the affected crop, a considerable area has been saved by this timely action, in checking the spread of the caterpillar marching from field to field, till they are stopped by control measures or the setting in of the pupation stage. The total paddy crop saved from this dreaded pest on paddy in the second crop season of 1949 in the Godavari Delta can be estimated at 3,000 acres and the value of the produce of the crop so saved may be computed at a very modest estimate to the tune of Rs. 2,40,000.

Sunbeam Mix-Master. At the Fruit Product Research Laboratory, Kodur, an elegant machine has been recently obtained for extracting orange juice. It is a power driven (AC, DC), unit, working a revolving bar and having glass bowls for holding the juice. It is called the Sunbeam Mix-Master and is an American machine, costing about Rs. 320/-. It is very useful for institutions, hospitals, clubs, ice cream parlours, hotels and restaurants.

Improved Dry Farming Practices. Owing to the failure and very often ill-distributed nature of rains in Bellary District in the taluks of Uruvakonda and Gooty of Anantapur District and Pattikonda of Kurnool District, which form the "dry farming zone" of the Province, famines are frequent. As a result of the research work that has been in progress for some years past at the Agricultural Research Station, Hagari, the following improvements in dry farming practices are recommended for adoption:— (1) Growing of quick maturing and high yielding strains: Cotton H. 1., Sorgham M. 47-3, Setaria H. 1 and Setaria H. 2. (2) Adoption of wider spacing of 18" for Sorghum and 36" for cotton. (3) At the last preliminary cultivation operation, bunds are to be formed, with

the bundforming implement, dividing up the field, in compartments of 5 to 10 cents. The bunds help to hold up the rain water for a longer period, thereby resulting in greater absorption of the rain water by the soil. Owing to the extra moisture, so made available, crop yield are increased. An investment of As. 12 per acre is this operation results in an increase in the produce worth Rs. 5/-.

Cattle Inoculation. During the period ending April 30, 1949, 51502 preventive inoculatious were done by toe Animal Husbandry Depaitment for animals against the various contagious diseases, as against 44,677 in the previous two months.

Gleanings

Pressure cooking does not destroy vitamins. Dietitians study a tricky problem: Changes in diet can have unforeseen and serious consequences. In the East, beri-beri has in the course of centuries destroyed millions of lives merely because polished rice — which lacks the husk in which vitamin B of the grain is stored — came to be considered more palatable than unpolished rice.

Today, the rapidly increasing popularity of pressure cookers is setting dietitians a serious problem: they are busy finding out what effect this new kind of cooking has on the nutritional value of food. This research is of the greatest practical importance for it would be a disastrous paradox if one branch of applied science — the use of high pressure steam to speed up cooking and made it cheaper — conflicted with another — the maintenance of health by properly balanced diets.

Fortunately, however, it seems that, rather unexpectedly, this danger will not materialise. Indeed, thanks to this research, the protagonists of pressure cooking can claim as a point in its favour that it enhances the vitamin content of food, rather than reduces it. Thus in seeking to expose a possible danger the dietetic experts seem to have brought to light a real advantage.

Simple principle: The principle of the pressure cooker is very simple. The temperature at which water boils depends on pressure. At ordinary pressures, it boils at 212°F (100°C). At lower pressures, on high mountains or in high-flying aircraft for example it may boil at a much lower temperature. Under such conditions it may be impossible to make an egg set by boiling it and meat is difficult to make tender however long it is stewed. To overcome such difficulties pressure cooking has long been resorted to. During the last few years, however, the pressure cooker has become very popular for ordinary domestic use under quite normal conditions. By heating water in a sealed container at quite a moderate and safe pressure — often 15 lbs. per square inch — it can be boiled at 252°F (122°C) instead of the normal boiling temperature. This extra 40° makes a lot of difference — food cooks in a fraction of the time usually needed and much less fuel is needed. There is an obvious danger in this method however. Two important vitamins — vitamin C, whose lack causes scurvy, and vitamin B whose lack causes beri-beri — are both slowly destroyed by heating. Consequently, it was feared that as quite substantial amounts are lost by ordinary boiling, the even highes temperatures reached in pressure cooking might cause almost all of both these vitaminr to disappear before the food reached the table. In families which relied entirely on pressure cooking this might eventually lead to the appearance of both scurvy and beri-beri.

