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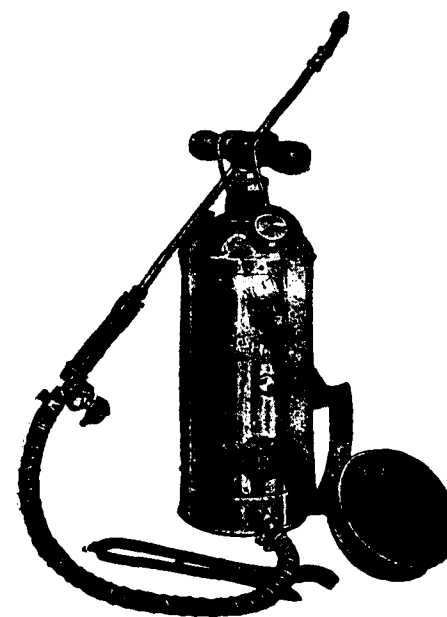
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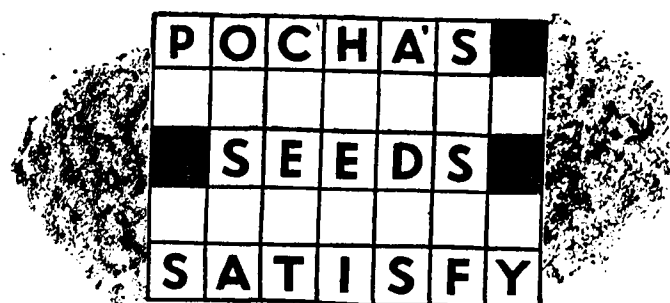
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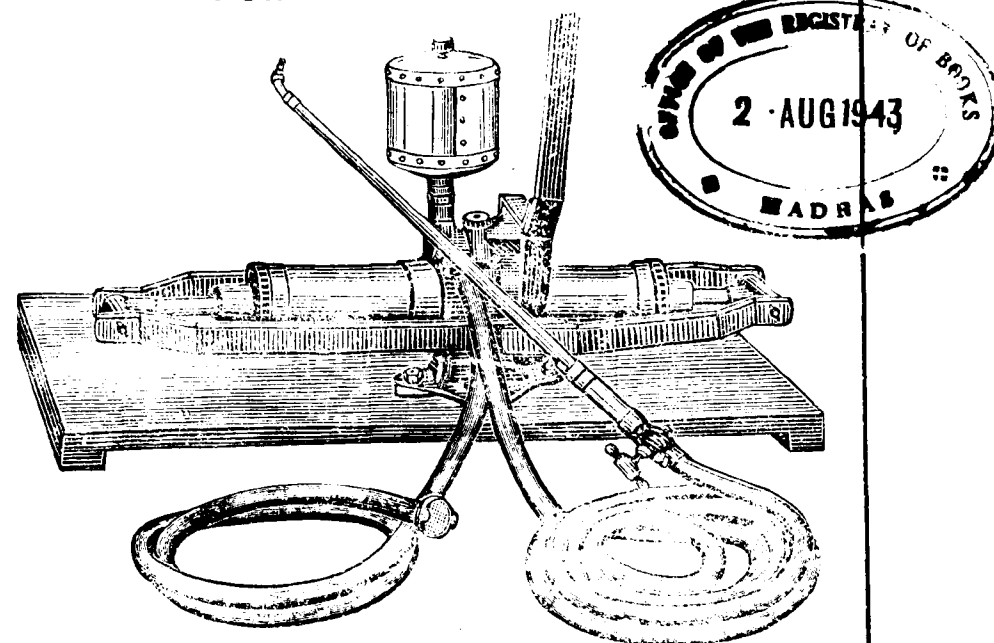
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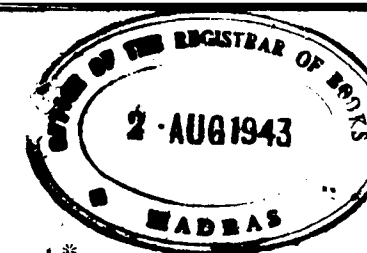
EDITORIAL 31

The Coconut Industry in India. The record of the coconut industry in India has not been one of uniform progress and prosperity even though the coconut palm has been grown in the country from very ancient times, and the area under the crop has gone up to 15 lakhs of acres. The coconut industry, which flourished at one time, has passed through extreme vicissitudes, and during the depression days of the pre-war period was on the verge of collapse owing to the unprecedented slump in prices brought about mostly by the dumping of cheap copra and coconut oil from Ceylon, Malaya and other Pacific Islands. Consequently, the districts of Malabar, South Kanara and the States of Cochin and Travancore, wherein lies about 94 per cent of the total area under coconut in India, were severely hit. The coconut growers, who are mostly owners of small holdings, began neglecting their *topes*, abandoning inter-cultivation, manuring and timely control of insect pests and diseases which ravaged the palms and made them unproductive. The Government of India who were appraised of the situation, instituted an all-India enquiry in 1933, and subsequently imposed an import duty, which was not considered sufficient by the interests affected, to afford the protection it was meant to confer. The situation further worsened and the many oil mills and coir factories on the West Coast ceased working, and lay idle, with the result that thousands of poor people who were entirely depending upon this industry for their livelihood were thrown out of employment and left to starve. The position, however, improved to some extent with the spread of the present war to the Far East and the Pacific Islands, which cut off imports into India resulting in a general rise in prices of coconuts and coconut products.

Organised production and unrestricted imports from elsewhere have a far-reaching effect on a perennial crop like the coconut, which takes about 10 years to bear and which when once neglected cannot be revived in a short time. As already stated, coconut plantations in India are mostly in small holdings and the various producers are not well organized to pool their limited resources to enable them to withstand competition from other countries. In such circumstances the Indian grower has little incentive to invest money and increase production. With the present restriction of

imports of Ceylon copra, time is opportune for the initiation of concerted measures for the re-habilitation of the Indian coconut industry on a sound and permanent footing so that it may stand effectively against any future foreign competition. The recent announcement in the press that the Government of India have decided to constitute an All-India Central Coconut Board on the lines of the Indian Central Cotton Committee for placing the Indian Coconut Industry on a sound basis is to be welcomed. It is reported that the Board is to be representative of the concerned Provincial Governments and Indian States, of the growers, millers, coir manufacturers and appropriate trade interests, and that it is to derive its finance by levying a cess on the copra crushed which is expected to bring an annual income of about five lakhs of rupees. However, the general feeling as expressed in the local press appears to be that the interests of the growers who require the most help are not adequately represented. The oil millers feel that the levy of the cess on copra is one-sided, that the coir industry should also be made to contribute and that a portion of the import duty on coconut and its products should also be utilized for the upkeep of the Board. It is hoped that the Board, when constituted, will watch over the interests of the coconut growers, who were all these years sadly neglected, and assist in the development of the coconut industry by encouraging increased production and efficient marketing of coconuts and its derivative products, besides acting as an advisory body to the Central and Provincial Governments and to the Governments of Indian States concerned, in the matter of enacting suitable laws for the development and protection of the Coconut Industry. It is our belief that the inauguration of the All-India Coconut Board will instil confidence in the Indian grower that any investment that he may make in the coconut industry in future will not be a gamble as in the past, and that he may reasonably expect adequate safe-guards against foreign competition.

The College Day and Conference We are sorry to announce that the annual College Day and Conference that is usually held every year in July, under the auspices of the Madras Agricultural Students' Union, could not be held this year also due to War situation. We, however, hope that conditions will improve and that it will be possible to conduct the Conference on a future date. In the meanwhile, the Managing Committee of the Union are making arrangements for holding the annual General Body Meeting for the election of office bearers and passing the budget for 1943-44.



