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EDITORIAL

The Madras Groundnut Trade. With an area of 3.7 million acres under groundnuts, Madras is the largest producer of groundnuts in India and the value of the provincial produce is estimated at 20 crores of rupees. For these reasons groundnut has become the chief 'cash crop' of the province. Though a considerable quantity of the produce is used up for internal consumption, the export from the province in 1938—39 reached 765,000 tons valued at nearly 9 crores of rupees. European countries, particularly France, were the principal consumers of Indian groundnuts, but with the sudden collapse of France and the closure of other continental markets, the entire export trade in this commodity was dislocated, creating a situation unprecedented in the annals of the industry. Great Britain though herself a large importer, could not absorb more than a fraction of the exportable surplus. Faced with the prospect of a large surplus and the consequent slump to uneconomic price levels, urgent representations were made to the Government of India by the local Government and the producing and marketing interests. It is a matter for gratification that the Government of India responded quickly and Sir A. Ramaswami Mudaliyar, the Commerce Member spared no pains to study the situation in all its intricate details. A conference of all interests was arranged in Madras under the chairmanship of the Commerce Member and the frank discussions which followed have brought out several interesting points. Various suggestions were put forward such as restriction of cultivation, storing of surplus produce by a Government or quasi-government agency, increase in internal consumption and exploring alternative uses for the nut and oil. We are afraid that the proposals to restrict cultivation of a crop which is raised in small areas by millions of small farmers is beset with difficulties. So is the problem of storage also. To us, the more feasible proposals appear to be the increase of internal consumption of nuts and finding of additional uses for the oil. We are glad to note that the commerce member assured the conference that intensive researches were being done to utilise groundnut oil for the manufacture of lubricating oils and endeavours made to expand the production of 'vegetable ghee' for which there was a growing demand in the country. India should avail the present opportunity to crush the oil seeds produced in the country and take to the manufacture of a

variety of products which she imports from abroad or for which the world markets are still open. This will not only develop a self contained industry of immense commercial value to her, but make available in the country vast quantities of valuable oil cake which her soils and livestock sorely need.

The Indian Poultry industry. The report on the marketing of eggs in India and Burma released by the Marketing section of the Government of India reveals interesting facts about 'this profitable but sadly neglected branch of Agriculture'. The startling figures furnished in the report should serve an eye-opener to many who have the interests of our rural population at heart. India possesses $10\frac{1}{2}$ percent of the world's poultry population but still remains an insignificant contributor to the world's egg trade. She is credited with the possession of 522 lakhs of laying fowls but among these only 7·3 lakhs or 1·3 per cent represents improved breeds of which over two-thirds are in one province—the United Provinces. For every 100 laying birds 230 non-laying birds are maintained which reveals a deplorable case of uneconomic production. Nevertheless India produces annually 33,648 lakhs and Burma 1,636 lakhs of eggs which if laid end to end will go four times round the circumference of the earth. The total value of the eggs sold in a year amounts to Rs. $5\frac{1}{4}$ crores and the birds themselves are worth $7\frac{1}{2}$ crores. Due to a variety of causes, the total loss to the egg industry every year is estimated at Rs. 57 lakhs of which 14 lakhs are attributed to inadequate housing, 15 lakhs to breakage in the course of collection, transit and distribution and 28 lakhs to staling in the course of marketing. Though the industry is of such great importance to the country, it is a sad commentary on the country's interest in her rural masses that only a sum of Rs. 74,000 is spent by 17 provinces and states on attempts at the improvement of poultry-keeping. India claims to have over 100,000 co-operative societies, but only seven of them are concerned with eggs, and of these only one lays claim to successful working without loss. It is high time that the country should take stock of the present situation and organise an effective drive for the improvement of this valuable cottage industry.

Soy Bean Trials in Madras.

By M. ANANDAN, L. Ag.,

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Introduction. Soy bean plant (*Glycine max*, Merr.) has been known to, and cultivated by, the Mongoloid races for several centuries as one of their most important food crops and feed for their domestic stock, while it was not even widely known to the other races of mankind until so late as the 18th century. Manchuria, China, Korea and Japan were, and are still the chief countries of production and export of this most important leguminous crop to the other parts of the world. Soy bean seed is very rich in protein and fat of high biological value and contains vitamins A, B and D and is a good source of minerals like calcium, sodium, phosphorus and manganese. Its starch content is very low and is therefore of particular value as food for diabetics. The seed is used in a variety of ways as food by the Chinese and the Japanese. Soy bean meal and oil-cake are excellent feed for cattle, and the crop when cut and fed green or converted into hay forms a very valuable fodder rich in nitrogen comparable to alfalfa (lucerne) and clover in feed value.

The cultivation of soy bean was started in the United States of America more than one hundred years ago, but the area occupied by it was very small and was only 2,000 acres in extent till 1914. From that year onwards the expansion of the area under the crop was very rapid and at the present day it is reported to be occupying nearly six million acres in that country. Nearly 56 per cent of all the soy beans grown there is for use as hay. It is reported that soy bean hay cut at the proper time and well cured is almost equal, ton for ton, to alfalfa.

Trials in Madras. As far as is known to the writer, the first trial of soy bean in Madras was made in 1915-16 by Mr. R. Cecil Wood, then Principal of the Agricultural College, Coimbatore in one of the fields on the Central farm. The crop was a fair one but its cultivation was not continued in subsequent years.

Great interest in this crop was aroused in India about 1932—33 as a result of Major General Sir Robert McCarrison's advocacy for the inclusion of soy bean as a very cheap and valuable source of first class vegetable protein in the average Indian diet, which badly lacks it. Another contributary cause for the spurt of such enthusiasm of the people in this new food crop was the decision of Mahatma Gandhi to give it a trial by including it in his daily diet. It is not known whether soy bean still finds a place in the Mahatma's daily diet. A third reason for stimulating the interest of the people was the fact that soy bean was becoming a serious competitor in the overseas market with the Indian groundnut, the premier oil seed crop of the country. The result of all this at the time was a great demand for soy bean

seed and for information regarding its cultivation. But unfortunately, the Department of Agriculture could not help the public either with the seed or information regarding the cultivation of soy bean as it had not been grown or tried on any of the Agricultural Research Stations before, except once on the College Farm in 1915-16. The Department, however, lost no time in taking up the trial of this new crop. The Director of Agriculture, Madras obtained seeds of soy beans from various sources and distributed them to several Research Stations in the Presidency for trial and study of the crop under varying soil and climatic conditions. For the first two seasons, small samples of seed received were grown for seed multiplication. Field trials were carried out from 1935 onwards. The summary of the results obtained at the several Research Stations is given below.

Agricultural Research Station, Hagari (average rainfall 20 inches) Two varieties, *Kachin* and *Pe Ngype*, both from Burma were tried for two seasons as a dry crop and for one season under irrigation. The yields given by these two varieties as dry and irrigated crops are given below :—

Nature of Crop.	Yield of seed in lb.		Remarks.
	Behrum.	*Pe Ngype.*	
Dry crop	230	94	The crops were subject to the attack of *Surul* caterpillar. (*Stomopterix nerteria*).
Irrigated crop	59	333	

Five other varieties were also tried in 1½ cent plots in 1937—38 season. Of these, variety No. 18 gave 375 lbs. of grain per acre.

Agricultural Research Station, Nandyal (annual rainfall 28 inches) On this station also, *Pe Ngype* and *Behrum* were the varieties tried on a bulk scale, while, 5 other varieties were tried on a small scale. The yields given by all the varieties were very poor on this station also, as will be evident from the figures given below :—

Name of variety.	Area in acres.	Yield of grain per acre in lb.	Remarks.
Pe Ngype.	2·08	200	The crop was subject to the attack of leaf rollers and millipedes.
Behrum.	0·85	88	
Laredo.	0·09	50	
M. S. 28	0·10	90	
,, 33	0·10	80	
,, 26	0·09	140	
,, 31	0·09	150	

A crop of *Pe Ngype* grown under irrigation was no better in grain yield as it gave only 135 lbs of grain per acre. But this variety grew well as a fodder crop, though it was badly damaged by caterpillars.

Central Farm, Agricultural College, Coimbatore. (annual rainfall 25 inches). The trials on this station were conducted during 1936-37 and 1937-38. In the year 1936-37, twenty four varieties were tried during the South-west monsoon season in garden land with red loamy soil. Of these, Kuala-lumpur 30 (Adt 32), black seeded variety gave the highest yield of 1,406

lb. while among the yellow seeded varieties, Mammoth Yellow gave 838 lb. of grain to the acre. In the same year, the above 24 varieties along with 33 new ones supplied by the Oil Seeds Specialist were tried during October in a black soil field. The results were not so good as those given by the crops sown during the south west monsoon season in the red soil area. The trial of soybean as a dry crop in red soil in July and in the black soil in October completely failed during the year for want of sufficient rains.

A more detailed work was attempted in 1937-38 (1) by sowing ten promising varieties for comparative trials in randomised blocks with 4 repetitions, (2) by testing the merits of four varieties as fodder crops and (3) by sowing 56 varieties in small areas side by side to study their comparative performances. The crop was sown in the hot weather on the 27th May 1937. It was subject to an attack of *surul* within a fortnight after sowing and the insect was controlled by spraying with calcium arsenate. This saved the crop to a great extent and it revived, but a second attack of *surul* in August almost destroyed the late varieties while the early and medium duration varieties suffered far less from this pest and yielded a fair crop. The yield figures from the comparative trials were so erratic as a result of the insect damage that no valid conclusions could be drawn. Out of the 56 varieties grown in study plots, the following four gave fair yields while the rest were far behind these in yield. Generally speaking the yields given were more an index of the severity of the damage caused by the *surul* than a true index of the normal yielding capacity of the varieties concerned. The varieties grown were classified into early, medium and late and it was found that generally speaking, the late varieties suffered from *surul* most.

No.	Variety.	Yield of grain in lb. per acre.
1.	Avoyelles	706
2.	Adt 4—Laredo	650
3.	„ 31 (Kualalumpur 16)	512½
4.	*Otatootan*	487½

Varieties for fodder. The yield figures given by the four varieties tried as fodder crops are given below from which it will be seen that Kualalumpur 30 (Adt 32) gave the highest yield of 12,800 lb. of green fodder per acre while the others were very poor. Here also, the yields were affected by the relative susceptibility of the varieties to the attack of *surul* caterpillar. Kualalumpur 30 was the most resistant to this insect.

No.	Variety.	Age of crop at cutting in days.	Yield of green fodder per acre in lb.
1.	Greenish yellow	100	3,600
2.	Lyallpur chocolate	103	2,400
3.	Adt 32 (Kualalumpur 30)	74	12,800
4.	Kachin	99	2,800

A sample of soybean fodder grown on the Central Farm was analysed by the Government Agricultural Chemist and the results of the analysis and his remarks on the fodder are given below :—

Heads of analysis	Percentage calculated on Dry laboratory sample	Original material
Moisture	8·40	72·25
Ether extractives	1·31	0·40
Crude fibre	21·87	6·63
Ash	8·32	2·52
Crude proteids	20·65	6·26
Carbohydrates (by difference)	39·45	11·94
	100·00	100·00
Acid value	57·05	57·05
Lime (CaO)	2·12	0·64
Potash (K_2O)	1·80	0·55
Phosphoric acid (P_2O_5)	0·67	0·20

Remarks: **The sample of soy bean plant contains good amounts of proteins and forms a good cattle feed**

The Superintendent, Central Farm has remarked that in soy bean cultivation on the Farm *surul* insect is a serious factor to deal with and to some extent, mosaic disease as well.

Agricultural Research Station, Anakapalle (rainfall 40 inches). The trials were conducted during 1936-37 and 1937-38 seasons on this station with two varieties *Pe Ngype* and *Behrum*. During 1936-37, 5-cent plots of the above two varieties were sown in June and the crops cut as fodder in October gave 10,010 lb. of fodder per acre. The plants were observed to have good root nodule formation.

A grain crop of *Pe Ngype* was grown in comparative trial plots with seed treated with a culture of root nodule organism, against untreated seed in 5 replicated plots. The treated crop developed more root nodules after flowering but the untreated plots gave a higher yield of grain than the treated plots, the average yield being 830 lbs. and 730 lb. of clean grain, respectively, per acre. A crop of *Pe Ngype* and *Behrum* sown in September of the same year was a failure due to low germinatiom and unfavourable weather conditions. During the 1937-38 season, a bulk crop of soy bean was grown in 33 cents and it recorded a yield of 679 lbs. of clean grain per acre.