Exhaustive experiments: Exhaustive experiments recently carried out at King's College of Household and Social Science — a part of London University — have confirmed that this new method of cooking is safe in this respect. Over 5,000 tests were

made altogether in which many kinds of everyday vegetables — cauliflower, carrots, turnips and several others — were cooked under the same sort of conditions as would be found in an ordinary kitchen. The results showed that, contrary to expectation, pressure — cooked vegetables contained more vitamin C — the anti-scurvy vitamin — than ordinary boiled ones. Other experiments, which have been confirmed in other British laboratories, show that vitamin B1 also is not destroyed so greatly. Naturally, an attempt has been made to find out why despite higher temperatures there is more vitamin left. There seem to be three main reasons. The first and foremost is the fact that very little water is put into pressure cookers and even this small amount never comes into direct contact with the food. When food is boiled in the ordinary way, some vitamin is lost by heat, but a great deal more is lost by being *dissolved out* by water. As much as half the vitamin C may be lost in this way and thrown into the kitchen sink. Another important factor is that in the pressure cooker the food is heated to its highest temperature in a very short time whereas when boiled in water it takes several minutes. It is during this preliminary heating that the vitamin is most likely to be destroyed. Yet another point is that in the pressure cooker there is no air, only steam, so that no vitamin is lost by chemical combination with oxygen.

Minerals: Vitamins are not the only important substances which boiling water may dissolve out of food — valuable minerals, such as iron, phosphorus and calciumt are also lost. Experiments in a number of laboratories have shown that scarcely any of these are lost when the pressure method is used. The pressure cooker has gained in favour so rapidly during the last few years — when economy in time and fuel have become so vital — that we may well be starting an era in which its use becomes common place. It is, therefore, gratifying to know that our scientists are keeping a watchful eye for any dangers which may result from such a departure from kitchen convention. (B. F. 1013 British Information Service.)

Locusts are not invincible: As the prevention of locust invasions is still imperfect, new invasions may come, but recent experience has shown that locusts are not invincible. Man can now defend his crops against the invaders, and sooner or later locust plagues will be a thing of the past.

For the last 20 years, scientists of many nations have been studying locusts in Africa, Arabia, India and elsewhere, trying to find out all about their life and habits in order to fight and eliminate their ever threatening menace. To make these studies, scientists travelled through inhospitable deserts and pestilential swamps; they lived for months amongst locusts and learned their ways. They also collected reports on swarm movements in all countries of Africa and plotted them on maps so as to know how locust invasions spread from one country to another, and particularly — to discover where and how the swarms originate. The most striking fact about locusts is that their swarms are not always present. There are periods of several years when there are no swarms at all. It has always been a puzzle — what happens to locusts when there are no swarms? This puzzle has now been solved. It has been found that, when swarms disappear, locusts continue to live in certain places, but they are few in number, do no harm and pass unnoticed by ordinary man. It is more remarkable, however, that even scientists in the past overlooked such non-swarming locusts, because they change their appearonce when not in swarms and look like ordinary grasshoppers. A young non-swarming locust is green, while a locust from a swarm is coloured orange and black.

Under constant watch: The solitary locusts survive only in a few places, and when the season is favourable, they increase in numbers, come together in dense groups and change their colour, becoming dreaded swarming locusts, which travel fast and wide. Once that secret of the change in locusts became known, the places were solitary locusts survive were discovered and the sources of swarms were no longer unknown.

These places are now kept under constant watch, to see whether locusts begin to change If this is noticed, measures are taken to kill off the first swarms, which are yet small in size. In this way, locust invasions can be prevented. Unfortunately, many of these original locust sources are in wild uninhabited countries, where it is difficult to maintain a strict watch. Therefore, there are still places where swarms can develop unobserved and locust invasions are still possible. However, the knowledge of swarm movements is sufficiently good now to enable scientists to make predictions, so that every threatened country is always warned in time to make preparations for defence. During the last war, vast swarms of locusts threatened crops in East Africa and the Middle East, and famine was expected, but warnings were sounded and anti-locust measures organised on a large scale. Thousands of troops, under the direction of scientists, were used to track down locusts and to scatter poisoned bran which locusts love in front of the advancing hordes. This anti-locust war was entirely succesful. Only in few cases was there damage to crops, and famine was averted. [B. F. 1096 British Information Service.]