Mixed Cropping of Groundnut*

By C. M. JOHN, C. R. SESHADRI & M. BHAVANI SHANKER RAO,

Oil Seeds Section, Madras Department of Agriculture

Introduction Groundnut has of late become an important dryland crop in most of the districts and occupies normally about three and a half million acres in this Province. Due to the attractive price it fetches in the market and the fodder it supplies, there has been a phenomenal rise in the acreage sown to groundnut at the cost of other crops, chiefly cotton and cereals. In certain tracts groundnut is sown extensively in a proportionately large area leaving very little scope for any rotation being practised. In South Arcot, Kurnool and certain other districts where the groundnut area is more than four lakhs of acres, raising of groundnut in the same land year after year is very common and no reduction in yields has been observed on this score. The South Indian ryot has to some extent solved the lack of rotation by raising a mixed crop with groundnut. Loehwing (1937) has stated that under American conditions natural processes of nitrogen fixation restores about 60 lb. nitrogen per acre under legumes and 10 lb. under non-legumes. Inter-cropped legumes are also reported to increase available lime, potash and phosphorus in the soil. This probably is the reason for the maintenance of fertility in soils continuously cropped with groundnut.

Literature The benefits accruing to cultivators by mixed cropping have been elaborately dealt with by many agricultural investigators. Ranga-swami Ayyangar and Sankara Ayyar (1941 and 1942) have discussed the advantages of mixed cropping. Patel (1935) in his review of the results of the rotation experiments of groundnuts and cereals at Palur concludes "Cumbu¹ is the ideal mixture crop for groundnut; but why this is so is not clear". Root studies at the Agricultural Research Station, Hagari, have shown that groundnut-*tenai*² mixture, as compared with horsegram-*tenai* and *pillipesara*³-*tenai*, is an ecologically sound combination, because the root systems have separate feeding zones. This mixture was also found efficient in preventing soil erosion. Groundnut-*cholam*⁴ mixture was also found a good combination provided there is a good distribution of rainfall. At the Agricultural Research Station, Guntur, cotton-groundnut gave the best monetary return per unit area. At Dharwar (Bombay) cotton and groundnut sown in alternate rows gave better returns than cotton and groundnut in separate blocks. It has been reported from the United Provinces that it is more profitable to grow groundnut between rows of redgram. It may be noted that these results are disjointed for the obvious reason that the experiments were conducted at different places and times,

* Contribution No. 23 of the Oil Seeds Section, Madras Department of Agriculture.

1. *Penisetum typhoides*
3. *Phassolus trilobus*

2. *Setaria italica*
4. *Sorghum vulgare*

and groundnut was not the main crop under consideration. With a view, therefore, to assess the relative efficiencies of mixed cropping of groundnut with various other crops an investigation was undertaken. It will be logical at this stage to make a brief survey of the agricultural practices with regard to the mixed cropping of groundnut in Madras.

Agricultural practices Groundnut is grown in this Province either as a pure crop or as a mixture with other crops, chiefly cereals and pulses, during the rainy season. The system of cropping in a particular tract is governed by a number of factors such as soil, season, extent of holding, market prices, etc. Ryots owning extensive areas prefer growing a pure crop of groundnut, while those with small holdings resort to mixed cropping for the purpose of producing all their domestic requirements from the limited area at their disposal. Groundnut, however, is the main crop as it fetches a good value in the market.

In the northern districts of Vizagapatam and Godavari, groundnut is an early *punaso* crop (May-June sowing) and is generally sown pure. But it is also grown mixed with either gingelly¹ or redgram, of which the latter one is more common. Due to the late receipt of monsoon showers, sowing of groundnut is delayed to July-August in Kistna and Guntur districts. Here mixed cropping of groundnut with other crops is the universal practice. The nature of the mixture adopted depends on the nature of the soil. In black soils bunch groundnut is sown mixed with *chulam* and cotton, while in red soils castor or redgram enters into the mixture. In the Ceded districts, besides the above crops, a cereal, namely *korra*², also forms one of the components of the mixture. In the central districts of Chittoor, North Arcot, Salem, Coimbatore and Trichinopoly, groundnut is cultivated both as a pure and mixed crop. Redgram and castor invariably form the mixture with groundnut. These two subsidiary crops are sown in lines 6 ft. to 15 ft. apart and they are said to yield on an average about a bag, i. e., about 150 lb. per acre. In the coastal districts of South Arcot, Chingleput and Tanjore, redgram, *chulam*, *cumbu* and rarely gingelly are sown mixed with groundnut. Where early (June) rains are received groundnut-*cumbu* is sown because the short duration *cumbu* comes up for harvest in September before the onset of the heavy north-east monsoon showers. For late sowings, groundnut-redgram and groundnut-*chulam* mixtures are preferred. In the South Arcot district where the largest area under irrigated groundnut is raised, it is customary to grow groundnut mixed with *ragi*³. *Ragi* seedlings are transplanted early in January and a month later when it is given a hoeing; i. e., at the commencement of flowering, groundnut seeds are dibbled between the *ragi* plants. After the harvest of *ragi* in March the groundnut crop puts on good growth and gives a heavy yield. It is claimed that the cost of raising the two crops is met from *ragi* and that the income from groundnut forms the net profit.

1. *Sesamum orientale*2. *Setaria italica*3. *Eleusine coracena*

Experimental The experiments reported in this paper were undertaken at the Groundnut Research Station, Tindivanam (South Arcot District), with the object of finding out the most efficient of the common mixtures adopted in this Presidency. The soil of the station is red sandy loam and is representative of a large portion of the groundnut tracts of the Presidency. The mean annual rainfall is 40 inches of which 12 inches are received during the south-west monsoon and 23 inches during the north-east monsoon period.

Generally groundnut is sown mixed with one other crop, though at times even two or three crops are included in the mixture. The most common crops sown mixed with groundnuts being castor, redgram, *chulam*, cotton, *tenai* and *cumbu*, the mixed cropping of these six crops with groundnut was compared with pure groundnut. The crops sown and spacings given are furnished below:—

1. Groundnut	A. H. 25	9"	between rows and plants 9" in the row.
2. Cotton	C. O. 4	3'	" " 9" "
3. <i>Cumbu</i>	Local	3'	" " 6" "
4. <i>Tenai</i>	Local	3'	" " 6" "
5. Castor	59-8-30	6'	" " 2' "
6. Redgram	Local	6'	" " 9" "
7. <i>Chulam</i>	Local	6'	" " 6" "

The field was prepared as for a groundnut crop and manured with town rubbish at 12,000 lb. per acre. A. H. 25 groundnut was sown to a spacing of 9 in. × 9 in. in July-August. The other crops forming the mixture were also sown to the desired spacing along with groundnut. To provide for the rejection of sufficient border rows at harvest and to have a uniform size of plot for reckoning the yields of the different crops, plots of two sizes had to be laid out. For the first four treatments; plots of size 50 ft. × 12 ft. and for the other three treatments, plots of size 50 ft. × 18 ft. were adopted so that after rejecting requisite borders, the ultimate size of plot in all cases was 44 ft. × 6 ft. or $1\frac{1}{3}$ acre. Randomised blocks layout was adopted. To ensure proper stand, number of seeds were sown at desired distances in the case of the subsidiary crops and after germination the seedlings were thinned in one or two stages leaving one healthy plant per hole. Two hoeings and weedings were given to the entire experimental area during the growth period of the groundnut crop. After the harvest of groundnut, H. M. Guntaka (blade harrow) was worked once between the lines of castor, redgram and cotton to remove weeds.

To find out the effect of the subsidiary crops on the growth and the production of the main crop, detailed plant measurements and counts of immature and mature nuts were recorded at harvest on a random sample of 60 and 120 groundnut plants respectively under each of the treatments. Plot-war yields of groundnut and other crops were also recorded.