Agricultural Research Station, Maruteru (rainfall 42 inches). Soy beans were tried for 3 years from 1936 onwards on this station as a dry crop. *Pe Ngype* and *Behrum* were the varieties tried. The trials were done only on small plots not exceeding 5 cents in area. During 1936-37 the crop was sown in the middle of June. Each variety was grown in two plots, one manured with 25 cartloads of cattle manure per acre and the other without the manure. The manuring had no effect on the yield of

the crop as the yield figures given below show. There was good formation of root nodules on the plants

Name of variety.	Date of sowing.	Yield in lb. per acre. Manured with 20 cartloads of cattle manure per acre.	Unmanured
Behrum.	15—6—36	1,564	1,500
Pe Ngype.	do	1,229	1,160

Trial during 'Pyru' season in wet lands. Both the varieties sown in a wetland plot towards the end of November suffered from excessive moisture in the soil and failed completely. During the 1937-38 season, the crop was raised without any manuring, again as a dry crop and it gave consistently good yields, as the figures given below show.

Name of variety.	Date of sowing.	Yield per acre in lb.
Behrum.	22—7—37.	1,900
do	17—6—38.	2,160
Pe Ngype.	22—7—37.	1,480
do	17—6—38.	1,800

Agricultural Research Station, Samalkota (rainfall 36 inches) Trials on this station were carried out during 1936-37 and 1937-38 seaons with *Pe Ngype* and *Behrum.* During 1936-37 season, sowing was done on the last day of June. *Behrum* did well and gave 1,200 lbs. of grain yield per acre while *Pe Ngype* yielded only 377 lb. Both the varieties were grown as fodder during the same season. The average yields of green fodder were 8,500 lb. from *Behrum* and 10,520 lb. from *Pe Ngype.* During 1937-38, the sowing date was delayed to 7—9—37 for both the varieties. *Behrum* failed to germinate. The field was resown to *Pe Ngype* and the latter variety yielded 1,200 lb. of grain per acre.

Agricultural Research Station, Guntur (annual rainfall 34 nches) Out of the seven varieties tried, five failed completely. *Behrum* was very poor in growth and yielded hardly any grain. *Laredo,* a black seeded variety yielded 350 lb. of grain per acre when tried in the early season and 200 lbs in the late season.

Agricultural Research Station, Palur (rainfall 51 inches). Soy bean was tried as a green manure crop on this station in wetlands in July during three years 1936 to 1938 In 1937 it completely failed while in 1936 and 1938, the green matter yielded was only 700 lb. and 800 lb. respectively. The germination of the crop was very low and the subsequent growth was also poor due to excessive moisture in the fields.

Agricultural Research Station, Adutural (rainfall 43 inches). The trial of soy beans was started on this station in the 1932-33 season and a few of the varieties that were found promising are being grown year after year as bulk crops. *Pe Ngype, Behrum* and E. B. strain 3940 (Adt. 28) are the most promising varieties in the collection so far tried.

Collection of samples. Till the end of 1939, seeds of 46 different varieties from various sources were received and grown in single rows for study. But, unfortunately several of them failed to germinate during the year of introduction itself and were thus lost. Another cause of their failure to survive was due to the ripening of the pods of early and medium duration varieties in very wet weather during the heavy North East monsoon months of October and November and the consequent difficulty of giving the seeds thorough drying necessary for retaining the viability of the seeds. The wholesale destruction of the young plants by the *surul* caterpillar is yet another cause for the loss of many of the varieties in the collection.

Seasonal trials. Trials were conducted in three seasons June to December, September to February, and December to May. June to December season has been found to be the best for growing soy bean in the wetlands of Tanjore district but unfortunately short and mid-duration varieties ripen their pods in the heavy North east monsoon months of October and November with the result that the seeds harvested during the wet weather fail to be viable in the succeeding season. More viable seeds are obtained when the sowing is delayed to the middle of August to escape the bad effects of the rains on the ripening seed. September sown crop matures in fine weather in January and the seeds obtained are quite sound though the yield is not so heavy as that of June sown crop. But as both the June and September sown crops are affected by water stagnation in the fields during the heavy rains of the North East monsoon season the crop has to be sown on raised beds 10 feet in width with drainage channels of a foot in depth between in beds and all along the boundary of the fields to draw off the excess water. If this precaution is taken the crop grows quite normally.

The December-sown crop puts on good vegetative growth in the initial stages but as it has to spend the second half of its life in hot weather and without irrigation facilities from the channels which are closed on the 31st of January, the crop fails to set seeds normally. However, a *Pe Ngype* crop grown in about 2 acres during this season gave nearly 20,000 lbs. of excellent fodder per acre, though it failed to set seed. This indicates the possibility of growing this variety of soy bean as a fodder crop in fields from which samba paddy is removed during December. Paddy varieties G. E. B. 24 Adt 8 and *Vadan samba* are generally harvested during December when grown as a *samba* crop in the Tanjore district, and the fields occupied by these may be sown to soy bean for fodder.

In the absence of *surul* attack, the following average and maximum yields may be expected from the three varieties found suitable to this delta.

	Average yield per acre in lb.	Maximum yield per acre in lb.
Pe Ngype	1,200	2,000
Behrum	800	1,000
E B strain 3940 (Adt 38)	500	650

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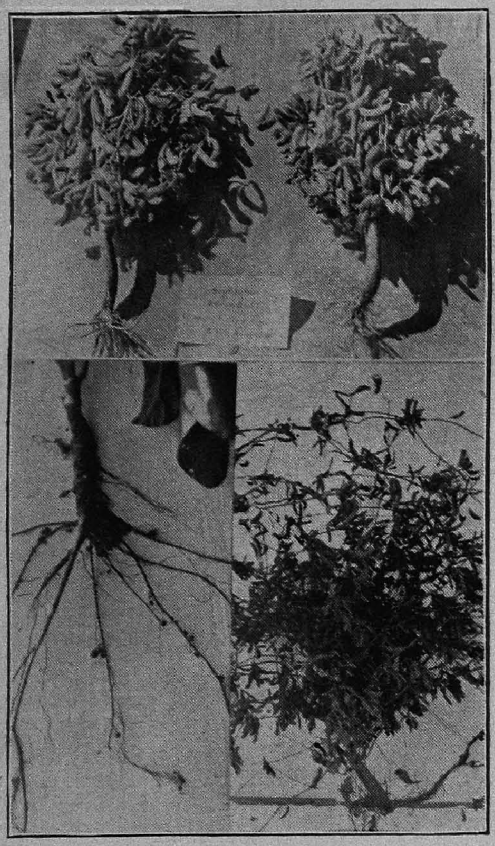

III

II

I. Soybean — Behrum plant with mature pods but without leaves.

II. Soybean—Pe Ngype plant with mature pods but without leaves.

III. Soybean plant showing root nodules.

In the dry lands of Tanjore, the best season for sowing the soy bean crop is with the break of the North east monsoon in September—October as a purely rainfed crop. *Pe Ngype* has been found to be the best variety for growing in dry lands during this period, yielding upto 1,500 lb. of clean grain per acre. Soy bean plants develop root nodules profusely when grown both in the dry and wet lands of Aduturai.

The soil seems to be well stocked with the root nodule organism, and artificial inoculation with the organism appears to be unnecessary. [Vide *Plate*].

Seeds and sowing, and cost of cultivation. The fields meant for soy beans should receive four dry ploughings to produce very fine tilth. The wetland fields should be thrown into 10 feet wide beds with channels between, to avoid water stagnation during the North East *monsoon season*. The crop can be either broadcast or sown in lines. When sown in rows the seeds may be spaced 1 foot in lines and 1 to 2 feet between lines depending on the growth habits of the variety concerned. Spreading types are to be given the wider and the erect types the narrower spacing. In the case of spreading types, the seed rate per acre is 6 to 10 lb. and in the case of erect types, 10 to 15 lb. depending on the size of the seeds of each variety sown. The depth of sowing should not be more than 2 inches as seeds buried deeper show poor germination.

The following figures give the average cost of cultivation for an acre of soy bean crop.

Ploughing 4 times	Rs.	5	0 0
Seed and sowing	,,	2	0 0
Hoeing and weeding twice, at 12 women per acre each time	,,	3	0 0
Harvesting and cattle threshing ...	,,	5	0 0
		15	0 0

Harvesting time. One peculiar characteristic of the soy been plant is that it sheds all its leaves by the time the pods are mature on the plant. [Vide Plate]. So it is very easy to judge the correct time for the harvest of the crop. The crop should be harvested immediately it has shed its foliage completely, as any delay beyond this would make the pods burst and scatter away the seeds.

Varietal characters. Soy bean plants may be classified into different groups according to their duration, habit of growth, character of the foliage, the shape and colour of the seeds.

Duration. 1. Short duration of 80 days 2. Medium duration of 100 to 120 days, and 3. Late duration of 140 days and over.

Habit of growth. 1. Dwarf plants with clusters of pods 2. Lean, lanky plants with zig, zag internodes with sparsely arranged pods and 3. Bushy, branching and trailing plants like horsegram.

Leaf shape. 1. Broad leaved. 2. Linear lanceolate, and 3. Ovate lanceolate.

Shape of seed. 1. Flat grains, kidney shaped, of various sizes, and 2. round grains of various sizes.

Colour of seed. 1. Pale yellow. 2. Deep yellow. 3. Chocolate. 4. Black. 5. Mottled.

Analysis of Pe Ngype. A sample of Pe Ngype grain produced on the Aduturai station was analysed by the Government Agricultural Chemist and found to contain 13 percent of oil and 40 percent proteid.

An attempt to extract soy bean oil in a *chekku* (country mill) at Aduturai by the writer and in a power crusher by the Government Soap Expert and Oil, Chemist at Calicut was a failure. Good *poonac* was obtained but no oil. Perhaps, the soy bean oil has to be extracted by the use of powerful chemical solvents.

Pests and diseases. The insects pests affecting soya beans in South India with details of the nature of the damage done and the control measures adopted as per information supplied by Sri Bramahachari, Assistant in Entomology, are given below :—

(1) **Surulpuchi.** *Stomopteryx nerteria* M. (Family Gelechiade). This is the most destructive pest of soy beans in Aduturai and Coimbatore. It may be stated that the success or failure of the crop depends more upon this insect than on any other single factor. The small caterpillars feed by mining the leaves and cause white patches. After a few days the caterpillars emerge from the mines and web together small leaflets and continue to feed on the green leaf tissue. This is the same insect which appears on the groundnut crop. As the insects are attracted to light, light traps have been found to reduce pest infestation.

(2) Noctvid caterpillars (*Prodenia litura* F., *Cosmophila sp.*, *Plusia sp.*) feed on the leaves of both young and old plants; these are more serious on young plants. Spraying with calcium arsenate is found to control the pests.

(3) **Verpuchi.** *Sphenoptera pertoetit* G. (Family Buprestidae). The beetle grubs bore into the lower portion of the stem and roots. The affected plants become stunted in growth and withered in appearance and ultimately dry up. This is the same insect found in groundnut, and in *dancha* and other green manure plants. Affected plants may be removed to stop the spread of the pest.

(4) In addition to the pests noted above, flea beetles (*Longitarsus sp.*) thrips, coccids, grasshoppers, and mites are found causing damage to the crop occasionally. Spraying with contact poisons was found useful against the first three insects, spraying of calcium arsenate was effective against grasshoppers, and dusting with flowers of sulphur checked the mites completely. Mosaic was noted on a few plants in some varieties each year. In one season a crop Pe Ngype was found to be attacked by a weak Fusarium fungus. This fungus, was not noted in other seasons.

Summary. From a study of the results of the trials conducted on the various Research Stations having different soil types and climates, it is found that soy beans have done best in the Godavary and the Cauvery deltas with deep alluvial soil and an annual rainfall of 40 inches or over. It was a fair success in Coimbatore in garden lands as an irrigated crop

but failed when grown as a purely rainfed crop. The crop seems to be unsuited both as a rainfed and irrigated crop in the Ceded districts. It is only a partial success in Guntur. The crop seems to be free from insect damages in Anakapalle, Maruteru and Samalkot but is subject to severe attack from insects, particularly of *surul* in Coimbatore and Tanjore districts and to mild attack in the Ceded districts.

P. S. It may be mentioned that of late the enthusiasm of the people for soy bean has cooled down, in view of the opinion expressed by Dr. Aykroyd, the Director of the Nutrition Research Institute, Coonoor, that he is unable to say that soy bean is in any way superior, as a proteid food, to the ordinary pulses grown largely in India and consumed by the people.