Grass cubes as cattle feed: Grass dried and pressed into cubes will feed thousands of dairy cows in Britain next winter. This revolution in feeding — which makes grass last all the year round — will save expenditure on imported feeding stuffs. Plants to dry grass and convert it into bales or cubes are being erected in many countries. Most of these are owned by farmers either through co-operative societies or local associations. The associations do the work of manuring, cutting, carting and drying and returning the final product to the farms.

The crop is cut two or three times a year and the average production of dried grass is two tons an acre. The cost averages about £ 15 (Rs. 200) a ton — nearly £ 10 (Rs. 133) less than imported feeding stuffs. Farmers say that cows milk better on and are much healthier. A big stimulus to this scheme has been provided by Government grants. [B. F. 1279 British Information Service.]

New orchard sprayer Impresses: A new Australian machine for spraying crops and orchards with insecticides and for similiar purposes is said to be very successful. The Wilmist dispenses with booms, and is a single compact unit. It can be mounted on a trailer, utility or truck.

A 3·4 h. p. motor is needed to drive a propeller at 3,000 revolutions per minute in a wind tunnel 14 inches in diameter. This produces a 60 mile an hour blast of air through a pipe shaped like a fish-tailed exhaust pipe. Spraying mixture is pumped through jets into the air stream at the mouth of the duct, and throughly atomised.

It is said that the machine is very economical. Whereas old-type sprayers usually needed about 100 gallons of liquid to cover one acre, the 'Wilmist' sprayer can out this down to between 5—10 gallons according to the material being sprayed and the requirements of the crop. [A. G. N. 246]

Toads eat bees: Some bee-keepers in Queensland and northern New South Wales are concerned about the increasing prevalence of the Giant Toad. This unpleasant-looking creature, known as '*Bufo Marinus*' has a voracious appetite for catching them.

The toads feed at night. Taking up a strategic position at the entrance to the hive, they catch the bees as they pass in and out. One bee-keeper maintains that he has seen two-and three-story hives destroyed in 3 weeks by these Giant Toads. A number of toads may attack a single hive. The toad, which exudes a poisonous slime, has also been blamed for the death of cats, dogs and poultry. No convenient way of destroying the toads has yet been found. [A. G. N. 246]

'Earthworm Enterprises': Most farmers and gardeners appreciate the value of worms in improving the soil, and in some places the land has been raised to a higher standard of fertility by encouraging the multiplication of the worms. Mr. Harold Karp, of Randwick, Sydney, claims that if home gardeners used more worms they would get better flowers and vegetables. With a box of 250 worms as breeding stock, he thinks any garden could be started along the road to high fertility, and he has set out to make the necessary worms available. Last December he took up worm breeding as a hobby, but he has now registered 'Earthworm Enterprise' as a business, and has built up a 'stud' of half a-million worms. He intends to sell them at from 15 shillings to one pound a box according to quality.

He apparently has a more ambitious rival in the United States, who recently sought the help of a Sydney newspaper to arrange for the export of some giant earthworms from Gippsland. This worm, technically known as '*Megascolides australis*', may grow to a length of 10 feet and as thick as a man's thumb. However, the prospects of acclimatising these worms in a strange environment are poor. The giant worm is so discriminating in its surroundings that it is found only along the banks of the Bass River in Gippsland, and no where else in Australia or the world. [A. G. N. 242.]

Crops and Trade Reports

Statistics—Crop—Cotton—1948—1949—Fourth Forecast Report: The average area under cotton in the Madras Province during the five years ending 1944—'45 represents 10·7 per cent of the total area under cotton in India.

2. The area sown under cotton upto the 25th January 1949 is estimated at 1,378,700 acres. When compared with the area of 1,286,000 acres estimated for the corresponding period of last year, it reveals an increase of 7·3 per cent.