Details relating to the cost of cultivation of the different crops were carefully maintained. In working out the economics of the different systems of cropping, a uniform figure for the cost of cultivation of the groundnut crop was utilised in all cases and to this the extra cost involved in harvesting, threshing and cleaning of the produce of the subsidiary crop was added to get at the cost of cultivation of the different mixtures. Only standard rates normally adopted in the "cultivation sheets" of the Station were utilised for cost accounting. Details of these are given below:

	Rs.	As.	Ps.
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One man ...	0	4	0
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Manure —Town rubbish per cartload ...	0	8	0
Seed Material —Groundnut kernels per lb. ...	0	1	0
Castor beans " ...	0	1	0
Cotton seed " ...	0	1	0
Redgram " ...	0	1	0
Cholam " ...	0	0	9
Tenai " ...	0	0	9
Cumbu " ...	0	0	9
Produce —			
Groundnut pods at 24 lb. per rupee and haulms at 1000 lb. per rupee			
Cholam grains » 25 lb. » straw 500 lb. »			
Cumbu » » 25 lb. » » 500 lb. »			
Tenai » » 25 lb. » » 500 lb. »			
Redgram » 25 lb. » stalks 1000 lb. »			
Castor beans » 16 lb. » » 1000 lb. »			
Cotton kappas » 10 lb. » » 1000 lb. »			

The experiment was repeated for a period of three years, 1939-40, 1940-41 and 1941-42. The first season was characterised by a severe drought in the initial stages, resulting in poor germination and stunted growth of *cumbu* and *tenai*. A similar droughty period was experienced in 1940-41 in the early stages followed by excessive rainfall towards the end of the season. This affected the short duration crops, viz., *cumbu* and *tenai* and also the long duration crops, castor and redgram. The final season was fairly normal except for the occurrence of a cyclone in December which damaged to a certain extent the *cholam* and castor crops. Of the six crops tried, cotton was least affected while *cumbu* and *tenai* suffered most due to seasonal vicissitudes.

Results and discussion (a) *Groundnut* (i) *Growth* The average growth measurements of the groundnut plants under the different treatments for the three seasons are presented in Table I. From a study of the figures it is clear that the groundnut plants grown as a mixture with other crops have a tendency towards more lanky growth. This is probably due to the

shading effect of the crop sown mixed with groundnut. This effect is most pronounced in the case of groundnut-cotton mixture.

In the total number of leaves produced per plant there is marked reduction when it is grown as a mixed crop. The total number of leaves produced seems to be an index of the yields of the plant as the leaf number maintains almost the same rank as the plot-war yields.

TABLE I Mixed Cropping of Groundnut

Data on groundnut plant measurements (average of 60 plants)

Year	Treatments	Main axis		Primaries		Secondaries		Total no. of leaves per plant
		Length	No. of nodes	Total length	Total no. of nodes	Total no.	Total no. of nodes	
1939-40	Groundnut pure	14.9	20	124.8	84	7	70	177
	— <i>cumbu</i>	14.7	14	141.5	70	4	34	120
	— <i>tenai</i>	15.6	16	126.6	79	5	58	152
	—cotton	18.3	21	136.3	93	6	64	139
	—castor	15.7	19	128.4	80	6	53	151
	—redgram	15.4	17	123.0	81	6	54	152
	— <i>cholam</i>	16.6	17	116.2	73	5	48	139
1940-41	Groundnut pure	18.6	22	128.7	105	8	109	236
	— <i>cumbu</i>	20.4	21	132.5	92	6	85	198
	— <i>tenai</i>	21.0	21	138.3	95	7	98	214
	—cotton	21.3	21	142.2	94	7	89	204
	—castor	19.4	20	140.0	94	8	85	199
	—redgram	18.8	22	130.1	99	8	100	222
	— <i>cholam</i>	19.8	21	136.1	90	7	72	183
1941-42	Groundnut pure	34.7	26	254.7	113	11	142	281
	— <i>cumbu</i>	38.6	26	241.7	104	9	112	242
	— <i>tenai</i>	43.7	26	259.8	110	9	122	259
	—cotton	41.5	25	265.1	105	10	120	250
	—castor	35.0	25	234.1	104	10	120	249
	—redgram	36.6	25	238.0	105	10	123	253
	— <i>cholam</i>	39.1	24	227.0	95	9	102	221
Average of 3 years	Groundnut pure	22.7	23	167.0	100	9	107	231
	— <i>cumbu</i>	24.6	20	161.1	88	6	76	187
	— <i>tenai</i>	26.8	21	172.3	94	7	93	208
	—cotton	27.0	22	181.1	98	8	91	198
	—castor	23.4	21	167.6	93	8	86	200
	—redgram	23.6	21	163.5	96	8	92	209
	— <i>cholam</i>	25.2	21	158.3	86	7	74	181

(ii) *Yield* The yield of the groundnut crop grown pure and as a mixture was recorded for all the three seasons. The data together with their statistical analyses are presented in Table II. The results show that the yield of groundnut is always reduced when it is sown mixed with other crops. The extent of depression in yield depends on the nature of the crop grown mixed with it. The maximum reduction in yield (to the extent of nearly 50 per cent) has been observed for all the seasons in the case of plots sown mixed with *cholam* and the least reduction in yield has been observed for two seasons in the case of redgram and for one season in the

TABLE II Mixed Cropping of Groundnut
Groundnut yield data

Year	Particulars	TREATMENTS							Standard Error of mean	Critical Difference
		Groundnut pure A	Groundnut -cumbu B	Groundnut -tenai C	Groundnut -cotton D	Groundnut -castor E	Groundnut -redgram F	Groundnut -chola G		
1939-40	Acre yield in lb. Percentage on control	1036 100	721 69.6	828 79.9	813 78.5	903 87.2	975 94.1	850 56.0	39.6	114.7
	Conclusion	A F E C D B G								
1940-41	Acre yield in lb. Percentage on control	995 100	858 86.3	879 88.4	766 77.1	842 84.7	944 94.9	593 59.6	32.6	95.2
	Conclusion	A F C B E D G								
1941-42	Acre yield in lb. Percentage on control	1258 100	724 57.5	915 72.8	803 63.8	725 57.5	693 55.2	415 33.8	60.2	173.8
	Conclusion	A C D E B F G								
Average of 3 years	Acre yield in lb. Percentage on control	1096 100	768 70.1	874 81.6	794 72.4	823 75.1	871 79.5	530 48.4	59.7	184.0
	Conclusion	A C F E D B G								

case of *tenai*. From the yield figures of the final year, it is seen that redgram which has recorded the highest outturn of the three seasons, has depressed the groundnut yield to a large extent. But *tenai*, in spite of its high yield, has affected the groundnut crop to the least extent. In the combined analysis of the three years' data also, *tenai* shows the least depressing effect on the yield of groundnut. Hence it must be concluded that among the crops grown mixed with groundnut, *chola* has the maximum and *tenai* the minimum depressing effect.

Detailed study of the productive phase (Table III) carried out at harvest confirms the above conclusions.