A Hearth for the use of Groundnut Husk as Fuel.

By V. VISWANATHAN,

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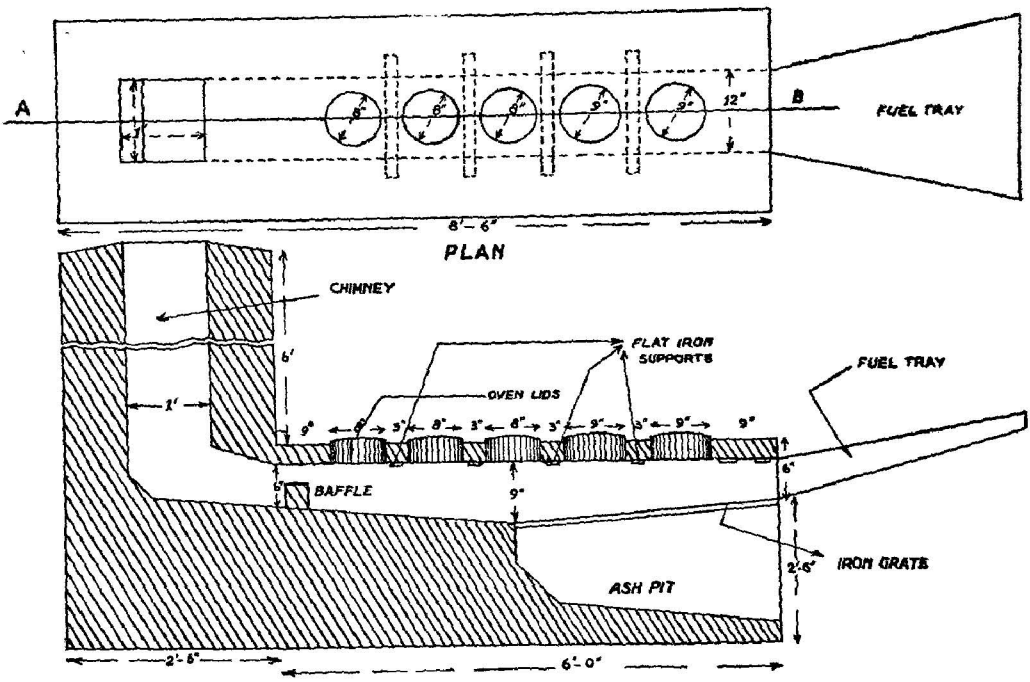
Madras grows 3·5 million acres of groundnuts. Seventeen, out of 24 districts in the province grow over 50,000 acres. Hence groundnut husk is available in large quantities and at cheap rates in several localities. The use of groundnut husk as fuel for the household is restricted because of its poor burning qualities. But with the aid of a suitable furnace, this defect is overcome and it becomes a very convenient fuel for cooking food in the kitchen. A hearth suitable for the South Indian household has been designed on the principle of the Sindhwahi furnace that is in use for boiling cane juice and making jaggery. [Vide illustration].



SECTION

The hearth has a built-in platform 8 feet 4 inches long, 2 feet wide and $2\frac{1}{2}$ feet high. There is a twelve inch wide central flue running along the length of the hearth and is connected to a chimney 7 feet high and 12 inches square in section internally. A baffle 8" × 6" is put in near the end of the flue. The baffle could be increased or decreased in size, to reduce or increase the draught as desired The flue is covered on the top with an iron plate provided with 5 rings for taking in 5 vessels. The first two rings are nine inches and the others eight inches in diameter. The iron plate is plastered over with a three inch layer of mud. A grating one foot wide and two feet long is fixed at an incline at the flue entrance. The grating receives the husk from the feeding tray placed just over it. The tray is of galvanised iron twelve inches wide near the grating, two feet three inches at the other end and three feet long. The sides of the tray are raised and hold a fair quantity of groundnut husk. An ash pit below the grating receives the burnt ash.

A sample hearth built at Pallur, Arkonam taluk, is in use and is working very satisfactorily. The family consists of 8 members. On an average, 56 lb of wood fuel were being used by the family for cooking food previously. The new hearth now cooks food for the family—2 Madras measures of rice and proportionate quantities of *sambar*, *rasam*, dhall and a curry—in about 35 minutes using 20 lb. of groundnut husk, valued at 6 pies. A bag of husk measures 50 to 60 Madras measures ($3\frac{1}{3}$ c. ft. to 4 c. ft.) and weighs 60 to 72 lb. A bag costs one and a half annas and cooks 3 to 4 meals for the family. By the use of groundnut husk as fuel the family is now saving six annas a day—nearly 85 per cent. in the cost of fuel.

Climate and Crop Production in the Guntur Black Soils.*

A Preliminary Study.

By S. V. DURAISWAMI, B. A., B. Sc. Ag.

Agricultural Research Station, Guntur.

Introductory. The black-soil of the Guntur District is one of the most interesting tracts in this presidency and has recently come into great prominence on account of the extensive production of cigarette tobacco. This tract has long been known to be an important centre for chillies groundnut (bunch variety), cotton and cigar-tobacco. Consequent on the introduction of the Virginia tobacco and its spread, the area under the food, fodder and chilli crops has been reduced. The approximate acreage of the different crops in the two districts of Guntur and Kistna are as follows :—groundnut 6,25000, cotton 1,10,000, tobacco (virginia) 85,000, chillies 56,000. It is of a great agricultural interest that all these crops are grown under dry conditions. No other tract in this presidency or even in India, grows so many money crops with such success as can be seen from the following statement :—

* Paper read at the Agricultural Section of the Indian Science Congress held in Madras, January 1940.

Yield of Crops per acre in lbs.

Crops.	Yield average for 16 years.	Maximum yield.	Minimum yield.
First season.			
Cholam dry (fodder)	4065	7000	2225
Groundnut (pods)	1331	2400	350
Second season.			
Cholam (dry grain)	439	950	73
Chillies (dry fruits)	344	758	75
Tobacco virginia (cured leaf)	670	844	466
Cotton (kapas)	474	850	110

Dry-farming as is known to us, has its own vicissitudes and disappointments but in this tract it is of a different nature in that it is intensive and ordinarily devoid of serious failures On the other hand the yields of crops are on a par with those of the irrigated tracts elsewhere. It is this aspect that makes the agriculture of this tract most interesting.

Geographical position. This tract lies in the curve of the peninsula on the Eastern side and near to the coast line. This aspect of the tract gives this area a specially favoured position with reference to rainfall and air movements. As we proceed westwards in this tract into the typical dry black soil of the Ceded districts, or to the South into the red soil tract of the Nellore district, such a benefit is entirely absent with the result that the only extensively grown crop is cotton. However, the precipitation in Guntur black soils during the N. E. Monsoon season is fitful and the tract is often subject to sudden cyclonic down-pours or rain may often fail. Thus the cropping in this tract is dependent more or less on the earlier rains than the later ones. The average rainfall data for 16 years (1923—1938) in 12 months is given below.

Average rain-fall data for 16 years.

Month.	Rainfall in inches (average for 16 years).	Number of rainy days (average for 16 years).	Month.	Rainfall in inches (average for 16 years).	Number of rainy days (average for 16 years).
January	0·01	·06	July	5·81	11·5
February	1·12	1·4	August	5·26	10·0
March	0·16	0·38	September	6·28	9·6
April	0·75	1·5	October	5·62	6·6
May	2·14	2·4	November	3·20	4·0
June	3·54	6·5	December	0·90	0·4

Nature of the soil. The soil is a heavy clay containing about 30 per cent of clay and 30 per cent of fine silt. It is over six feet deep in some places and can be said to be the best black soil of the Presidency. Its retentive power for moisture is very great and this accounts mostly for the very successful cultivation of the various commercial crops. The analysis of the soil done by the Agricultural Chemist, Coimbatore in 1923, when the station was newly brought under cultivation is given below :—

Loss on ignition	7·100	Moisture	8·19
Insoluble mineral matter	68·060	Fine gravel	5·14
Iron (Fe_2O_3)	6 787	Coarse sand	2·74
Aluminium (Al_2O_3)	11.174	Fine sand	11·30
Lime (CaO)	2 590	Silt	11·93
Magnesia (MgO)	2·380	Fine silt	30·06
Phosphoric acid (P_2O_5)	0·039	Clay	29·01
Potash	0·543		
Soda	0·619		
Sulphuric acid	0·036		
Carbonic acid	1·093		
Nitrogen	0·0550		
Available phos. acid	0·0039		
„ potash	0·0166		

The analysis shows a deficiency in phosphoric acid and nitrogen which is generally made up by systematic application of cattle manure and the mixed cropping that is practised under normal conditions. It is generally well supplied with lime and potash.

During summer the temperature goes well beyond 110°F. and the soil cracks deep. The inherent fertility is kept up and does not seem to have been affected even in places where, due to economic reasons, rotation of cropping has not been kept up. It is an almost ideal soil which retains moisture to the greatest extent, allows free drainage and when kept under good tilth becomes fit for sowing or cultivation within an astonishingly short time even after very heavy showers. In 1938 except for an abnormally heavy rainfall of 20" in August-September, there were no further rains still the second season crops were grown successfully with the rain recieved in August-September. Such is the retentive capacity of this soil.

Season and rainfall. The year in this tract may be classified into (a) the summer months (from February to May), (b) South-west monsoon or '*Punasa*' season (from June to September), and (c) the North-east monsoon or the '*Pyru*' season (from October to January). The *Punasa* is suited for fodder, groundnut and minor food crops and the *Pyru* for tobacco, cotton, chillies and millets. The period from January to March is cool, dry and practically rainless. It therefore aids the ripening, harvesting, and preparation of the produce for storage or sale. In general, once the rains start in June or July, the precipitation continues at intervals upto about October, so that the crops in that season get the supply in adequate quantities and the fields intended for the second season crops are cultivated several times when conditions permit and are thereby enabled to absorb and retain the maximum amount of moisture necessary for the benefit of the second season crops.

Cropping system. A very good system of rotation of crops to meet the various needs of the farmer is practised *viz.*, in the first season a pure fodder crop or groundnut (a cash crop) and in the second season cash crops (tobacco and chillies) and grain crops for food and fodder. The following system of rotation of cropping is followed under normal conditions and has proved to be the best for the tract:- First year—chillies;

second year—ground nut or maize or late grain cholam; third year—tobacco or fodder crop, or first year—fodder cholam; second year—chillies; maize or variga; third year—tobacco; fourth year—ground nut.

Yield and its correlation with rainfall. It has been pointed out that the successful cultivation of crops under dry conditions, elsewhere grown in garden-lands, is mainly due to the adequate and well distributed rainfall. On correlating the rainfall with the yield of the more important crops the following interesting features were brought out:- (1) It is the distribution and not the total rainfall that counts. In 1929, the rainfall was the lowest yet the yields were favourable, probably due to the good distribution of the precipitation. (2) In years when the average has been exceeded due generally to sudden down-pours or cyclones the crops have been adversely affected and pests and diseases have increased. (3) A rainfall less than average does not necessarily reduce the yield. (4) Years succeeding those with rainfall in excess of the average have given better yields. (5) A favourable first season is an almost sufficient warrant for a fairly successful second season. (6) More than average rainfall is not at all necessary for tobacco and cotton.

Climatic influences. Though the rainfall is the main factor there are other influences which affect the cropping of this tract. The rainy days should alternate with clear days and when this happens an astonishingly rapid growth in the crops is seen. During these months there are frequent thunder-storms which probably help in the growth by way of electrical influences. Alternating dry periods are essential for the inter-cultural operations which have a very good effect on the crops. The tract is subjected to sudden down-pours (as much as 10 inches in 11 days) yet the soil is not subjected to serious wash as the land is not undulating and a well-cultivated soil absorbs surprisingly large quantities of moisture. Such heavy rains however, give rise to much surface surplus flow and the system of storing the surplus water in ponds adjacent to the fields is an interesting arrangement, in that the ponds retain water for a long time and enable the farmers to sow and water their chilli and tobacco nurseries and subsequently to water the transplanted crops. The dry weather period succeeding the North-East monsoon season is of great importance for the maturing and successful harvest of the money crops. A steady sea-breeze starts from about the end of December which is believed to help the rapid growth and maturity of all the second season crops. The temperature variations between night and day during the first season are very little, the average minimum ranging about 80° and the average maximum about 90°F. The first season crops therefore, have generally, very favourable temperature conditions for their growth.