Three hundred and seventy thousand six hundred acres have been reported as sown since the last December forecast was issued. This extent comprises 202,500 acres under Tinnevellies including Karunganni in Coimbatore, 73,900 acres under Cambodia, 60,200 acres under Westerns (including Mungari cotton), 12,900 acres under Warangal and Cocanadas, 18,000 acres under White and Red Northerns, 2,600 acres under Salems and 500 acres under Chinnapathi or short-staple cotton. The area sown in December 1948 and January 1949 is less than that sown in the corresponding period of the previous year by 1·2 per cent.

3. When compared with the area estimated for the corresponding period of the previous year, an increase in area is estimated in the districts of West Godavari, Kurnool, Bellary, Anantapur, Coimbatore, Ramnad and Tirunelveli and a decrease in area in the other important districts. The variations are marked in Guntur (—6,100 acres), Kurnool (—18,000 acres), Bellary (—40,000 acres), Anantapur (—13,700 acres), Nellore (—6,400 acres), Salem—5,500 acres), Coimbatore (—29,800 acres), Ramnad (—9,300 acres), and Tirunelveli (—7,000 acres).

4. The area under irrigated cotton, mainly Cambodia, is estimated at 132,100 acres, as against 126,100 acres estimated for the corresponding period of the previous year.

5. Pickings of the mungari or early sown cotton crop in the Deccan are nearing completion.

The crop has been affected by insufficiency of rainfall in parts of the Anantapur and Salem Districts. In the Bellary District the crop is reported to have been subject to attacks of hairy caterpillar pest in the early stages of its growth, and to show signs of drooping and shedding of bolls and flowers. The yield per acre is estimated to be normal in the districts of East Godavari, West Godavari, Krishna, Guntur, Tirunelveli, Malabar and South Kanara and below the normal in the other districts.

The seasonal factor for the Province as a whole works out to 91 per cent of the average which is the same as that estimated for the corresponding period of the previous year. It is, however, too early to estimate the yield with accuracy as the harvest has not yet commenced in the major portion of the area and much will depend upon the future weather conditions in the districts.

6. The average wholesale price of cotton lint per imperial maund of 82 2/7 lbs. or 3,200 tolas, as reported from important market centres on 26th March 1949, was Rs. 57—11—0 for Cocanadas, Rs. 64—4—0 for White Northerns, Rs. 65—13—0 for Red Northerns, Rs. 60—1—0 for Westerns (Mungari), Rs. 65—1—0 for Westerns (Hingari), Rs. 83—1—0 for Coimbatore Cambodia, Rs. 74—3—0 for Coimbatore Karunganni and Rs. 57—12—0 for Nadam cotton. When compared with the prices published in the last report i. e., those which prevailed on 8th January 1949, those which prevailed on 8th January 1949, these prices reveal a rise of approximately 27 per cent in the case of Westerns (Hingari), 25 per cent in the case of Westerns (Mungari), 19 per cent in the case of Cocanadas, 10 per cent in the case of Nadam cotton and 1 per cent in the case of Coimbatore Cambodia.

Cotton Raw in the Madras Presidency: The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1949 to 10th June, 1949 amounted to 163,051 bales of 392 lb. lint as against an estimate of 301,800 bales of the total crop of 1948—'49. The receipts in the corresponding period of the previous year were 212,812 bales. 230,590 bales mainly of pressed cotton were received at spinning mills and 1,705 bales were exported by sea while 53,817 bales were imported by sea mainly from Karachi, Bombay and Egypt. (From the Director of Agriculture, Madras)

MADRAS UNIVERSITY

The following is the list of Register numbers of successful candidates in the recent B. Sc. (Agriculture) Examination held in May 1949.

First Examination:— 1 2 4 6 to 8 10 13 14 16 to 18 20 to 22 24 to 36 38 39 41 to 46 48 51 to 55 57 to 64 66 67 69 to 78 80 to 95 97 to 99 and 101.

The results of candidates with register numbers 5 11 23 50 65 68 are withheld.

Second Examination:— 102 to 20 22 24 27 to 32 34 35 37 39 40 42 to 51 53 54 56 58 59 61 to 65 67 to 74 75 79 to 81 83 to 97.

Passed in all subjects except Animal Hygiene:— 121.