TABLE III Mixed Cropping of Groundnut

Summary of the study of the productive phase of groundnut
(average of 120 plants)

Year	Treatments	Immature nuts	Mature nuts		Total good nuts	Total kernels
			1-kernelled	2-kernelled		
1939-40	Groundnut pure	5.9	2.6	8.3	10.9	19.2
	-cumbu	5.1	1.9	5.7	7.6	13.3
	-tenai	6.1	2.6	7.5	10.1	17.6
	-cotton	6.3	2.2	6.6	8.8	15.4
	-castor	7.6	2.2	6.3	8.5	14.8
	-redgram	6.9	2.2	7.0	9.2	16.2
	-chola	5.9	1.8	4.8	6.6	11.4
1940-41	Groundnut pure	14.0	2.3	7.7	10.0	17.7
	-cumbu	14.2	2.6	7.1	9.7	16.8
	-tenai	11.4	2.9	7.0	9.9	16.9
	-cotton	12.1	2.5	6.2	8.7	14.9
	-castor	11.2	2.3	6.9	9.1	16.1
	-redgram	12.9	2.2	7.1	9.3	16.4
	-chola	11.8	2.0	5.4	7.3	12.8
1941-42	Groundnut pure	12.4	1.9	10.9	12.8	23.7
	-cumbu	10.5	1.6	8.3	9.9	18.2
	-tenai	11.6	1.6	8.1	9.8	17.8
	-cotton	11.2	2.2	7.8	10.0	17.8
	-castor	11.9	1.5	7.6	9.2	16.7
	-redgram	8.5	1.5	7.6	9.2	16.7
	-chola	8.0	1.2	5.6	6.9	12.4
Average of 3 years	Groundnut pure	11.0	2.3	9.0	11.2	20.3
	-cumbu	9.9	2.0	7.0	9.1	16.0
	-tenai	9.7	2.4	7.5	9.9	17.4
	-cotton	9.9	2.3	6.9	9.2	16.1
	-castor	10.3	2.0	6.9	8.9	15.8
	-redgram	9.5	2.0	7.2	9.2	16.2
	-chola	8.6	1.7	5.3	6.9	12.3

(iii) *Quality* The effect of mixed cropping on the quality of groundnut was also studied each season. Qualitative determinations consisting of shelling percentage, number of kernels to a pound, natural test weight per Madras measure of pods and kernels etc., were carried out on the produce from each of the treatments. The results are summarised in Table IV. It is seen that the quality of the nut is not affected by growing it mixed with other crops.

TABLE IV Mixed Cropping of Groundnut
Results of qualitative studies on groundnut produce

Year	Treatments	Shelling percentage	No. of kernels per lb.	N. T. W. of 1 M. M. in gm. ¹		Percentage of oil ²
				Pods	Kernels	
1939-40	Groundnut pure	70.4	974	582	1285	-
	" -cumbu	70.7	986	588	1291	-
	" -tenai	70.1	967	588	1291	-
	" -cotton	70.9	970	590	1291	-
	" -castor	70.4	952	589	1296	-
	" -redgram	71.6	954	594	1292	-
1940-41	Groundnut pure	72.6	1081	569	1257	-
	" -cumbu	71.4	1096	556	1254	-
	" -tenai	71.6	1126	562	1255	-
	" -cotton	72.5	1072	573	1256	-
	" -castor	71.4	1120	559	1248	-
	" -redgram	72.4	1082	565	1253	-
1941-42	Groundnut pure	73.6	909	591	1195	51.31
	" -cumbu	73.4	881	611	1206	52.23
	" -tenai	73.7	912	607	1200	51.81
	" -cotton	73.6	910	611	1203	51.94
	" -castor	73.8	913	603	1193	50.58
	" -redgram	72.7	943	603	1194	49.07
Average of 3 years	Groundnut pure	72.2	988	581	1246	-
	" -cumbu	71.8	988	585	1250	-
	" -tenai	71.8	1002	586	1249	-
	" -cotton	72.7	984	591	1250	-
	" -castor	71.9	995	584	1246	-
	" -redgram	72.2	993	587	1246	-
Average of 3 years	" -cholam	72.8	987	591	1252	-

1. N. T. W.-Natural test weight; M. M.-Madras measure (about 108 cubic inches).
2. Percentage of oil in kernels was determined only for the last season.

(b) *Other crops* The yields of the other crops sown mixed with groundnut for the three seasons are given in Table V. All the crops show the effect of the seasons in varying degrees. Of these, *cumbu*, *tenai* and *redgram* show extremes of variations ranging from very high yields to complete failures. But in other cases the seasonal effect has not been so marked. For this reason it appears desirable to select the crops least affected by the season, namely, cotton, castor and *cholam*, for being grown as a mixture with groundnut in tracts with environmental effects similar to Tindivanam. It is likely that elsewhere *cumbu*, *tenai* and *redgram* will be found economical to be grown mixed with groundnut.

TABLE V Mixed Cropping of Groundnut
Yields of crops mixed

Year	Acre yield in lb.					
	Cumbu	Tenai	Cotton	Castor	Redgram	Cholam
1939-40	264	322	248	535	295	720
1940-41	54	134	448	218	16	663
1941-42	606	631	224	413	606	444
Average of 3 years	308	362	307	389	306	609

(c) *Economics* The economics of growing groundnut as a pure crop and as a mixture with other crops was worked in each of the years. The results are summarised in Table VI. Generally growing of the mixtures is more remunerative than growing a pure crop of groundnut. Instances where mixtures have not given as much return as the pure crop are mostly due to the failure of the subsidiary crop forming the mixture and rarely due to the very low yield of groundnut as in the groundnut-*cholam* plots of the third year. Owing to the varying effects of the seasons on the crops tried, the economic ranking of the mixtures has not been the same in all the three years. Groundnut-castor in the first year, groundnut-cotton in the second year and groundnut-redgram in the third year have given the maximum profits. But taking the averages of the three years groundnut-cotton stands foremost followed by groundnut-castor, groundnut-redgram and groundnut-*cholam*. These four mixtures appear to be the most remunerative.

TABLE VI Mixed Cropping of Groundnut
Economics of Cultivation on acre basis (in rupees)

Year	Particulars	TREATMENTS						
		Groundnut pure	Groundnut -cumbu	Groundnut -tenai	Groundnut -cotton	Groundnut -castor	Groundnut -redgram	Groundnut -cholam
1939-40	Value of groundnut	49	34	39	39	43	46	28
	Value of the crop mixed	-	13	15	26	34	16	41
	Gross return	49	47	54	65	77	63	69
	Total cost of cultivation	39	44	44	48	46	44	45
	Net profit	10	3	10	17	31	19	24
1940-41	Value of groundnut	46	40	41	36	38	44	27
	Value of the crop mixed	-	3	6	47	15	1	39
	Gross return	46	43	47	83	53	45	66
	Total cost of cultivation	37	40	41	46	42	40	44
	Net profit	9	3	6	37	11	5	22
1941-42	Value of groundnut	53	31	39	31	31	29	18
	Value of the crop mixed	-	30	28	24	31	35	27
	Gross return	53	61	67	58	62	64	45
	Total cost of cultivation	28	35	34	32	32	31	33
	Net profit	25	26	33	26	30	33	12
Average of 3 years	Value of groundnut	49	35	40	36	37	40	24
	Value of the crop mixed	-	16	16	32	27	18	35
	Gross return	49	51	56	68	64	58	59
	Total cost of cultivation	35	40	40	42	40	38	40
	Net profit	14	11	16	26	24	20	19

Conclusions To sum up, raising of a mixed crop results in lanky growth of groundnut and this is more pronounced when cotton is the crop mixed. The yield of groundnut is also reduced, *cholam* causing the maximum depression, while *tenai* affects least. The causes for this reduction probably depend both on the duration and root behaviour of the crop

sown mixed. It is interesting to note that long-duration crop of castor and redgram do not depress the yield to any large extent and *tenai* does not depress the yield to the same extent as *cholam* though both these have the same duration. The quality of the groundnut as indicated by the various tests is not affected by the mixed cropping. The most important matter with which the ryot is concerned is the net return from unit area. In this respect mixed cropping is decidedly more paying than a pure crop of groundnut. The ranking of the various mixtures is slightly different in different years, probably due to the seasonal effect. It must be realised that while mixed cropping is generally to be recommended, the selection of the crop to be sown mixed with groundnut has to be done carefully. Crops like *tenai* and *cumbu* which fared badly at Tindivanam as compared with *cholam*, cotton and castor, may behave differently in other tracts.