Forecasting and how it can help. A tract which is so greatly dependent upon climatic influences should naturally benefit very much by a systematic study of the climatological manifestations and the part they play on the crop production. If it were only possible to forecast the nature of the first

season, its rainfall and distribution, the ryots would be in a position to adjust their cropping definitely with reference to their needs of food, fodder and cash. It has been found by experience that when there are reports of heavy rainfall in the West and North-West as in Mahabaleswar and Nagpur adequate rainfall can be expected in this tract immediately after. In the same way when there is heavy fall recorded at Masulipatam and Cocanada there is sure possibility of rains in this tract. The early or late start of the season has its own bearings on the situation since an early one facilitates the raising of two crops. The raising ot nurseries can be adjusted so that the crops are planted at the right time. Sometimes heavy rains are received in February and March. An indication of these in advance should give the cultivator a chance to manipulate his harvest and curing of the tobacco in such a way as to incur minimum loss. It is therefore, not out of place to emphasise here the necessity for starting meterological sub-stations in such important tracts.

Conclusion. In conclusion, it may be said that this tract enjoys a more favourable condition of weather and rainfall than other dry-land tracts. Yet it is left to us to use our ingenuity to extract the maximum benefit out of the indulgence of nature. We have to make efforts to keep the soil in its right condition, sow the best and give the best of our attention so that the normal out-turn is assured invariably. Any complicated or elaborate system of manuring is out of the question particularly with artificials. Systematic and adequate manuring with organic manures like cattle manure, sheep manure or cake and bones have given the best results. Crop improvement work in such a tract should proceed on the following lines:—Crops should be bred to (1) withstand heavy rainfall and long drought; (2) give immunity or resistance to diseases and insect pests; (3) come into maturity at suitable seasons (4) conform to the quality required in the markets and (5) give adequate yields to make their cultivation pay a handsome return.

Seed Testing.

An important Agricultural Practice.

By S. N. CHANDRASEKARA AYYAR, M. A.,

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Introduction. What is it that every gardener or farmer would most desire? The ready answer to this question will doubtless be one word 'success'. Success in good farming or gardening will mean the production of the largest, the handsomest, the healthiest and the most vigorously growing plants yielding the maximum produce which will give an abundant return for the labour and expense of running a farm or a garden. For, 'a product properly produced is already more than half marketed'. The first and the foremost criterion is the purity of the seed for its species and the strain or variety the farmer which intends to grow. For example, if it is to be Co_2 Combodia, he must make sure that it is Co_2 Cambodia and nothing

else, for it is a very common thing to find inferior cotton seeds like those of *Pulichai* mixed up with this. The next point to be considered is that the seed should be free from other crop seeds. A sample of cotton may contain seeds of *tenai*. A third point to be noted is it should be free of weed seeds and in this connection no amount of emphasis can be laid on its freedom from seeds of weeds of a parasitic nature such as those of *Striga*, *Orobanche*, *Cuscuta*, etc. Another point for consideration is that the seed sample should be free from mechanical impurities such as mud, bracts, bracteoles, etc. The most important point, however, is that every seed sown should sprout and grow into a healthy plant. There should be absolutely no gaps in the field. Success in farming, therefore, centres to a great extent round the seed. The farmer must see that the seeds he consigns to earth are endowed with a maximum power of life. If one wants a hundred per cent result one must plant seeds that rate 100 in the scale of life in a soil that rates 100 in the scale of fertility.

In order to know the true value of seeds that one is going to sow, one must test them for their viability. This is known as "seed testing." Since 1930 this work is being done by the Lecturer in Botany, Agricultural College, Coimbatore, for the department and the public on scientific lines and so far more than 1,200 samples of seeds of different kinds have been tested. Samples of seeds have been received as for example from the cultivated cereals, pulses, oil-seeds, the green-manure crops such as sunnhemp, *dhaincha, (Sesbania aculeata) kolinji (Tephrosia purpurea) pillipesara* (*Phaseolus trilobus*), cotton, tobacco, tea etc.

Methods of testing. One would certainly be interested to know how seed testing is done. In the laboratory seed testing is done in what are called "germination trays" which are made of zinc sheets and the test is carried on in the incubator under a constant temperature. The tray measures 6" x 6" and is 2" deep with perforations on all the sides for aeration. Inverted into the tray is a framework of wire gauze across which are laid two strips of filter paper cross-wise, so that these touch the bottom of the tray where water is kept. Over this framework a square piece of filter paper with hundred square rules on it is placed. This is kept constantly moist by the connecting strips of filter paper, placed cross-wise. Since the tray is kept in an incubator, there is no need to cover the tray with a lid. But, if the test is carried outside the incubator, the tray has to be covered with the lid. So all the ideal condition for germination are here, i. e., moisture, air, constant temperature and darkness. Ordinary seeds like paddy, sorghum, etc., are sown on wet filter paper after giving the seeds a previous soaking in water overnight. Hundred squares are ruled on the filter paper and countings are taken from day to day till the whole set finishes its germination. Seeds like cotton or tea are sown in moist sand in trays. Holes are made in the sand and the seeds are dibbled into them and here also each tray carries hundred seeds. It is quite easy for even a layman to practise seed testing. Supposing a farmer wants to test his seed paddy before purchase, he should

get samples from 3 or 4 different merchants, taking care to obtain random samples from the different portions of the seed containers of each of these merchants. Two hundred seeds should be counted out from each sample irrespective of their size, shape, appearance, colour, etc. These should be sown in duplicate in clean moist sand in shallow earthernware pots provided with drain holes and labelled. One hundred seeds should be arranged in each pot in 10 rows, each row carrying 10 seeds. Separate counts should be taken of the germinated seeds from day to day for about a week and recorded. In this manner the total germinating capacity of each of these samples is determined. By doing so, not only the germination capacity of each sample is easily determined but the speed or energy of germination is also noted. If a sample shows 90 per cent germination in five days and another the same percentage in ten days it is obvious the former is a better lot than the latter.

Observations in this laboratory go to show that the germination speed is generally very high in almost all our cultivated crops provided the seeds are of good quality. Ordinarily even at the first counting which is done 24 hours after sowing, a good lot generally records as much as 70 to 80 and very often the test is completed on the third day. Counts are taken of seeds where the radicle (the primary root) is seen emerging out. These are the healthy seeds which are said to be germinating. It is very infrequently that there is need to carry on the counts to the fourth day. In poor lots, however, one has to wait up to 10 days. There are also slow germinating seeds such as tea, sugarcane, onion and kolinji, which need a longer period. In the case of *kolinji* the slow germination is due to its hard coat. In cases where seeds are hard coated as in many of the Leguminosae and in seeds with hairs as in cotton it is recommended that for hastening germination the seeds should be specially treated. In the case of cotton, the treatment usually adopted is stirring the seed with concentrated sulphuric acid for about 3 to 5 minutes, filtering the acid and throwing the seed into rain water. The acid treatment chars the fuzz of hairs which are easily washed off in water. This process of delinting does not interfere with germination in any manner. In the case of *kolinji* two methods have been tried viz., (1) the treatment with concentrated sulphuric acid, and (2) rubbing the seeds with glass paper by hand. The latter method has always given better results and is the only method that is now adopted. Tea seeds which are hard coated and have low viability are treated like *kolinji* with glass paper. They germinate very satisfactorily giving us an increase of about 20 per cent over the untreated seeds. Another method advocated is, to steep the seed in boiling water for five minutes dry and then sow. It is explained that the hardness of the seed coat in seeds like *kolinji* serve a purpose. In adverse conditions the ordinary seeds are destroyed but hard seeds survive the period and propagate the species when favourable conditions set in and therefore it has been argued that hard seeds should be regarded as germinable for purposes of declaring the percentage of

germination capacity of a sample. Under the rules of the International Seed Testing Association a compromise is adopted. One half of the hard seeds is added to the number germinated for calculating the real value of the sample. At the end of each test, the total number germinated, the number attacked by mold and the number of hard seeds are also given.

Conclusion. In a vital matter like purchase of seed the farmer looks for qualities such as colour, size, lustre, plumpness and sometimes smell as in coriander, paddy, etc. No doubt, these are points worthy of consideration, but appearance is very often misleading and what is really wanted in addition to good appearance is a good performance when they germinate, for 'handsome is that handsome does'. So seed testing on scientific lines is very essential. Seed testing has been going on in the Western countries for more than half a century and two of the world's greatest seed testing stations are at Zurich in Switzerland and Copenhagen in Denmark. Very valuable research work in seed testing has been done at both these stations. There are seed testing stations established now in the United States of America, Great Britain, Ireland, Australia, etc.—in fact in almost all the civilised countries of the world.

This is an age of commercial competition and if the Indian farmer is to be progressive he must eliminate every element of chance in agricultural practice so as to strengthen his position in the universal struggle. Though a creature of habits and very conservative by nature, the Indian farmer must realise the present day conditions and rise up to the occasion. It is said that agriculture was a fairly easy task a hundred years ago when seasons were more normal, prices of seeds and other commodities low and labour much less expensive than now. The state of affairs is entirely different to-day. The Indian farmer must copy the farmer of the Western countries and adopt scientific methods and see that he reaps the maximum profit from his labours. One of the most important considerations should be that his seeds are pure both for the species and the strain or variety which he intends to grow, and free from impurities such as chaff, mud, weed seeds and insect or fungus attacked seeds or plant parts and also show a high percentage of germination and vigour. Hence the motto should be never to sow seeds without testing them for their vitality and purity.

SELECTED ARTICLE

America's New Deal in Agriculture.

By J. K. TAYLOR, M. Sc., B. A.,

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In 1929, things began definitely to go amiss with the American farmer. Since the World War, 1914—18, agriculture has been existing in a state of fluctuating prosperity, trying to keep pace with the crazy finance of the industrial world in America. The policy of high tariffs, high prices, and heavy over-production, combined with a shrinking overseas market, brought the economic depression in its train, and the first man to feel the effects was the farmer. The first reaction was to put into practice the idea that the way to pay bills was to produce

more—producing more meant flogging the land or using more machinery for large scale cheaper production. To pay for machinery, constant cropping was necessary, and that meant more goods to sell on an overfull market at low prices. When prices are low the 'grow more-sell more' principle merely puts the farmer more hopelessly into debt. In addition the fertility of the soil decreased and erosion played havoc with the land It was brought out in 1932 that a farmer's income was only half that of 1914. This was due to the fact that while the farmer paid 9 per cent. more for the same goods, he sold his own produce for 43 per cent. less than in 1914. Continuance of this state was impossible, and before remedial measures were instituted there had been a serious decline in the prosperity of the farmer, often to subsistence levels, accompanied by a no less serious degeneration of the soil.

A great deal has been said about the 'New Deal' of President Roosevelt, often loosely and without a clear understanding of the idea behind it. Americans themselves are highly critical of it but as far as could be gathered last year, they have small idea of what to put in its place. At any rate in these days, they, and we also, cannot afford to be negative. What is this New Deal in Agriculture? It may be summed up very briefly—stability and security: a policy of save the farmer and save the soil. The American farmers are a most independent and individualistic people; it is part of their creed to stand by the idea of a God-given right to plough their own furrow. They have clung to their right of possession of their land up to the stage of dispossession and then moved to new fields exactly as the "Okies" migrated westward into California and the Dakotans into Oregon and Washington in the last five years. But the New Deal has given a plan to keep farmers from moving and even if it guarantees only a subsistence level of life, it has the merit of security. There has grown a spirit of co-operation, of community endeavour which overrides independence and makes the group plan and helps its individual members. President Roosevelt has been interested, personally, in farming all his life and understands the farmers' position. No other leader seems to have grasped the problem so well or tried to do so much. What failure there is, is not due to the *spirit* of the New Deal whatever the criticism of its action.