Passed in all subjects except Agriculture:— 125 133 141 176 178 182.

Passed in all subjects except Agriculture Engineering:— 138 152 160.

Final Examination:— Second Class: 184 to 257 59 to 62 and 64 to 89.

Weather Review — For May 1949

RAINFALL DATA.

Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches	Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars	Gopalpore	0·3	—1·8	0·8	South.	Negapatam	4·1	+2·5	4·7
	Calingapatam	1·2	—1·4	1·6		Aduturai*	3·4	+0·7	3·4
	Vizagapatam	5·9	+3·9	6·5		Pattukottai*	1·5	—0·7	2·9
	Anakapalle*	4·2	+2·0	6·4		Mathurai	4·7	+2·0	11·5
	Samalkot*	1·2	—0·2	...		Pamban	1·5	+0·5	8·3
	Kakinada	1·3	—0·2	3·5		Koilpatti*	4·2	+2·1	6·6
	Maruteru*	3·8	+2·8	4·1		Palamcottah	6·2	+4·6	8·0
	Masulipatam	2·8	+1·5	3·2		Amba-samudram*	1·6	—0·5	5·4
	Agrl. College, Bapatla	2·3	+1·5	2·8	West Coast.	Trivandrum	11·1	+2·3	15·4
	Veeravanam (College Farm)	1·4	(x)	1·8		Cochin	19·4	+7·7	25.9
						Calicut	22·8	+13·9	32·4
						Pattambi*	17·2	+10·1	19·8
Ceded Dists.	Kurnool	2·6	+1·5	4·1		Taliparamba*	19·1	+12·8	20·4
	Nandyal*	2·1	+0·4	2·8		Nileshwar*	24·5	+14·6	26·6
	Hagari*	2·5	+0·3	3·2		Pilicode*	19·6	+11·7$	20·9
	Siruguppa*	2·5	+0·5§	2·5		Mangalore	23·1	+15·4	23·1
	Bellary	2·4	+0·5	2·4		Kankanady*	22·9	+16·2	22·9
	Rentichintala	1·8	—0·7	2·0					
	Cuddapah	2·5	+1·5	2·5	Mysore & Coorg.	Chitaldrug	0·8	—2·1	1·1
	Anantharajpet*	3·5	+0·6	3·5		Bangalore	1·8	—2·4	3·7
Carnatic.	Nellore	9·1	+8·0	9·5		Mysore	5·4	—0·2	7·5
	Buchireddi-palem*	5·4	+3·1	5·4					
	Madras	8·0	+7·0	8·9	Hills.	Mercara	10·6	+5·4	13·7
	Tirurkuppam*	6·5	+4·1$	6·5		Kodaikanal	5·8	—0·6	9·3
	Palur*	4·5	+0·9	4·5		Coonoor*	3·5	+1·0	9·2
	Tindivanam*	1·0	—2·9	1·5		Ootacamund*	5·2	...	7·7
	Cuddalore	4·2	+3·2	4·3		Nanjanad*	6·0	+0·5	8·2
Central.	Vellore	2·7	+0·4	4·2					
	Gudiyatham*	2·3	—1·7	2·3					
	Salem	2·7	—1·9	8·6					
	Coimbatore (A. C. R I.)*	2·9	+0·4	4·3					
	Coimbatore (C. B. S.)*	2·6	+0·2	3·7					
	Coimbatore	3·5	+1·0	5·0					
	Tiruchirapalli	3·4	+0·8	4·6					

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

(2) Average of ten years data is taken as the normal

(3) x Readings are being recorded only from February 1948.

(4) § Taluk office normal is 1·72", and Rainfall is 2·25".

(5) $ Average of six years data for Tirurkuppam, and seven years data for Pilicode is given as normal.

Weather Review For May 1949

Due to the western disturbance noted over the West Punjab on 12—5—49, a marked increase and extension of thunderstorm activity over the country east of Longitude 75°E were recorded on the very next day. On the third day, the western disturbance apparently passed away across the western Himalayas. The net result was the conditions became unsettled on the same day in the south Bay of Bangal.

Owing to the trough of low pressure in the southwest Bay of Bengal on 15—5—49, monsoonic weather was experienced along the west coast on 17—5—49.