Summary The effect on growth, production and quality of produce of groundnut crop when grown as a mixture with *cumbu*, *tenai*, *cholam*, cotton, redgram or castor during the rainy season (July—December) has been studied and the economics of growing the mixtures and the pure crop worked out.

The groundnut plants have a tendency for lanky growth when sown mixed with other crops.

The groundnut crop also suffers reduction in yield, when grown as a mixture. The maximum depression in yield (50 per cent) is observed when grown with *cholam* and the minimum depression in yield (19 per cent) with *tenai*.

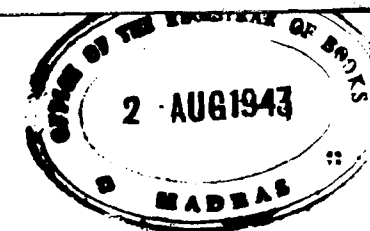
Among the crops tried as a mixture with groundnut, cotton was least affected by seasonal conditions.

Mixed cropping of groundnut with other crops is more remunerative than raising a pure crop of groundnut.

Mixed cropping of groundnut with cotton, castor, redgram or *cholam* is more profitable than with the other crops tried.

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The Cultivation of Vegetables in the Northern Circars

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The important role that vegetables play in our diet, providing the necessary proteins, carbohydrates, fats, vitamins etc., is too well known. The need for the systematic development of market and kitchen gardening, with a view to overcome the shortage of food at the present moment, is very great. In the Northern Circars not more than 48,000 acres is utilised for vegetables, although the scope for their culture is exceedingly great. The province of Madras claims nearly 3 lakhs of acres under vegetables out of the 28 million acres occupied by different food crops. This is obviously insufficient to cater to the needs of the population.

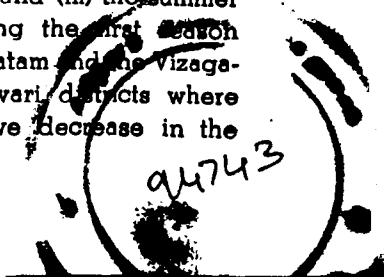
Types of vegetable gardening The types of vegetable gardening met with in the Northern Circars may conveniently be divided into two sections based on the object sought and methods employed in producing and disposing of the crops.

(i) **Kitchen gardening** This type of vegetable growing has for its aim the production of vegetables in the back yard of the house solely to cater to the daily needs of the kitchen. It is a hobby giving both pleasure and profit. Limited holdings and nearness to the house form the outstanding features of this type, and their up-keep and development entirely depend on the availability of land and personal care and attention of the owner.

(ii) **Market gardening** This type of vegetable growing has for its object the production of vegetables for markets situated in towns and cities, and is the most common and popular type of gardening in the Northern Circars. Suitable land in the neighbourhood of towns and cities is most desirable. A fairly fertile land with some reliable source of irrigation will be suitable for this. Intensive cultivation with adequate manuring to maintain the fertility of the land, is essential for the success of this type of gardening.

Soils The garden land soils of the Northern Circars naturally vary widely in their fertility from place to place but on the whole are well adapted to vegetable culture. In certain localities the wet lands also offer scope for raising vegetables of the type of gourds, plantain and yams. In some localities the land is more of a sandy nature, which when well supplied with organic manures, prove suitable for successful vegetable cultivation.

Season and rainfall In the Northern Circars the season can be divided into three periods, viz., (i) the south west monsoon (June to September), (ii) the north-east monsoon (October to December) and (iii) the summer or dry season (January to May). The monsoon during the first season brings 40 to 45 in. of rainfall to parts of North Vizagapatam and the Vizagapatam agency. It gets feeble as it passes to the Godavari districts where the precipitation is only 36 in. There is a progressive decrease in the



districts of West Godavari and Kistna to below 40 in. and it is only about 30 in. in the Guntur district. During the second monsoon there is less rain on the hills, and all the districts in the plains receive about 10 to 12 in. only. In the summer period a few showers are received in the entire tract and are popularly known as "mango showers". The amount of rainfall received varies from 2 to 5 in. Dependent on the rainfall, there are three seasons for the sowing of the vegetable crops, viz., (i) the monsoon or *tholakari* (June), (ii) the winter (October—November) and (iii) the summer (February). The rains of the south-west monsoon are taken advantage of to raise most of the vegetables. With the setting in of the north-east monsoon rains different kinds of gourds, brinjal, tomato etc., are grown. But in the summer season great difficulty is experienced in securing water for irrigation. Conditions of weather are always very favourable in the first two seasons for producing bumper crops, with less expense for irrigation. The relatively higher prices of vegetables in summer compensate to a certain extent the increased cost of irrigation.

Lay-out of vegetable gardens Based on the nature of the soil, the plot is first divided into different blocks. Parts of the field with soils of a heavy nature are utilised for root crops like yams, sweet potato and colocasia. Other blocks with light loamy soil are set apart for vegetables like brinjal, lady's finger and gourds. High level plots with drainage are particularly set apart for the culture of greens. In the vicinity of the water source, a small high level plot is usually used for the nurseries.

Tillage An optimum tilth brought about by 8 to 12 ploughings with the wooden plough depending on the previous crop, is all the preparatory tillage given to the lands to bring them into condition for sowing. Generally great care is bestowed during the growth period of the crops, and clean cultivation is maintained.

Manures The only manure that is commonly used is the cattle manure. Vegetable crops in particular give marked response to large dressings of well prepared composts and town refuse. Adequate manuring will be amply repaid by higher yields. The growers therefore will do well to conserve all possible farm wastes and convert them into valuable manure by composting as suggested by the Agricultural Department.

Irrigation Irrigation is a matter of great importance in the successful cultivation of vegetables. Irrigation with a *picotah* (counterpoise bucket lift) is commonly adopted in the Vizagapatam district. Of late, in and around Anakapalli the improved water lifts, the circular mhothe and the persian wheel are becoming popular. In the Godavari districts, besides lift irrigation with mhothes, cannal irrigation is also common.

Harvest and marketing Vegetables like brinjal and gourds are usually harvested in the evening and transported next morning to the neighbouring markets; greens are always gathered very early in the morning, for it is only in their fresh condition they are salable. Excepting the root crops, other vegetables do not keep well after a couple of days.

Vegetables intended for sale in the distant markets and weekly fairs (*shandies*) are usually packed in palmyra leaf baskets and transported in bullock carts in the Vizagapatam district. In the districts of Godavari, transport by boat is very common. Gardeners who are not in the neighbourhood of towns dispose off their entire crop, before harvest, to middlemen. The middleman undertakes the harvest operations and sells the produce to retail market vendors. Where market gardens are advantageously situated within easy reach (2 to 3 miles) of towns or cities, growers sell their produce directly to the retail market vendors, thus avoiding the middleman. A few gardeners even effect direct sale of the vegetables to the consumers. However it is very unusual to find the growers coming into direct contact with the consumers. It is this that is responsible for the disparity between the price received by the grower and the price paid by the ultimate consumer. At Anakapalli certain dealers are engaged in the export of vegetables and derive very high profits. Retail sale of vegetables at the very door of the consumer in towns is common in the Godavari districts and of late this practice is slowly creeping into parts of the Vizagapatam district also.