The history of American farming in the past ten years has been disastrous but the decline from as far back as 1920 has been severe. There are 6½ million farm families in the U. S. A., forming 22 per cent. of the population. In 1920, they received 15 per cent. of the total national income—in 1925, 11 per cent. in 1928, 9 per cent., and 1932, 7 per cent; since 1932 most of the mass migrations have occurred which forced the nation to take an active part in stabilising the agricultural industry. There was pressure on land in some places when the closing factory doors sent jobless sons to their father's farm and in other places, the land was abandoned. Last year the Texas and Oklahoma panhandles, and the adjoining parts of Kansas and Colorado which form the very heart of the famous "Dustbowl", presented a very un-spring-like picture in April. In driving 50 miles through the Oklahoma panhandle into Kansas and into south Western Colorado, there was not one mile of green to be seen Odd patches of sprouting wheat and some of the ubiquitous roly poly did not relieve the grey and brown landscape of windblown soils and dead grass. Drifting soil had shaved off the grass and young wheat plants and piled itself in hummocks and along fence rows. The resident owners had walked off, absentee landlords had given up the task and the mortgagees from New York to San Francisco were waiting for the promise of a good year or high prices to return. At this time 300,000 migrants from degenerated lands west of the Mississippi were moving with the tide of employment hopelessly up and down California, while Oregon and Washington tried to absorb the human stream for Motana, the Dakotas and

Nebraska. Through Tennessee and the southern States there was poor living for the farmers and an increase in tenancy and share cropping. The average farm income in Alabama in 1938 was about 500 dollars, as compared with 2,500 dollars in Iowa as the most prosperous State in the Union.

The story of land misuse and erosion painted so vividly by the publicity men in the Department of agriculture of the southern part of the country did not need exaggeration. Travelling in 1939, through these south-eastern States gave the impression that commonly the farmers were far from secure. At the last census in 1930, 42 per cent. of all the farmers in the U. S. were tenants who farmed 43 per cent. of the total farm acreage. The principle of tenancy is recognised as being against good farming. No farmer values someone else's land as his own. Much of the tenancy is found in the south and the west-central States so severely hit by drought and pests.

With this sketchy background it may be possible to visualise something of the urgency and the reason for the force of the New Deal campaign for stability and security of the farmer. From 1933 onward, since President Roosevelt came to power, there has been a series of acts passed by Congress aimed at improving agricultural conditions These cannot all be mentioned, but some are highly useful examples for us to study. The new Deal policy had three main aims. (i) Reorganisation of the Department of Agriculture. (2) Policy of planned land use. (3) Reduction of farm taxation and prevention of mortgage foreclosure.

In the fulfilment of these plans a great many new duties were given to the Department of Agriculture, for which provision of staff and finance was made, but as the new agencies multipled there arose some confusion of effort and conflict as to the scope of work. In 1938 the Bureau of agricultural Economics was given the job of planning a programme of investigation and assistance, and an office of Land Use Co-ordination created for the purpose of co-ordinating the work of the various sections of the Department in their approach and service to the farmer. This is the body which carries the second item in the programme-planned land use.

Planning land use really developed from two angles. First the policy of land improvement sponsored by the Agricultural Adjustment Administration—the A. A. A. or Triple A.—and secondly, the activity of the Soil Conservation Service in stabilising land against erosion. The main function of the A A. A. was the limiting of the production of primary products in accordance with the market's demands. Briefly, the Bureau of Agricultural Economics undertakes the work of predicting market requirements in advance and assessing a figure for total U. S. production of certain crops and livestock in the current year. The main crops affected are wheat and cotton—this year tobacco will probably be important also. The A. A. A. then portions out the area for each State concerned with the crop, and it is possible for it to swing production gradually from one part of the country to another on the grounds of greater suitability of climate or superior quality of product. This can only be done by degrees to avoid the shock to local industry, but the aim is good, namely to concentrate production in the most suitable belts and build up compensating industries in those parts deprived of a staple crop. Each State distributes its quota according to counties and the county deals with the limiting of its own crops according to its allotment. Up to 1935, the payment made by the Federal Government to compensate farmers for the smaller area planted was taken from a tax on processed primary products such as flour, but on this tax being declared unconsitutional by the U. S. Supreme Court, the later payments have been met from general revenue. There was one change made in policy—the farmer was given a contract with wider obligations. If the taxpayer at large had to pay the farmer, he was entitled to demand a return for his money ; since the land is a national asset and therefore

everybody's concern, a return could be made by the farmer improving his land as a national asset. The farmer was required to restrict his crop and to plant or treat the land thereby not used in a manner prescribed by federal agents. He had then three alternatives. He could perform the full contract of restriction and prescribed management and be paid for it. He could restrict his crop without carrying out any soil building programme, in which case he would not be paid; or he could neither, in which case he would be penalised by the confiscation of the excess crop. The first course is naturally adopted by the main body of farmers. The point to be noted is that a string is tied to the contract and the ultimate aim is not only to control the market supply of the crops but to institute a programme of land improvement-whether it be by prevention of erosion by the use of legumes or pasture for raising fertility, or by the retirement of unsuitable areas to farm " wood lots "

The second agency in land use planning is the Soil Conservation Service. The Service was set up in 1936 specifically to tackle the problem of soil erosion and conservation nationally, and in a manner not possible for all individual states. It has worked by advice and active assistance in farm planning, but in particular through soil conservation districts set up, with an advisory staff, at the voluntary request of the farmers of the district. The soil conservation district was organised with a manager and a variety of assistants trained in agronomy, engineering, forestry etc., according to the nature of the area. The object was to reclaim degenerated portions of the district and make an attack on problems of farm management as they affected soils, stabilisation and crop improvement. The soil conservation district permitted soil erosion control to be instituted on a wide scale, with the aid of demonstrations and experiments and the organisation of the whole community on the basis of planned agriculture.

Whatever was done for advancing the farmer and raising his income, equally assisted in keeping him from moving. Security of farm ownership meant a great deal to a farmer in constant fear of a succession of adverse years, mortgages and possible foreclosure, of being forced into tenancy or finally into share cropping. The evidence seems to show that this was no unusual condition, and a very great problem in many States. There was a way out. The land could be improved in production and rendered secure by development along sound lines made possible partly by A. A. A. payments and partly by loans made through the Farm Security Administration. The latter agency was set up in 1937, for the specific purpose of financing farmers with a genuine case for assistance. The loans are of three types. First, good farmers who have lost their land or are on submarginal land incapable of returning them a living may be lent money to re-establish themselves on a fertile site. There is a requirement that the new farm be handled correctly, and Federal officers have the job of watching the development. Second, farmers might receive loan to allow them to get on their feet again, provided they followed intelligent farm management plans. These loans are on a five-year to ten year basis at low interest. They were used for buying livestock, implements, fertilisers, and such things that a low income would not allow for effecting improvements. Third, tenant farmers may be assisted by long term low interest loans to buy farms for themselves. For five years after purchase, the Government may resume the farm if it is not used properly, and throughout the period of the loan Federal officers may supervise farming operations.

Another Act passed by Congress authorised the purchase of submarginal land to remove it completely from the market and develop a better use for it. This land is being taken out of poor farms into range grazing land, forests, recreation areas, or other suitable uses. The amounts of money voted for this and the loans to tenant and other farmers are small by comparison with the need, There are 86 million acres of submarginal land in farms, and only 50 million dollars were

voted to begin buying it. The numbers of tenant farmers were increasing between 1880 and 1935 at the rate of 33,000 per year; the 50 million dollars in 1939, the largest amount voted for assisting tenant farmers, would not nearly cope with the annual increase if all were to be re-established as landholders. Obviously a proportion would not be worth financing even on supervised farms.

Of all the efforts at improvement, none are more interesting than the community planning sponsored by the land use planning agency of the Bureau of Agricultural Economics. Despite the independent attitude of the farmer, there has come a strong movement towards co-operation and in at least one county in every State communities have elected committees to study and plan for the improvement of the district. The committee is essentially made up of farmers with some State or Federal agents acting as advisers. Their object is to work out a scheme for lifting the level of the community, for example by proposing on the agricultural side a more extensive use of fertilisers, or an increase in the number of high-class bulls, and on the social side, a new road or moving a school site or a rural electrification scheme, or the provision of a recreation reserve. The committee formulates the programme of improvement they would like for the community and, to implement it, may ask for assistance by money loan, cheap electric supply, fertilisers at low rates, or perhaps labour to be done by a Civilian Conservation Crops youths' camp. The community scheme is passed on by the State planning committee, if they are agreeable to Washington, where it may be accepted or referred back for amendment. The Government both State and Federal, is keen to help these community committees because the security and stability of the rural population is one of the most urgent problems to be faced. Last year 450 counties had begun community planning within eighteen months of the inception of the movement by the Department of Agriculture so that the future progress of the scheme will be very interesting to follow.

The account given of the activities of Federal agencies set up as a part of the New Deal policy has been necessarily sketchy and there are many other aspects which could be discussed. For example, there is the Tennessee Valley Authority's programme of development and rehabilitation in that area touching on seven States, all of which are co-operating. The co-operation of State and Federal research and extension services is a most pleasing sign; it is a recognition that the brains, as well as money, of the Federal Department can be used to solve national problems within individual states. A Federal Crop Insurance Act, 1938 attempts to insure crop returns to the farmer. The Surplus Commodities Act, 1937–8 provides money for buying crops in excess of the estimated production to prevent gluts and low prices. The Omnibus Flood Control Act, 1936-8 seeks to co-ordinate Federal Government attack on flood problems by bringing in the Department of Agriculture to work with army engineers; it was the the first sensible step in flood control in so far as the problem was tackled at its source in run-off control though land management instead of by building bigger and better levees as in the past. A Water Facilities Act of 1937 provides money for developing water resources in arid and semi-arid regions according to an approved land use programme. From various sources the Secretary of Agriculture is given emergency relief money to preserve wild life, forests, soil, and to control insect pests.

There are a great many critics within and without America of this vast planning programme and public expenditure. Foreign observers often have not quite grasped the size of the country and the extremely serious state it was in. It is all very well to say there is "graft" and misuse of money, that the country cannot go on indefinitely assisting farmers, that the administration does not know where it is heading or when to stop, and that the whole organisation is a

pretty example of triumphant and bungling bureaucracy. In the foregoing pages the principle aims and some of the methods of the New Deal have been described, and undoubtedly good is being done. Some "dictators" have made the statement, somewhat cold-bloodedly, that as the western Dakotas and Nebraska and much of the Dustbowl constitute only range land and have been broken up for wheat by mistake, that they should just simply revert to grass and the quicker the better. Unfortunately such wholesale programmes are impossible because population cannot be moved *en bloc*, Much of the Texas panhandle is held in 320—acre or smaller areas, and the average carrying capacity or range land is 10 or, on good land may be 20 beasts per square mile. What then is to be done with say 100,000 farm families who would pass out with the return of the range. Resettle them? And if so, where? Or send them into the towns, and as surely on to relief? The projected plan for the Dustbowl reduces wheat acreage from 19 million to 13 million acres and proportionately alters all other crops while putting the remainder into grass. Ultimately the agricultural system will find its proper balance. It cannot be indefinitely supported by government grants, payments and loans, but if these had not been used in the past five years the critics would have had much more reason to deplore the continuance of the Old Deal. In any case, at least one traveller last year in America found the critics without a plan to substitute.

Surely the way to view the New Deal is as an attempt to save the farmer and the land by the only means that seemed adequate in the desperate condition affairs were reaching in 1934; namely by a huge expenditure of public revenue and loan money. The eyes of the nation are tending to focus on control of land use by Federal or State or other bodies. The people are learning no longer to permit the use of unsuitable and submarginal land in small holdings and in rural communities the spirit of co-operation to improve farms, incomes and living in general is stirring. There are many things the farmer can thank the New Deal for, and perhaps the salvation of the farmer in the long view may transcend the mistakes and cost of the great experiment. Australia has not the same problem to face, but there is every need for land use planning and sound development of a *permanent* agriculture. Eyes on America therefore for experience, with a tolerant discriminating judgment. (*Journal of the Australian Institute of Agricultural Science* 6: (1940) 78—84.)

ABSTRACTS.