A depression in the southwest Bay of Bengal which was formed on 21—5—49, caused heavy rains along the eastern coast, particularly in Madras and Nellore on 22—5—49. A temporary advance of the monsoon was in evidence in Malabar. In fact, on 23—5—49 the South West Monsoon advanced into the South East Arabian Sea and caused widespread and local heavy rains along the west coast.

The monsoon appeared to have started in South Malabar on 28—5—49 and continued to be active only during the remaining days of the month when it again became feeble.

Inspite of the disturbed weather conditions, Rentachintala, Cuddapah, Nellore and Kurnool recorded respectively maximum temperatures the tune of 111°F, 110°F, 109°F and 106°F in the second half of the month.

Fairly widespread thundershowers occurred in different parts of the Presidency. The noteworthy falls in the month are as detailed below:—

Date	*Place*	*Rainfall in inches.*
8—5—49	Palghat	2·7
13—5—49	Ongole	3·8
14—5—49	Mathurai	2·4
17—5—49	Cochin	3·8
,,	Trivandrum	3·7
,,	Calicut	3·3
22—5—45	Madras	6·4
,,	Nellore	6·1
23—5—49	Mangalore	6·7
,,	Alleppey	2·5
,,	Anantapur	3·0

M. B. V. N. & C. B. N.

Departmental Notifications

GAZETTED SERVICE—POSTINGS AND TRANSFERS.

Name of Officers	From	To
Janab Abdul Samad Sahib,	Superintendent, A. R. S. Aduthurai,	Assistant Paddy Specialist A. R. S., Pattambi.
Sri Hanumantha Rao, K.	Assistant in Paddy A. R S., Mangalore,	Gazetted Superintendent A. R. S. Nanjanad.
,, Jagannatha Rao, C.	Superintendent, A. R. S. Hagari	Assistant Cotton Specialist A. R. S. Nandyal.
,, Kalyanaraman, S. M.	Superintendent, A. R. S. Koilpatti,	Assistant Cotton Specialist A. R. S. Koilpatti.
,, Narasimha Rao, M. P.	Superindent, A. R. S. Maruteru,	Gazetted Superintendent A. R. S. Maruteru.
,, Ponniah, B. W. X.	Assistant in Millets, Coimbatore,	Gazetted Superintendent Koilpatti.
,, Ramana Rai, K. S.	D. A. O. Saidapet	Gazetted Assistant Lecturer in Agriculture, Bapatla.
,, Ramaswami, K.	Superintendent, A. R. S. Aduthurai,	Gazetted Superintendent A. R. S. Aduthurai.
,, Ramachandra Rao, S.	Assistant in Paddy A. R. S., Maruteru,	Gazetted Superintendent A. R. S. Maruteru.
,, Rama Rao, V.	On leave	D. A. O. Chingleput.
,, Seshadri, C. R.	Superintendent, A. R. S. Tindivanam	Gazetted Superintendent A. R. S. Tindivanam.
,, Sankara Ayyar, M. A.	Superintendent, A. R. S. Palur,	Gazetted Superintendent A. R. S. Palur.
,, Subbiah Mudaliar, V. T.	On leave	S. L. A. Agricultural College, Bapatla.
,, Satyanarayanamurthi, M.	On leave	D. A. O. Ootacamund.
,, Subramania Mudaliar, V.K.	Regional Dy. D. A. Vellore,	HQ. Dy. D. A. Madras.
,, Venkatasaravayya Chetty	Superintendent, A. R. S. Samalkot	Gazetted Superintendent A. R. S. Samalkot.
,, Venkatasubramaniam, M. K.	Assistant Paddy Specialist A. R. S. Pattambi,	Gazetted Superintendent A. R. S. Tirurkuppam.
,, Venkataramana Reddi, T.	On leave	Lecturer in Botany, Agricultural College, Bapatla.

SUBORDINATE SERVICE.

APPOINTMENTS

Sri R. Alagarswami, B. Sc. Ag., is appointed as Agricultural Demonstrator, Paramakudi.

,, A. V. Krishnanandam, is appointed as Agricultural Demonstrator, Tiruvarur.