Seed selection and preservation A majority of the common Indian vegetables are raised from seed. The first few fruits are generally set apart for seed. It is not uncommon to find seed being collected from odd ripe fruits that escaped harvest but were noticed at the time of pulling out the crop. This will result in reduced yield and quality. Well-grown vigorous plants, free from pests and diseases should be set apart expressly for seed collection. In the Northern Circars many market gardeners exercise a certain amount of care and attention in the collection and preservation of the seed required. Vegetable seeds are usually sold in the weekly fairs (*shandies*) but they are not of dependable quality. For preservation till the next sowing season, seeds of brinjal, greens, etc., are kept in cloth bags in a covered narrow-mouthed mud pot. Seeds of snake gourd, bitter gourd and cucumber are imbedded in *bratties* (dunk cakes) and dried. The dried cakes are carefully preserved in mud pots. Dry fruits of ribbed gourd, bottle gourd, *bendai* (lady's finger) etc., are kept in a safe place free from damage by rats and other pests. Seed is also kept in tins provided with tight-fitting lids.

A profitable enterprise Satisfactory returns are obtained from well-grown vegetables of the more common kinds viz., brinjal, yams, gourds, lady's finger, etc., and it is not therefore very surprising if these crops rank high amongst those to which the grower turns his attention. In very favourable seasons the profits are substantial. But the fickleness of the monsoon in certain localities and in certain seasons, resulting in higher expenses for artificial irrigation or at times by the damage of insects often reduce the profits. Nevertheless, market gardening is still accepted as a profitable enterprise in the Northern Circars.

Notes Brief notes on the cultivation of the common vegetables is given in a tabular form as an appendix.

APPENDIX

Hints to grow common vegetables in the Northern Circars

English of local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Dura- tion of the crop	Yield	Remarks
Fruit Vegetables								
Brinjal	<i>Solanum melongena</i>	Solanaceae	June November February	8 to 12 oz. of the seed sown in 5 cents will give seedlings for one acre 2 to 2½ lb. of seed for an acre	September February May	3½ to 4 months	10,000 lb. 12,000 " 8,000 " per acre	Seedlings planted 3' apart on square in a well-manured rich light loamy soil.
Lady's finger (<i>bendai</i>)	<i>Hibiscus esculentus</i>	Malvaceae	June November		September February	3 months	6,000 to 8,000 lb. per acre	Seed sown in rows 1½' apart and 1' from plant to plant. Picking continues for nearly five weeks.
Tomato	<i>Lycopersicon esculentum</i>	Solanaceae	October— November	8 oz. of seed to be sown in five cents plot	January— February	3½ months	8,000 to 10,000 lb. per acre	Seedlings to be transplanted 4' in rows and 3' from plant to plant.
Plantain	<i>Musa para-disiaca</i>	Musaceae	June or November	800 suckers acre	August or December of the following year	12 to 14 months	700 bunches per acre	Ratooned for two years, and in the third year, the return is by sale of leaves only.
Beans								
Labiab, Garden bean	<i>Dolichos lablab</i>	Legumi- noseae	June	5 to 6 seeds per pit and pits 10 to 12' apart	November	5 to 6 months	5 to 6,000 lb. per acre	Commonly grown in the back yards of the houses on <i>pandalis</i> (trellis). There is also a bushy field variety.
Cluster beans	<i>Cyamopsis tetraloboides</i>	Do.	June October	1 to 1½ lb. per acre	September February	3 to 3½ months	8,000 to 10,000 lb. per acre	Seeds to be sown 2' apart on square. Grown alone or as an inter-crop with root crops.

<i>Rajula chikhudu</i>	<i>Dolichos</i> sp.	Legumi- noseae	June	5 to 6 seeds per pit and pits 10 to 12' apart	November	5 to 5½ months	5,000 lb. per acre.	Commonly grown in the back yards of houses, trailed on old trees and thatched sheds. Only tender seeds are consumed. Very popular in parts of North Vizagapatam.
<i>Golkonda chikhudu</i>	Do.	Do.	Do.	3 to 4 seeds in pits. Pits 8 to 10' apart	October	4 to 5 months	5,000 to 6,000 lb. per acre	Plants trailed on individual bamboo poles. Very popular in Vizagapatam Dt.
Leafy Vegetables								
Amaranthus thus								
Motha or perugu thotakura	<i>Amaranthus gangeticus</i>	Amaran- thaceae	Through- out the year	2 lb. per acre	—	40 to 45 days	Rs. 80 to 100 worth of greens per acre	Greens marketed in summer will fetch higher price. A cent plot will yield a produce of the value of 14 annas to a rupee.
Koyya thotakura	<i>Amaranthus gangeticus</i> var. <i>tristis</i>	Do.	Do.	Do.	—	40 days	Rs. 50 to 60 worth of greens per acre	A cent plot of the green will fetch annas 8 to 10.
Raga thotakura	<i>Amaranthus paniculatus</i>	Do.	June	About ½ lb. of seed to be sown in a nursery of 250 sq. yds. to plant an acre	October	4 months	10,000 to 12,000 plants per acre	Seedlings of 3 weeks' age are to be transplanted 2' apart either way in the field. Grown only in Vizianagaram taluk. Sold one or two for 3 pies.
Spinach Matu batahali	<i>Basella rubra</i>	Cheno- podiceae	June October	8 to 10 oz. per acre	August December	50 days	A rupee worth green from a plot of 1 cent	Broadcasting seed or transplanting of seedlings 1' apart on square. A very popular green in the Circars.
Padda batahali	Do.	Do.	June	6 to 8 seeds in pits 10' to 12' apart under <i>pandalis</i> (trellis)	August	50 to 60 days	—	Largely grown in Peddapur and Pithapur taluks. Mostly grown in back yards. Not available in large quantities.

English or local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Duration of the crop	Yield	Remarks
Gem	<i>Hibiscus cannabinus</i>	Malvaceae	Throughout the year	8 to 10 lb. of seed per acre	Tender plants ready for harvest after 2½ months	5 to 6 months	One cent plot will fetch greens worth 8 to 10 annas	Sowing in June will yield abundant greens. Sour, Red and <i>Danasari gogga</i> are the more common varieties. Very popular greens in the Guntur district. Leaf is preserved with salt to prepare <i>chutni</i> .
Root Vegetables								
Elephant yam	<i>Amorphophallus campanulatus</i>	Araceae	June–November	1,500 to 1,800 lb. of corms per acre	January–May	8 months	12,000 to 15,000 lb. per acre	Corms to be planted 1½ to 2' either way. Acridity depends on the type of soil. <i>Pasikanda</i> is considered to be the best.
Colocasia	<i>Colocasia antiquorum</i>	Do.	June–July	650 to 750 lb. per acre	December	6 months	2,000 to 2,500 lb. per acre	Tubers to be planted 1½' either way. Also grows well in shade and wet conditions obtaining in plantain gardens.
Sweet potato	<i>Ipomoea batatas</i>	Convolvulaceae	September–October	12,000 sets per acre	January	3½ months	8,000 to 10,000 lb. of tubers and 8,000 lb. of vines per acre	The vines should periodically be pruned and lifted to prevent the formation of small and unmarketable roots. There are two varieties of roots, white and red.
Chars kanda or Chars chemu	<i>Colocasia</i> sp.	Araceae	June–July	1,000 lb. per acre	January	7 months	15,000 to 16,000 lb. per acre	Grown only in parts of North Vizagapatam and Orissa.
Yam—Pendalam	<i>Dioscorea alata</i>	Dioscoreaceae	June	800 to 1,000 lb. per acre	January to March	8 months	6,000 to 7,000 lb. per acre	Tubers planted 1½' apart either way. A set of four vines are trailed on a single pole planted at the centre of the four vines.