Cold Resistant Sugar Cane. Queensland Agri. Jour. 53: (1940). An experiment is now being carried out in the United States in the division of sugar plant investigations. The variety in question was received from Turkestan, and during the past three years several further importations of the same type of cane have been made. It is quite probable that there are many such varieties of wild cane in the vast stretch of country between the Caspian Sea and Western China, but the difficulties of travel in such remote parts have prevented visits by plant explorers. The outstanding characteristic of this "Turkestan" cane—is its ability to withstand extreme cold. The first importation was grown in the vicinity of Washington, U. S. A. at a latitude similar to that of Tasmania. During winter in spite of the fact 15 to 20 degrees of frost were registered, the plants remained green and few of the lateral buds were killed. The cane was also found to grow quite rapidly under the comparatively cold conditions of spring. Sugar-cane in Louisiana suffers from the extreme disability of late autumn frosts so that it has to be harvested before it is ripe, while early spring frosts prevent its early planting or ratooning, so that the cane has a growing season of only some seven or eight months per year. Dr. Brandes and his associates have tried to hybridize

this cold-resistant cane with some of the local canes in order to produce a commercial cane with a longer growing season. A difficulty arose in that the Turkestan specimen arrowed in mid-summer, whereas the commercial varieties of sugar cane arrow in late autumn. This was overcome by taking advantage of the reversal of seasons North and South of the equator. Enquiries showed that commercial varieties of cane would be arrowing in the Republic of Columbia, in South America, at a time when the Turkestan cane was arrowing in the northern hemisphere. Cuttings of the Turkestan cane were planted in boxes and when the arrows were just about to emerge they were carted and shipped down to Columbia as fast as possible. When removed from the crates the arrows were in good condition and they were then set in position in contact with arrows of commercial varieties of sugar cane. At the same time pollen was collected in special containers from the cane which was arrowing in Washington, and these containers were then rushed by aeroplane to Columbia and there the pollen was dusted on to the flowers of commercial canes. Both methods proved successful in 1938 and some 15,000 hybrid seeds were obtained and taken back to Washington by air. The seeds were planted immediately on arrival and gave rise to a large number of seedlings which are obviously hybrids between the two types of cane. They have shown improved vigour over the wild type and have also demonstrated their ability to withstand cold which would have killed ordinary varieties of cane. In 1939 further pollen was sent to Columbia and hybrids were again obtained. Also the pollen from the 1938 hybrids was back-crossed with the commercial types. The progenies of these are grown at Washington—these having one quarter Turkestan blood. This success does not necessarily imply that the sugar industry will be shifted to colder climates but that considerable benefit would be conferred on some of the sub-tropical cane-producing countries. It is also realised that the necessity to ennoble the hybrids in order to improve the sugar content and tonnage, will lead to the ultimate dilution of the cold-resistant properties of the hybrids. Nevertheless it will be a very great achievement if there can be produced an otherwise suitable cane which will be able to withstand temperatures of, say, 28°F. instead of being killed at 32°F. and perhaps this is as much as could be expected.—N. K.

Problems of keeping milk in the home. O. Kudelka, *Queensland Agr. Jou.* 53:. (1940).

A high-quality milk for drinking purposes has to satisfy several conditions. It has to be fresh and free from pathogenic germs. It has to contain as few as possible milk bacteria which are not pathogenic, and has to possess all nutritional properties in good proportions. In short, a high-quality milk has to be clean, safe, and rich. To produce, handle, transport, and to sell such a product certain methods must be applied. Among conditions for the production of a high-quality milk the temperature plays a very important part. The amount of bacteria present in freshly drawn milk coming from a healthy cow is always very low. The increase in the bacteria in the milk is caused by two factors. Firstly, external contamination that occurs during the handling with unsterilized utensils, or by dust contamination; and, secondly, the multiplication of the original milk bacteria at a favourable temperature, and time. The medium of milk is one of the best, and is very suitable for the multiplication of the milk bacteria and the bacteria commonly coming from the external sources. The most favourable temperature for this development is over 70° F. and the optimal temperature being between 70° and 90° F. Hence the importance of the cooling of the milk immediately after milking to keep its original low bacteria count and the need for strictest cleanliness in handling. The number of bacteria increases proportionately to the length of time the milk is stored. This multiplication, however, is limited since the development of

bacteria is checked by the by-products of the bacteria themselves if they are present in too high numbers. Even after its supply to the household, milk must be treated very carefully. It has to be kept in the cleanest utensils (best in the bottle it is delivered in), and placed in a very cool spot. It is better to have a small quantity delivered twice a day than a large quantity once a day. The bacterial changes taking place in the milk at various periods of time and temperatures were tested. Six bottles of fresh pasteurised milk were examined. The first bottle was counted for bacteria immediately on arrival while the sixth was kept in a refrigerator. The remaining four were kept at atmospheric temperature and counted at different times. It was found that bottle 1, gave 12,000 bacterial count at 8·30 a. m. the time of arrival, while bottle 5, at 4 30 p. m. gave 2,960 000. The sixth one kept in the refrigerator (56·0°) gave 2,900 at 5 p. m The argument that pasteurised milk loses some of its supposed forces of resistance was found to be unfounded. Experiments have proved that milk, if it is properly pasteurised, does not lose any of the good qualities of the raw milk. but is freed from all pathogenic germs that could be present in it. Experiments similar to those of the pasteurised milk conducted with clean raw milk showed that at the end of eight hours at room temperature the count of bacteria was the same as in the previous set of experiments while that kept in the refrigerator gave after eight hours 14.000. Both experiments seem to prove the importance of cold storage of milk, even at home, and stress that the time of storage should be limited unless at a temperature below 60°F. The higher the temperature the shorter the time of storage should be. N. K.

The influences of sowing depth and moisture on smut diseases and the prospects of a new method of control. G. H. Jones and A. G. Seijel Nasr. *Ann. App. Bio.* 27·35—57, 1940.

In Egypt wheat and barley are planted in two ways, the chief difference being that in one case (*herati*) the soil is moist and the seeds are planted deeper while in the other (*afir*) the soil is wet and the seeds are nearer the surface. Bereal smuts were found to be sensitive to the method of planting and *herti* sown plots showed consistently a higher percentage of disease. This led to the conduct experiments to note the effect of methods of planting on smut diseases. Studies were made on covered smut of barley (*Ustilago hordei*) grain smut of millet and broom corn (*Sphacelotheca sorghi*) bunt of wheat (*Tilletion tritici*) and flag-smut of wheat (*Urocystis tritici*). The two systems of planting were followed and sowings were made at 5 cm. 4 cm. 8 cm. and 12 cm. from the surface. The *herati* plots had 25 per cent moisture content and *afir* plots 32 per cent. Thus two factors sowing depths and soil moisture were involved in these experiments. The results showed a progressive increase of disease with each increase of depth with a few exceptions all occuring in deeper plantings in wet soil. Depth of sowing is found to have a marked influence on the incidence of smut and this is due to the lengthening of the susceptible stage of the host by deeper planting. The rupture of the coleoptile and the consequent onset of resistance of the seedling are delayed. The influence of soil moisture is less and constant wet soil discouraging disease increasingly with depth, presumably due to lack of aeration. The exceptional cases in deeper plantings in wet soil are explained by stating that the fungus becomes destructively parasitic killing the weak seedings at an early stage and thus preventing a proportion of infected seedlings developing into diseased plants in the crop. In countries where irrigation is practised and where it is possible to control soil moisture and depth of sowing, smut diseases can be checked by planting as shallow and on as wet a soil as possible. In Egypt flag-smut of wheat which is both soil and seed borne can be more efficiently controlled by "mud sowing method" (moist soil ploughed and flooded and seed broadcast one hour later) than by the use of disinfectants or resistant varieties. It is

suggested that the influence of depth of sowing may be studied with advantage in the case of other seed and soil borne seedling-infecting diseases also. T. S. R.

Antdhelmintic activity of crystalline papain. J. Berger and C. F. Aserjo, *Science* 91 : (1940) 387—388.

The use of certain plant juices as worm killers is known from ancient times but has been neglected in recent years. Reports are available of successful use of the crude milk from papaya fruits against intestinal worms during the last century. Experiments have shown that round worms are completely digested in 16 hours by 0·11 percent concentration of crystalline papain. This is 14 times as active as commercial preparations. Bromelin obtained from fresh pineapple juice and crystalline ficin obtained from the latex of Ficus species also can digest round worms. This capacity is attributed to protein-dissolving enzymes present in these juices. But there is evidence to show that other plant juices containing these enzymes do not possess this capacity of digesting live worms T. S. R.

EXTRACT

Cleanliness In Dairy Routine

Much has been written on " cleanliness " in the various phases of the production of topgrade dairy products, i. e., washing utensils, cleaning separators, milking machines and so on, and it will be readily admitted that this subject is of paramount importance to the dairy farmer who is paid according to grade for his produce. This article has been written in an endeavour to include the most important sections of all these operations under the heading of " cleanliness in the dairy routine". Taking the various operations in order of their occurrence, the first point which warrants close attention is :—

Cleanliness of the Cow :— The hair of the coat and on the udder is a fruitful source of bacterial contamination when the cows come in from the paddocks. In the summer bacteria-laden dust invariably exists on the hair, and in the winter when the cows are wet with rain or dew the drops of water contain many thousands of bacteria allowed to drop into the milking bucket. It is recommended that a cloth which has been dampened with a dilute solution of potassium permanganate (Condy's crystals) should be used to wipe over the flanks and udder of the cow immediately prior to milking. The first squirt of milk from each teat should be discarded for the reason that bacteria find their way into the teat from the exterior and multiply there between milkings.

Methods of Milking :— It is a well-known fact that so-called " wet milking " is definitely a contributing source of the bacteria in milk. A smear of petroleum jelly on the teats should obviate the necessity for wetting the milker's hands with milk and has the effect of keeping the teats in healthy condition. Cleanliness and health of persons tending the cows, of course, is essential in the production of bacteriologically clean milk.

Cleansing of Separator and Utensils :— In cleansing the separator and dairy utensils three processes are necessary, any one of which is useless unless combined with the other two :—

(a) Washing with lukewarm water to remove the curdy sediment which, if left, will form upon subjection to heat an insoluble substance (milk-stone) which is particularly difficult to remove.

(b) Washing and scrubbing with scalding hot water containing washing soda or other recognized dairy cleanser.

(c) Sterilization with steam. A simple steaming device for placing over copper vessel of boiling water is described in Leaflet No. 424 which may be obtained on request.

It may be said here that the growth of organisms from the time of washing and sterilizing to the time of the next milking can be very great and therefore considerable benefit can be derived by a second sterilising of all utensils immediately prior to milking with either stream or chemical sterilizers containing chlorine compounds. Chlorine distinfectants are marketed at present in powder form which is preferable to liquid chlorine disinfectants, as the powder is less likely to deteriorate in storage. All utensils, after sterilising, should be placed on racks so that the metal surfaces dry out rapidly. Bacteria will multiply in the presence of moisture. It is also necessary to have yards, bails and surroundings in clean condition, in order to minimize contamination with dust, dung etc. With this in view, compliance with the following conditions taken from the Health Act. 1911—1919, regulations has become necessary;

(a) The floor of a properly constructed milking shed must be concrete or other impervious material and correctly drained into an open impervious drain at least 20 feet away from the shed.

(b) A milk and cream storage room must be built on approved lines with a concrete floor and properly ceiled and ventilated, also fly-proof and be at least 10 feet from the milking shed.

(c) Provision must be made for boiling water to be available at the bails immediately adjacent to the washing up facilities in use.

(d) Cow bails and sheds must be lime-washed or painted with other suitable preparation. A 4-foot dado of tar or bituminous paint is recommended at being simple to wash down.

It may be said in conclusion that only a few cases of unsatisfactory milk or cream quality are traceable to any single source of origin, but most cases are due to a culmination of many small and seemingly unimportant foci of bacterial contamination which can only be eliminated by careful attention to detail as outlined above in every operation of the dairy routine. *Tropical Agriculturist* 94: (1940) 303—304.

Vitamin-hormone stimulant—in powder form.

From the Horticultural Department of the American Chemical Pains Company comes news of the commercial production of a vitamin-hormone stimulant, Transplatone, for plants, that not only invigorates old roots but also multiplies the production of new ones, reduces the loss which frequently occurs with transplanting operations, and reduces wilting. It is applied to rooted plants to add to existing root growth and to force their general growth. Transplantone is a water-soluble powder impregnated with Vitamin B_1 and other parts of the Vitamin B fraction, plus root-promoting hormones. The hormone initiates root growth and plant physiologists assert that the Vitamin B chemicals are necessary for the maintenance of their growth. That it is quite concentrated is obvious for it requires only one level teaspoonful to a gallon of water to make a stock solution which is then further diluted. Seedlings may be lightly sprinkled weekly, or it may be applied to plants set out in the soil, whether they be trees, shrubs, vines, annuals, or perennials. In the case of plants which are set out without a ball of earth, the manufacturer recommends that the roots be soaked in the stock solution for an hour. Treatment usually results in vigorous and extensive root growth and this, in turn, requires more frequent watering than is ordinarily necessary. The manufacturer further claims that, owing to frequent clipping, grass is unable to produce enough vitamin and hormone naturally for the roots and that watering with an ounce of stock solution to three quarts of water will improve turf quality. Sods similarly treated before being set in place will also readily form new roots.— C. F. Greeves—Carpenter. (*Scient. Amer.* 163, (1940) 85—86).