,, T. Suryanarayanamurthi, is appointed as Assistant in Millets, Coimbatore.

The following women graduates trained in Fruit Canning and preservation are appointed as women demonstrators and posted to the places noted against.

Miss. Leela Menon K. P., B. Sc., Madras,	Madras.
,, Leelavathi, P. G., B. A., Calicut	Coimbatore.
,, Evelyn Perianayakam, B. Sc., Mylapore,	Madras.
,, Shanta, C. K., B. Sc., Madras,	Cocanada.
,, Parvady Chinnapp, B. Sc., Ceylon.	Trichinopoly.

The following candidates are appointed as upper subordinates and are posted to the vacancies shown against each.

Sri Jagannathan, A.	A. D. Nugur.
,, Lakshmiah Ch.	A. D. Sugarcane Scheme Hospet.
,, Prabakara Rao, P.	A. D. Cuddapah.
,, Ramachandran, L.	A. D. Markapur.
,, Sanyasi Rao, C.	Assistant in Cotton, Hagari.
,, Venkatachari, B.	Assistant in Cotton, Hagari.

PROMOTIONS.

The following grade promotions of lower subordinates are ordered

Sri Achuthan Nair, E, — From Grade V to Grade IV from 1—7—47.
,, Cheriako, T. V. — From Grade IV to Grade II from 22—8—47.
,, Naganatha Ayyar T. R. — From Grade IV to Grade I from 23—8—47.
,, Ponniah, B. P. From Grade V to Grade IV from 1—4—47.
,, Rajaratnam, S. — From Grade IV to Grade II from 1—4—47.
,, Samu Iyar, P. V. — From Grade V to Grade IV from 20—5—47.

SUBORDINATE SERVICE.

POSTINGS AND TRANSFERS.

Name of Officers	From	To
Sri Adinarayanamurthi, S.	A. D., Tuni,	A. D., Nugur.
,, Alwa, K. S.	A. D., Karkala,	Agricultural Engineering Training, Coimbatore.
,, Appa Rao, K.	A. D., Nagur,	A. D., Chiprupalle.
,, Ananthachari, P. S.	A. D., Mathuranthakam,	Plant Protection Assistant in (Entomology), Cuddalore.
,, Achuthan Nair, E.	Assistant F. M., Wynad.	Assistant A. D., Ponneri.
,, Bangarayya, M.	Assistant in Mycology, S. R. S., Anakapalle.	Assistant in Entomology, S. R. S., Anakapalle.
,, Dharmalingaswami, P.	F. M., A. R. S., Guntur,	A. D., Bellary.
,, Hanumantha Rao, D.	On leave,	Assistant in Plant physiology Agricultural College Bapatla.