Yam—Siragadam	<i>Dioscorea esculenta</i>	Dioscoreaceae	June	1,500 lb. per acre	November continues till February	6½ months	6,000 to 7,000 lb. per acre	Cultivation similar to <i>Dioscorea alata</i> . White skinned tubers are very tasty. Very popular in the Vizag. district.
Gourds								
Ribbed gourd	<i>Luffa acutangula</i>	Cucurbitaceae	June–January	2 to 2½ lb. per acre. 3 seeds in pits 4' apart either way; sown broadcast also	October–April	4 months	36,000 fruits or 8,000 lb. per acre	Picking continues for two months. Harvest on alternate days and each picking gives on average 1,200 fruits per acre.
Snake gourd	<i>Tricosanthus anguina</i>	Do.	June–December	3 to 4 seeds in pits 12' apart either way; 1 to 1½ lb. per acre	November–April	4 to 4½ months	A plot of 5 cents yields 800 fruits or 300 to 400 lb.	Picking continues for 1 to 1½ months and in all 15 pickings can be made.
Bitter gourd	<i>Momordica charantia</i>	Do.	June–October	3 to 4 seeds in pits 12' apart under <i>pendals</i> (trellis)	October–February	3½ to 4 months	—	Not grown on any considerable scale; only near hedges, bunds and such odd places. The white variety is much favoured.
Ash gourd	<i>Cucurbita pepo</i>	Do.	June	½ to 1 lb. per acre; 3 or 4 seeds in pits 12' apart	November to December	4½ to 5 months	2,000 to 2,400 fruits per acre	Mostly a rainfed crop. Allowed to spread on ground or on old trees or thatched houses. Very largely grown in the Godavari <i>lankas</i> (islands in the river bed of the Godavari).
Bottle gourd	<i>Lagenaria vulgaris</i>	Do.	June–October	½ to ¾ lb. per acre; 3 or 4 seeds in pits 10' apart	October–February	4 months	3,000 to 5,000 fruits per acre	Grown as a rainfed crop too. Trailed on hay stacks, cattle sheds and allowed to spread on ground. A very paying crop owing to its high yield even under neglected conditions.

English or local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Duration of the crop	Yield	Remarks
Pumpkin	<i>Cucurbita maxima</i>	Cucurbitaceae	June	1 lb. per acre; 3 to 4 seeds in pits 10 to 12' apart	February	6½ to 8 months	2,000 to 2,500 fruits per acre	Very largely grown on the <i>lankas</i> .
Cucumber	<i>Cucumis sativus</i>	Do.	June October	Do.	September February	3 to 3½ months	8,000 to 10,000 fruits or 3,000 to 4,000 lb. per acre	Very popular throughout the Circars. A particular variety locally known as <i>Mundosa</i> with short spines on the fruit is grown in parts of North Vizag. Grown in the back yards of houses on <i>pendals</i> (trellis).

Acknowledgements I am deeply indebted to Sri T. Nataraj, B. A., B. Sc. (Ag.), Assistant Lecturer in Agriculture, Agricultural College, Coimbatore, for his sympathetic criticism and valuable suggestions on the paper.

SELECTED ARTICLE

The Impact of Science on Agriculture

By SIR JOHN RUSSELL, F. R. S.

In spite of considerable diversity, agricultural systems in the prescientific days usually possessed two features in common; they aimed first and foremost at providing complete subsistence for the community, money crops being a subordinate consideration; and they included measures for conserving the productiveness of the land, either by the so-called fallowing, or by letting the land revert to the wild state, or by some other device. Although these systems had a low level of productiveness they provided food for indefinitely long periods of time, and in addition possessed certain social advantages. In the system followed in Great Britain, around the Baltic, in Northern India and elsewhere, the land was divided into strips which were shared out among the participants for the purposes of ensuring equitable distribution of good and bad land. The whole complex of peasant life developed some creative art which showed itself in a love of colour, folk music and dancing, embroidery, wood carving, pottery, iron work and other peasant arts and crafts.

Unfortunately, the strip system of farming was incapable of improvement by scientific means, and as soon as the peasants insisted on a higher standard of living it had to go. The method of change varied in different countries, Russia adopted one way and Poland another. Instead of scattered strips the agricultural holding was brought into one self-contained unit. Here science was able to play its part. Unfortunately, as science came in so the peasants' arts and crafts, the colour, the singing and the dancing got somehow crowded out; they ceased to be spontaneous peasant activities and are becoming only museum pieces. It would be a great advantage to the country side if, somehow, this apparent antagonism could be overcome.

In Great Britain the change to unified holdings had been made before the scientific era and so we were able at once to introduce science into our agriculture. It led to great improvements and in the 1860's and 1870's our farming superiority was widely admitted. Then came a remarkable sequence of events illustrating the difficulty of anything less than 'total' application of science to agriculture. The prairies of North America were gradually being opened up for settlement. The development of implement design made cereal cultivation possible, while plant selection and breeding—then only in their early stages—provided suitable varieties. Transport and business agencies arranged to take and pay for the produce. A very cheap agricultural system was worked out, and the operations were on so large a scale that considerable economies were possible with the result that wheat was put on British markets at prices below those at which our farmers could grow it. Similar developments occurred in the production of butter, cheese and meat, mitigated somewhat in the latter case by the fact that British produce always had a superior quality and so had some preference in the market. Our farmers could not compete, and British agriculture fell in the 1890's to a very low level. Then a more comprehensive application of science was attempted which was gradually directed to an increase in the output per man-hour, so allowing a higher rate of wage sufficient to keep some of the men on the land. This effort was so far successful that before the War our output per man-hour was higher in money value than in any country in Europe. It proved very difficult, however, to combine this high output per man with high output per acre: indeed there appeared to be some sort of inverse relation between them. Our output per acre was considerably

lower than in the smaller Western European countries of small holdings, and our agriculture remained solvent only by reducing the numbers of paid workers; in England and Wales the fall was from 803,000 in 1925 to 593,000 in 1937-38.

The increased efficiency of the worker rather more than counterbalanced the fall in numbers so that the gross value of the output rose somewhat even after allowing for differences in price.

Meanwhile a striking change had come over large sections of the prairie regions, the development of which had been the cause of so much trouble to British agriculturists. The system of agriculture proved destructive of the soil texture, the original crumb structure broke down, the soil changed to dust and in the high winds blew away. Soil erosion took place on a gigantic scale, and vast areas fell out of cultivation, some never to come back into agricultural use so far as we can see. The United States suffered most and led the way in the search for causes and remedies. It was sown that mixed farming, with alternations of grass and arable husbandry, was the surest way of preventing erosion and the best curative treatment for land not yet ruined beyond repair. But this meant a complete change in the commercial arrangements, and a reversion to the old principles, which included farming for subsistence, and the recognition of responsibility for the conservation of the soil. Far-reaching social changes are likely to result.

A somewhat different problem arose in tropical Africa and parts of India. The climate favoured the production of certain commodities of high commercial value, such as oil, fibre, tea, coffee, etc. The large supply of very cheap native labour ensured cheap production. So a plantation industry was developed and proved highly susceptible to scientific treatment; striking developments occurred. Then, however, arose certain difficulties. These new crops, helped by the aid of science, pushed out the native food crops; the subsistence agriculture gave away before plantation cropping, and the natives received pay for their work but not food. This substitution of money for food led to social difficulties, unrest, malnutrition, etc. Further, a change in the market requirements might render the produce of a whole region more or less superfluous thereby causing great financial loss; the history of sugar-cane in the West Indies is an example. In short, the intense specialization which followed the too exclusive emphasis on efficiency of production had two grave defects; it lacked the permanency of the older system and it did not adequately provide for the needs of the community.

During the past thirty years a great change has come over our ideas of administration, and it is now recognized that subsistence farming must be fully developed so as to ensure abundance of suitable food for the home population. This is necessitating a much broader utilization of science than in the earlier days.