Gleanings.

Cotton Writing Paper. Details are as yet unavailable as to the new process for making a high quality writing paper directly from cotton—low-grade cotton at that—but the development work was done by the U. S. Department of Agriculture in co-operation with the Writing Paper Manufacturers' Association. Provided that the process is a commercial success and paper can be made cheaply enough to create a big demand for it, then this should solve a sizeable part of the problem of what to do with America's surplus cotton. (*Scient. Amer.* 163, (1940) 90).

Wholesome Milk. Normal milk can only be produced by a normally healthy herd, fed on wholesome and non-taint producing fodders. If only one cow in the herd is not in normal health her milk production will be sub-normal, and, if mixed with the milk from the remainder of the herd, the quality of the whole may be seriously affected. Cleanliness should be exercised during the whole process of milking and all utensils and surroundings kept clean.

If the milk is intended for human consumption, cooling and aerating will allow the flavours to be given off, and the reduction in temperature will check bacterial development. *Queensland, Agr. Jou.* 53: (1940).

Acreage under bananas in New South Wales. On 31st March 1940, there were 17,211 acres under bananas in New South Wales which is an increase of 1,367 acres over the acreage of the previous year. *Agr. Gaz. N. S. Wales.* 51: 382.

Reviews.

Indian Indigenous Milk Products by W. L. Davies, Director of Dairy Research in India (Thacker Spink & Co. Ltd., Calcutta).

In this book of about 100 pages Mr. W. L. Davies describes the utilization of milk in India for the manufacture of indigenous milk products. The methods of their manufacture, the scientific principles involved in their preparation, their composition (physical, chemical and biological), their properties (including nutritional), and uses to which they are put, are briefly and clearly explained.

The first chapter deals with the composition of milk; the second treats of *khoa, kheer,* and *rabbri ;* the third deals with the fermented milks, *dahi* (curd) and *lassi* (butter milk); the fourth and fifth deal with local butter and *ghee* (clarified butter); the sixth deals with miscellaneous products as creams (*malai* and *sar*), cheese and *channa* and the last chapter indicates the possibilities of the utilisation of milk for the manufacture of western products as creamery butter, cheese, condensed milk, dried milk, and tinned cream, which we are importing in increasing quantities every year.

The book contains suggestions on almost every page for improvement and research and as the author says, it will be useful for all those interested in the development of the Indian dairy industry, especially, students of dairying, agriculture, and animal husbandry; biochemists, analysts, and technologists. The book is an important addition to the very meagre list of books on Indian dairy industry. T. N.

Insect Pests of The Punjab. By Khan A. Rahman, B. Sc., Ph. D., F. R. E. S. *The Punjab Agricultural College Magazine* May to July '40.

This article contains useful information on some of the major pests of important crops and stored produce in the province. Short notes on the pests

are given under the following heads:—identification, distribution and food plants, damage and control. The scientific names of the pests and references for those who require more detailed information are also given in small type. Besides these, the preparation and use of the different insecticides and descriptions and prices of the spraying and dusting machines recommended by the Department also find a place in the publication. The illustrations given in the article add to the value of the publication as they will be found useful in the identification of the pests. The author states that he has compiled the information on the different pests and their control from the various publications of his predecessor Khan Bahadur M. Afzal Husain, M. Sc., I. A. S., Entomologist for 18 years and now Vice Chancellor of the Punjab Universisty—whom he considers as the father of Entomology in the Punjab. A word of praise is due to Mr Rahman who has, for the first time, brought together in one publication information on the insect pests of the Punjab scattered over in the numerous publications. He has succeeded in his attempt to give in a concise form sufficient information to meet the needs of the student and agriculturist and, to some extent, of the research worker. With better care and attention, the errors for which an errata slip has already been issued could have been avoided. These, however, need to be corrected at the time of the second edition of the publication. M. C. C.

Annual Review of Bio-Chemical and Allied Research in India—Vol. X, 1939.

This book has been published by the Society of Biological Chemists, India It is priced Rs. 3 and is available with the Honorary Secretary of the Society, Hebbal P. O., Bangalore. It contains in a clear and concise manner, the latest results of research work done in India, in Pharmacology, human physiology and pathology, industrial chemistry, foods and nutrition, soils, fertilisers, manures, plant physiology and phytopathology. Bengalgram is said to be the best from nutritive value, with greengram coming a close second. In view of this decision, which has also been corroborated by Akroyd, it is for consideration, whether the cultivation of soya beans should be encouraged in this country. Tapioca as a staple article of diet is said to be unsatisfactory because of a deficiency in the quantity and possibly the quality of its protein. A technique has been developed in which insects are made use of, as test animals, for nutritional and vitaminic studies. Black gram husk and *agathi* leaves, have been reported to be found adulterated in tea. A preliminary soil map of India, which will satisfy a long felt need, is reported to be under preparation.

The results of the competition sponsored by Marsland Price & Co., Ltd., at the instance of Mr. Walchand Hirachand, offering a prize of Rs. 1,000, for growing 100 tons or more of sugarcane per acre, has revealed some interesting facts. Out of twenty-one, 3 competitors, showed a tonnage of over 100 tons, of stripped cane. In addition to thorough and deep preliminary cultivation of the land, heavy manuring was resorted to in these cases, consisting of 30 cartloads of farm yard manure, 4 tons of oil cake and 4 bags of ammonium sulphate per acre in addition to green manuring and sheep folding. The expenses of manuring alone came to Rs. 350 to Rs. 400 per acre and including other items of cultivation, the total expenses came to about Rs. 750 per acre or Rs. 7 per ton of cane.

The review is well edited and is worth reading. M. K. R.

Crop & Trade Reports.

Cotton—First Forecast Report 1940-41. The average of the areas under cotton in the Madras Province during the five years ending 1938-39 has represented 9·7 per cent. of the total area under cotton in India. The area under cotton up to

the 25th July 1940 is estimated at 235,100 acres. When compared with the area of 149,000 acres estimated for the corresponding period of last year, it reveals an increase of 57·8 per cent.

Central districts and South—Mainly Cambodia tract. The area in the Central districts and the South represents generally the last year's crop left on the ground for second pickings before the plants are removed in September in compliance with the provisions of the Pest Act. The area in these districts rose from 86,500 acres to 146,100 acres due mainly to favourable rains in April and May 1940. The yield is expected to be generally normal.

Western tract. The area under Westerns rose from 28,400 acres to 61,300 acres. The increase in area in the current year is due mainly to the good rains received in the Bellary district in the early part of the *mungari* season.

White and Red Northern tract. The area under white and red northerns rose from 12,000 acres to 13,500 acres, i. e., by 12·5 per cent.

Warrangal and Cocanadas tract. The area under Warrangal and Cocanadas cotton fell from 15,600 acres to 8,200 acres, i. e., by 47·4 per cent.

The average wholesale price of cotton lint per imperial maund of 82⅔ lbs. as reported from important markets on 5th August 1940 was Rs. 16—7—0 for Cocanadas, Rs. 16—10—0 for white northerns, Rs. 17-4-0 for red northerns, Rs. 14-9-0 for westerns (mungari crop), Rs. 17—7—0 for Westerns (jowari crop), Rs. 28-14-0 for Coimbatore Cambodia, Rs. 20—15—0 for Southern Cambodia, Rs. 26—10—0 for Coimbatore Karunganni, Rs. 20—8—0 for Tinnevelli Karunganni, Rs. 19—0—0 for Tinnevellies and Rs. 22—5—0 for Nadam cotton. (*From the Director of Industries and Commerce*).

Cotton—Intermediate Forecast Report 1940-41. *Last year's crop.* The yield of the second or summer pickings of the 1939-40 crop is estimated to be generally normal.

Current year's crop. The main season for sowing is not yet over in most parts of the Province. Sowings of the crop are in progress in the Circars and the Deccan. The condition of the early sown crop is generally satisfactory.

The average wholesale price of cotton lint per Imperial maund of 82,2/7 lbs. equivalent to 3,200 tolas as reported from important markets on 2nd September 1940 was Rs. 14—13—0 for Cocandas, Rs. 17—4—0 for Red Northerns Rs. 16—10—0 for White Northerns, Rs. 13—10—0 for Westerns (*mungari* crop), Rs. 17—5—0 for Westerns (*jowari* crop), Rs. 27—15—0 for Coimbatore Combodia, Rs. 20—4—0 for Southern Cambodia, Rs. 26—2—0 for Coimbatore Karunganni, Rs. 19—0—0 for Tinnevellies and Rs. 21—4—0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 5th August 1940, these prices reveal a fall of ten per cent in the case of Cocanadas, six per cent in the case of Western (*mungari*), five per cent in the case of Nadam, three per cent in the case of Coimbatore Cambodia and Southern Cambodia, two per cent in the case of Coimbatore Karunganni and one per cent in the case of Western (*hingari*), the prices of Northerns (Red and white) and Tinnevellies remaining stationary. (*From the Director of Industries and Commerce*).

Sugarcane—Intermediate condition report 1940. The condition of the sugarcane crop is satisfactory in all the districts outside Vizagapatam where it was adversely affected by the very heavy rains of May. A normal yield can be expected in the other districts if the season continues to be favourable.

2. The wholesale price of jaggery per imperial maund of 82,2/7 lbs. (equivalent to 3,200 tolas) as reported from important markets on 9th September 1940

was Rs. 5—11—0 in Mangalore, Rs. 5—0—0 in Erode, Rs. 4—15—0 in Salem, Rs. 4—14—0 in Cuddalore, Rs. 4—10—0 in Cocanda and Rajahmundry, Rs. 4—5—0 in Vizianagarm, Rs. 4—2—0 in Adoni and Chittoor, Rs. 3—14—0 in Vellore and Coimbatore, Rs. 3—7—0 in Vizagapatam, Rs. 3—1—0 in Trichinopoly and Rs. 2—14—0 in Bellary. When compared with the prices published in the last report, i. e., those which prevailed on 5th August 1940, these prices reveal a fall of approximately 16 per cent in Bellary, ten per cent in Vizianagaram, six per cent in Rajahmundry, Vellore, Salem and Trinchinopoly five per cent in Vizagapatam, four per cent in Chittoor and one per cent in Cuddalore, the prices remaining stationary in Cocoanda, Adoni, Erode, Coimbatore and Mangalore. (*From the Director of Industries and Commerce*).

Ginger—First forecast report 1940. The area under ginger up to 25th August 1940 is estimated at 12,000 acres in Malabar and 800 acres in South Kanara. The condition of the crop is generally satisfactory except in parts of the Malabar district where the crop is affected by "soft-rot" to some extent. (*From the Director of Industries and Commerce*).

Pepper—First Forecast Report 1940. The area under pepper up to 25th August 1940 in the districts of Malabar and south Kanara is estimated at 102,500 acres 94,000 acres in Malabar and 8,500 acres in South Kanara, as against 102,300 estimated for the corresponding period of the previous year. The yield is expected to be normal.

The wholesale price of pepper per Imperial Maund of 82,2/7 lbs. (equivalent to 3,200 tolas) as reported from important markets on 9th September 1940 was Rs. 10—1—0 at Calicut, Rs. 9—13—0 at Tellicherry, and Rs. 10—2—0 at Mangalore. When compared with the prices which prevailed on the 8th January 1940, these prices reveal a fall of about 22 per cent in Mangalore, 16 per cent in Tellicherry and 13 per cent in Calicut. (*From the Director of Industries and Commerce*).

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 13th September 1940 amounted to 425,020 bales of 400 lb. lint as against an estimate of 3,66,800 bales of the total crop of 1939-40. The receipt in the corresponding period of the previous year were 411,134 bales. 415,550 bales mainly of pressed cotton were received at spinning mills and 113,286 bales were exported by sea while 109,386 bales were imported by sea mainly from Karachi, (*From the Director of Agriculture*).

College and Estate News.

College. The Students of the third year B. Sc. (Ag.) class were given a course of special lectures on Poultry-farming by Sri H. Narahari Rao, Assistant in charge of Poultry, Panagal Demonstration Farm, Kalahasti.

Examinations. The first terminal examinations for the 1st, 2nd and 3rd year classes commenced with practicals in the first week of September and were finished by 13th. The College closed for the Michaelmas vacation on the 15th and will reopen on the 4th October. The final year students were, however, permitted to leave the College on the 13th as they have to assemble on the 1st October for their tour.