Name of Officers	From	To
Sri James Colaco,	Botanical Assistant, Ootacamund,	Special A. D., Sugarcane Development work, Mangalore.
,, Kamalanathan, S.	Assistant in Cotton, Palur,	Cotton Assistant, Coimbatore.
,, Kuppuswami, S. V.	On leave,	Assistant in Chemistry, Coimbatore.
,, Krishnamurthi Rao, S.	P. A., to D. A. O., Bellary,	Special A. D., Adoni, Tungabadra Project.
,, Krishnaswami Ayyar, A.	A. D., Pattukottai,	P. A., to D. A. O., Pattukottai.
,, Krishnamurthi Rao, S.	A. D., Bellary,	P. A., to D. A. O., Bellary.
,, Kameswara Rao, G.	A. D., Kavili,	Special A. D., Sugarcane Scheme, Ramachandrapuram.
,, Krishnamurthi, I. V. G.	Assistant Millets Coimbatore,	Assistant in Millets Narasapatam,
,, Lakshmi Reddy, M.	Assistant in Cotton Hagari,	Agricultural Engineering Training, Coimbatore.
,, Lakshmipathi, S.	Teaching Assistant in Botany, Agricultural College, Bapatla,	Assistant in Mycology S. R. S. Anakapalle.
,, Lohidas, T.	Assistant in Mycology S. R. S. Anakapalle,	Teaching Assistant in Botany Agricultural College, Bapatla.
,, Nagarajan, V.	On leave,	A. D., Pattukottai.
,, Narayana Reddy, M. L.	On leave,	A. D., Seethampeta.
,, Narasimha Raju, K. A.	A. D., Narasapatam,	A. D., Krishnadeveipeta.
,, Narasimha Rao, G. L.	On leave,	F. M., A. R. S., Guntur.
,, Narayana N. G.	Assistant in Cotton Koilpatti,	Assistant in Cotton, Coimbatore.
,, Prasada Rao, E. V.	A. D., Krishna Deveipeta,	A. D., Narasapatam.
,, Muthuswami, N.	Assistant in Entomology,	Technical Assistant to Regional Food Commissioner, Madras.
,, Papayya, B. P.	A. D., Gummalakshipuram,	A. D., Tuni.
,, Prakasam, P.	On leave,	Assistant in Mycology S. R. S. Anakapalle.
,, Radhakrishnamurthi, S.	A. D., Cuddapah,	Agricultural Engineering Training, Coimbatore.
,, Ramalingeswara Rao, M.	Assistant in Oilseeds A. R. S., Tindivanam,	Marketing Assistant for the survey of oil-bearing Plants Madras.
,, Ramalingam, M.	A. D., Podili,	A. D., Kavili.
,, Sobhanadhiri, N.	On leave,	Teaching Assistant in Entomology Agricultural College Bapatla.
,, Satyanarayana, P.	On leave,	A. D., Darsi, (Nellore District).
,, Subramania Ayyar, R.	Assistant, A. D., Adirampatnam.	Assistant, A. D., Mannargudi.

Name of Officers	From	To
,, Subba Rao, P.	A. D., Chipurupalle,	A. D., Gummalakshipuram.
,, Sitarama Rao, K.	Cotton Assistant, Co-Scheme,	Assistant in Cotton, Coimbatore.
,, Srinivasan, V.	A. D., Dindigul,	Agricultural Engineering Training Coimbatore.
,, Shanmughanainar, T. P.	A. D., Tanjore,	Agricultural Engineering Training Coimbatore.
,, Sriramulu, K.	A. D., Chandragiri,	A. D., Podili.
,, Venkatakusumba Rao, V.	On leave,	Plant Protection Assistant in Mycology, Bezwada.
,, Venkateswara Rao, P.	Plant Protection Assistant Mycology, Bezwada.	A. D., Kavali.
,, Venkata Rama Ayyar, S.	A. D., Mannargudi,	A. D., Mayavaram.
,, Venkataramana Rao, V. G.	A. D., Mayavaram,	Marketing Assistant for the survey of oil-bearing Plants Madras.
,, Varisai Mohammad, S.	On leave,	Assistant in Oilseeds A. R. S., Tindivanam.
,, Venkataramiah, M.	F. M., A. R. S., Guntur,	A. D., Chandragiri.

Agricultural College and Research Institute Library, Lawley Road, P. O. Coimbatore

MONTHLY LIST OF ADDITIONS FOR MAY 1949

1. BROWN (William H.): Plant Kingdom — a text book of general Botany. 1935
2. DANBENMIRE (R. F.): Plants and Environment — A text of plant antecology 1947
3. Dutch Agriculture — Facts — (Netherlands — ministry of Agriculture and fisheries and food) 1948
4. ELEMENTS OF GENETICS — Mendals laws of Heredity with special application to man. 1947
5. FRASER (Allam): Sheep production. 1947
6. GOVERNMENT OF INDIA LABOUR BUREAU: — Ministry of Labour — Indian Labour — a Symposium. 1947
7. JOHNSTON (Katharine H): Vegetable culture — a study of growing of vegetable in open. 1943
8. Lyon (T. L.) and Buckman (H): Nature and properties of Soils—Edn. 4. Revised by H. O. Buckmam. 1948
9. LONG ISLAND — Catalogue and announcement of Agricultural and Technical Institute. Division of Industrial and related fields. 1949
10. SCHENDER: (P. J. V. D. H.) and Wright (F. B.) Horse on the farm (Union of S. Africa Dep. Agriculture Education and Research series No. 52). 1948
11. WATERSTOW (J. M.): Fungi of Bermada. 1947