Students. The Educational tour of the final year B. Sc. (Ag.) begins from 1st of October.

Agricultural Research Station, Gudiyattam	October	2nd & 3rd
Fruit Research Station, Kodur	,,	4th & 5th
Agricultural Research Station, Hagari	,,	7th & 8th
Irrigation Research Station, Siruguppa	,,	9th & 10th
Hebbal Agricultural School, Bangalore Imperial Dairy Institute, Bangalore Lal Bagh Gardens, Bangalore	,,	11th, 12th & 13th
Live-stock Research Station, Hosur	,,	14th & 15th
Return to Agricultural College, Coimbatore	,,	16th

Hostel. Consequent on the great reduction in the number of students remaining in the hostel during the Michaelmas holidays the regular four messes of the Hostel are temporarily suspended and instead a special mess is run for the duration of the holidays.

Club activities. A highly educative and instructive lecture was delivered by Sree N. Subrahmaniam, B. A., B. L., under the auspices of the Students' Club on 30—8—40. Sri. Sheshavataram occupied the chair. The speaker dwelt upon the Development of Co-operation in Agriculture laying emphasis on its evolution and how the intrinsic desirability of adopting such co operation came to be realised in foreign countries and exhorted the students that special responsibilities lay on their shoulders to educate the opinion of the Indian farmers as to the vast utility and immense significance of co-operation among agriculturists.

Games: Cricket. The students of the Agricultural College had a fixture with the Palghat Victoria College, on 24th August '40 and snatched an easy victory. Palghat 108 for 6 wickets (Venu 25, Srinivasan 21, Somanna 2 for 28, S. V. Srinivasan 2 for 26). Agricultural College 168, (B. S. Krishnan 28. S. V. Srinivasan 23, C. Sankara Rao 37, Devadas Kamath 54 (not out).

The first match of the Rhondy Shield Cricket tournament was played against Government Arts College Coimbatore, and resulted in an easy victory for the Agricultural College. Government College, 53; (Somanna 3 for 14. S. V. Srinivasan 3 for 18 and Hegde 3 for 3) Agricultural College 109 for 5 (B. S. Krishnan 18, Nageswara Rao 19. K. M. Somanna 35, not out.)

We were taught a bitter lesson to restrain unruly confidence when we sustained rather an awkward defeat at the hands of the Salem Gymkhana Club on 1—9—40. Agricultural College 44; C. N. Babu 14. (J. V. Brown 4 for 17 and McHatton 3 for 4) Salem Gymkhana 193 for 7. K. B. Nagesh 71, Venkatachari 49, Spittler 54, (S. V. Srinivasan 3 for 14).

On 5—9—40 the second match of the Rhondy Shield tournament was played against the Scout Recreation Club, Coimbatore on Government College grounds. Our College kept up the tradition by winning the match easily. S. R. C. XI—53; A. Suri 21. S. V. Srinivasan 3 for 17, Hegde 3 for 15, Somanna 3 for 5.) Agricultural College 208; H. Shiva Rao, 49, Krishnan 22, C. N. Babu 41. Shanker Rao 31, Kodandaraman 34.)

There was a proposal to have a games tour during the Michaelmas holidays but the matter was dropped owing to financial exigencies.

Personal. Mr. R. C. Broadfoot, who had been to Madras, for medical treatment has returned to Coimbatore after undergoing a successful abdominal operation. He is now convalescing at Coimbatore and it is hoped that he will rejoin duty next month.

Moffussil News and Notes.

Salem Agricultural Exhibition. An Agricultural Exhibition was put up during the All India Swadeshi and Industrial exhibition organised by the Salem Municipality between the 5th and 21st of the month. Improved Iron implements,

strains of heavy yielding varieties of cereals, millets, groundnut, cotton and sugarcane evolved from Government farms, fruits, and industrial products prepared from these, insect pests and plant diseases with remedial and control measures and Bee-keeping formed the main items of the display. The exhibits commanded considerable attention of the ryot classes and elicited interested inquiries. An average attendance of between 800 to 1300 was recorded from the commencement to the termination of the exhibition during a period of 16 days. A practical demonstration of the use of iron ploughs was also given on one of these days.

A. R.

Weather Review—AUGUST 1940.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	20·9	+13·1	63·9	South	Negapatam	0·4	−3·2	6·2
	Calingapatam	10·6	+2·7	36·9		Aduthurai *	2·0	−1·1	12·3
	Vizagapatam	4·5	−0·9	21·0		Madura	6·4	+2·1	19 9
	Anakapalli*	0·0	0·0	0·0		Pamban	0·0	−0·7	11·5
	Samalkota*					Koilpatti*			
	Maruteru*	8·2	+1·2	26·0		Palamkottah	0·1	−0·5	7·1
	Cocanada	5·9	+0·4	28·3					
	Masulipatam	7·6	+0·7	19·1					
	Guntur*	0·0	0 0	0·0	West Coast	Trivandrum	6·8	+2·7	45·8
						Cochin	23·9	+11·0	100·1
Ceded Dists.	Kurnool	6·5	+1·5	18·2		Calicut	26·0	+10·4	106·1
	Nandyal*	7·1	+1·6	13·4		Pattambi *	20·9	+6·1	81·8
	Hagari *	1·8	−2·0	13·5		Taliparamba *	38·9	+14 0	130·9
	Siruguppa*	4·5	+1·0	14·0		Kasargode *	41·9	+18·3	130·5
	Bellary	1·7	−0·6	13·7		Nileshwar*	39·8	+14·3	139·7
	Anantapur	1·3	−0·9	7·0		Mangalore	47·6	+25·1	127·4
	Rentachintala	3·3		15·8					
	Cuddapah	2·7	−3·1	20·8					
	Anantharaju-pet *	4·0	+1 3	17·3	Mysore and Coorg	Chitaldrug	2·9	−0·1	16·5
						Bangalore	3·1	−2·3	18·8
Carnatic	Nellore	1·0	−2·3	13·8		Mysore	1·7	−1·6	18·7
	Madras	4·0	−0 6	15·2		Mercara	34·0	+8·5	126·5
	Palur *	3·8	−1·3	11 0					
	Tindivanam *	4·6	−0·3	13·8	Hills	Kodaikanal	4·1	−2·9	31·9
	Cuddalore	4·1	−0·9	11·3		Coonoor			
Central	Vellore	3·2	−3·1	13·6		Ootacamund *	5·4	−1·8	30·9
	Salem	2·2	−4·6	22·1		Nanjanad *	5 2	−1·7	31·9
	Coimbatore	0·7	−0·4	15·5					
	Coimbatore A. C. & R. I.*	1·0	−0·2	12·9					
	Trichinopoly	0·6	−3·2	9·9					

*Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1937 published in the Fort St. George Gazette.

The monsoon was generally active over the peninsula, under the influence of four depressions in the Bay of Bengal. The first depression originated as an area of unsettled weather at the head of the Bay on the 1st and developing into a storm crossed the South Bengal coast on the 2nd and 3rd and finally disappeared over the United Provinces on the 11th. The second depression appeared off the Circars Orissa coast on the 12th and moving inland merged into the seasonal low

by the 15th. The third depression appeared as a low off the Orissa coast on the 7th and developing into a depression by the 21st off Puri, passed inland on the next day and disappeared over Central India by the 25th. The fourth depression appeared about 100 miles south east of Calcutta on the 26th and moving inland, disappeared by the 31st of the month.

Rainfall was particularly heavy on the West Coast of the peninsula between the 10th and the 14th and on the Circars-Orissa coast between the 17th and 22nd during the passage inland of the third depression.

Rainfall was in large excess in parts of the Circars, and West Coast, and in slight excess in the Ceded Districts, nearly normal in the Carnatic and below normal elsewhere.

The chief reports of heavy rainfall in 24 hours were :
Mangalore 4·1″ (10th) ; 6·5″ (12th) and 4·5″ (13th) ;
Cochin 4·1″, Irinjalakuda (Cochin) 8·9″;
Peermade (Travancore) 6·4″; Cranganore (Cochin) 6·3″;
Kasargode 6·4″ and Ankamalli (Travancore) 7·0″ (all on the 14th).
Narasapur (W. Godavary) 6·5″ and Jeypore (Ganjam) 5″ (on the 17th).
Gopalpore 9 0″ (21st) and 4·2″ (22nd).

Weather Report for the Agricultural College and Research Institute Observatory.

Report 8/40.

Absolute maximum in shade.	...	91·5°F
Absolute minimum in shade.	...	68·0°F
Mean maximum in shade.	...	86·9°F
Departure from normal.	...	nil.
Mean minimum in shade.	...	71·9°F
Departure from normal.	...	+0 8°F
Total rainfall for the month.	...	0·99″
Departure from normal.	...	– 0·20″
Heaviest fall in 24 hours.	...	0·34″ on the 13th.
Total number of rainy days.	...	3
Mean daily wind velocity.	...	5·4 m. p. h.
Departure from normal.	...	– 1·6 m. p. h.
Mean humidity at 8 hours.	...	72·3%
Departure from normal.	...	– 1·7%

Summary. The weather conditions were slightly unsettled during the 1st half of the month when a total rainfall of 0·99″ was recorded. The rainfall was in defect by 0 2″. Skies were moderately to heavily clouded and the humidity was in slight defect. The mean maximum temperature was normal while the mean minimum was slightly above normal. P. V. R. & F. L. D.

Departmental Notifications.

Gazette Notification.

Appointment.

Sri. L. Narasimha Acharya, Agricultural Demonstrator, Chittoor is appointed to officiate as Assistant Director of Agriculture in Category 6, class I Madras Agricultural Service and is posted to Bellary vice Sri. R. N. K. Sundaram appointed as Deputy Director of Agriculture, II Circle, Cuddapah.

Transfers.

Name of officers.	From	To
Sri. R. Chokkalingam Pillai,	Asst. D. A., (on leave)	Asst., D. A., Tinnevelly
„ V. T. Subbayya Mudaliar	Offg. Asst. D. A., Tinnevelly.	Offg. Asst. D. A., Bellary.

Subordinate Services.

Transfers.

Name of officers.	From	To
Mr. Syed Ibrahim Sahib	F. M., A. R. S, Kodur	A. R. S., Hagari.
„ S. Suryanarayana,	A. D., Kirlampudi,	Special duty at Sugar Factory, Vuyyuru.
„ G. L. Narasimha Rao,	Asst. A. D., Vuyyuru Sugar Factory,	Special duty under the Sugar-cane Growers' Union, Kirlampudi.
„ V. N. Subbannacharya	A. D., (on leave)	A. D., Rayadrug.
„ D. Satyanarayan,	F. M., A. R. S., Anakapalle	A. D., Challapalle.
„ N. Krishna Menon,	Sub-Asst. in Entomology, Coimbatore,	Special duty, Vadavanur.
„ R. Krishnamurthi,	A. D, Saidapet,	F. M. Nandyal.
„ M. P. Narasimha Rao,	A. D, (on leave),	Asst. in Cotton, Guntur.

Leave.

Name of officers.	Period of leave.
Sri T. K. Balaji Rao, A. R. S., Aduthurai	L. a. p. for 3 months from 5—8—40.
„ R. Krishnamurthi, A. D., Saidapet	Extension of l. a. p. on m. c. for 1 month from 24—8—40.
„ R. Guruswami Naidu, A. D., Kaikalur	Extension of l. a. p. for 45 days from 31st August 1940.
„ J. Suryanarayana, A. D., Gurzala	L. a. p. on m. c. for 3 months from 19—8—40.
„ S. Kuppuswami Ayyangar, A. D., St. Thomas Mount	Extension of l. a. p. for 2 months from 26—8—40.
„ M. P. Sankaran Nambiar, A. D, Dharapuram	L. a. p. for 3 months and 15 days from 9—9—40.
„ A. G. Ramaswamiah, Sub-Asst. in Entomology, Coimbatore	Extension of l a. p. on m. c. for 2 months from 6—9—40.
„ P. Vishnusomayajulu, Asst. in Mycology, Coimbatore	L. a. p. for 1 month from 9—9—40.
„ K. M. Jacob, A, D., (on leave)	Extension of leave on half average pay on m. c. for 2 months from 11—9—40.
„ C. S. Namasivayam Pillai, A. D., Nanguneri	L. a. p. on m. c. for 2 months from the date of relief.
„ E. Kunhappa Nambiar, Permanent Upper Subordinate and Assistant Director of Agriculture, St. Thomas Mount.	L. a. p. for 2 months with effect from the 5th September or the date of relief.