Even in regions of the world where plantation cropping was not practised, the limited scientific intervention first attempted led to unexpected and undesirable results. The efficient medical and veterinary services greatly reduced the incidence of human and animal disease and so curtailed an important check on the population; the numbers of men and of animals increased and put great pressure on the land. The old system of shifting cultivation which had allowed of recuperation of fertility could no longer function; soil deterioration and in many cases soil erosion set in and a crop of troubles—social and technical—arose. These have necessitated great schemes of investigation. The general result is as before the need for a more varied type of farming, making more use of grass and leguminous crops and taking other steps to ensure soil conservation; also a large but better organized production of crops for human and animal food; this of course involves collaboration with the veterinary and the medical staffs so as to ensure that the right foods are grown.

The War has imposed upon us in Great Britain the necessity for finding some solution of the very difficult technical problem of combining high output per acre with high output per man. The fundamental difficulty is the slowness of agricultural production, which science seems powerless to hasten. In spite of a hundred years of agricultural science crops still take as long to grow as ever they did, further, a lamb still takes five months in getting born and a calf takes nine months or more; all the big vital processes are in the main outside our control. Many of them are very dependent on season. Crops and animals are rarely ready for sale in less than 15 or 18 months after expenditure on them has begun, and as it is impossible to forecast prices for so long farmers are bound to play for 'safety first'. So it comes about that well-recognized improvements cannot be adopted because of the uncertainty whether the prices ultimately obtained will justify them. Probably there is no greater cause of frustration of agricultural science than this uncertainty about price of produce.

In war-time this difficulty disappears and farming is virtually run on contracts like other businesses. Prices and wages are fixed, and farmers know exactly where they are and exactly how far they can go in adopting improved methods. So in spite of almost unparalleled difficulties the output per acre now seems to be rising without any corresponding diminution in the output per man. On all grounds it is essential that British agriculture should continue to function effectively after the War. It will be needed for three purposes: (1) to help in solving the difficult social problems that will certainly arise; standards of population, national nutrition, unemployment, etc. (2) to add to the national wealth and provide food for the community; (3) to remain as an effective protection when next a military adventurer starts a war in Central Europe.

The great need after the War will be for careful planning as to what exactly agriculture in Great Britain is wanted to do. Is it to slacken down considerably to allow of heavy imports of food for the benefit of shipping and commerce, or is it to produce as much as possible? Some sort of compromise will probably be reached. If the imports of food continue to be organized centrally it should be possible to allocate the various items among the different producing countries, giving a certain share to the home farmer at a price which enables him to pay the statutory wages without having continually to reduce the number of workers. So the different problem of combining high output per man with high output per acre can be solved. As an insurance against starvation in the next war it will be imperative to maintain a certain level of agricultural production.

A planned agriculture would allow of the comprehensive application of science, anything short of which may, as we have seen, have unexpectedly bad results. But the planning must not destroy the individual initiative that still remains one of the most potent factors of success in agriculture. (*Nature*, September 12, 1942.)

Gleanings

Banana fibre for bags According to Francisco Linares of Cuba banana fibre offers numerous advantages over jute for the making of sugar bags. It is easily obtained from a trunk of high yield, and is manipulated without difficulty. It is stronger than hemp, yet light and silky. It can be obtained immediately in almost any amount and could very well serve as raw material for the production of the bags necessary for the packing of Cuban sugar. (*Int. Sug. J.* Jan. 1943.)

A method of storing sweet potatoes Sweet potatoes can be stored without deterioration for two years or more if they are treated in the following manner. The tubers are dug and then wilted for two or three days. They are next placed in cold water which is brought to the boil and kept boiling for about an hour.

After this, they are removed, cooled, then either sliced lengthways into three or four pieces or else squeezed out as flat as possible with the fingers, and afterwards dried brick hard in the sun. They are then ready for storing. No special storage vessel is needed. When required for use the dried roots are washed and then boiled in the ordinary way. The result is said by natives to be even more palatable than boiled fresh roots.

This recipe is used by the natives of Sukumaland in the Lake Province of Tanganyika, an area which has a very dry atmosphere for a considerable part of the year. It is possible that under more humid conditions the results might be less satisfactory, but there must be many large tracts of East Africa where the method would be worth a trial, particularly in districts where it is necessary to insist on the planting of root crops as a precaution against famine but where cassava (tapioca) is unpopular as a food or agronomically unsuitable. R. B. Allnut. (*E. Afr. Agric. J. Ootr.* 1942).

Hints for Bee-keepers

For August

August is perhaps one of the most unfavourable months for bee activity. A meagre supply of pollen is available from *Eupatorium*, zinnia, onion, ragi, pumpkin and *cumbu*; and *Antigonon* is the only source from which the bees can collect nectar for their bare subsistence. The strong winds and the lack of pasturage render field activity almost impossible and the little foraging is done only during the short spells of calm weather. The bees have, therefore, to fall back on their reserve food-material. Corresponding to these adverse conditions, breeding is very poor and most of the colonies show a tendency to desert. All possible care should be taken to induce the bees to remain in the hives, by warding off bee enemies, reducing the hive-space, systematic artificial feeding, etc. In addition to these precautions which one has to take during these lean months, the provision of a drone trap, or a piece of queen excluder sheet at the entrance, would minimise the chances of desertion. The opening in these contrivances is about $\frac{1}{2}$ inch, and it allows only the workers to pass through, but not the queen, and bees seldom desert without her, though in some stray cases, they kill her and bolt away.

M. C. Cherian & S. Ramachandra Ayyar.

Crop and Trade Reports

Statistics—Crop—Groundnut—1943—Summer and early crops—Condition report Sowings of the summer crop of groundnut are reported to be normal in Cuddapah and above normal in the districts of Chingleput, South Arcot, Chittoor, Tanjore and Madura due mainly to attractive prices for the crop. Sowings of the early crop in Coimbatore are reported to be above normal on account of the promising market conditions.

The summer crop of groundnut is being harvested in parts. The yield per acre is expected to be normal in all districts outside Chingleput and South Arcot where the crop is reported to have been damaged by the cyclone and heavy rains of May 1943. The condition of the early crop of groundnut is generally satisfactory.

The wholesale price of groundnut (shelled) per imperial maund of 82½ lb. (equivalent to 3,200 tolas) as reported from important market centres on the 3rd July 1943 was Rs. 14-1-0 in Vizianagaram, Rs. 14/- in Adoni, Rs. 13-11-0 in Guntur, Rs. 13-8-0 in Tadpatri, Rs. 13-4-0 in Bellary and Guntakal, Rs. 13-3-0 in Nandyal, Rs. 13-2-0 in Cuddalore, Rs. 13/- in Cuddapah, Vellore and Hindupur, Rs. 12-14-0 in Erode and Rs. 12-11-0 in Salem. When compared with the

prices published in the last report, i. e., those which prevailed on the 10th April 1943, these prices reveal a rise of approximately 29 per cent in Guntakal, 25 per cent in Bellary, 17 per cent in Vizianagaram, 11 per cent in Guntur, 10 per cent in Adoni, 9 per cent in Cuddalore and Salem, 8 per cent in Hindupur, 7 per cent in Tadpatri, 3 per cent in Cuddapah, 2 per cent in Nandyal and 1 per cent in Vellore and Erode. (*Secretary, Board of Revenue—Civil Supplies, Madras*).

Cotton raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 2nd July 1943 amounted to 221,796 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 329,740 bales. 314,094 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 123,308 bales were imported by sea mainly from Karachi and Bombay.

(*Director of Agriculture, Madras*).

Moffusil News and Notes

Agricultural Exhibitions—Jammalamadugu An agricultural exhibition was conducted at Jammalamadugu from the 21st to 23rd May 1943 during the annual Car festival of Sri Narapurawami temple. Green manure crops and plants and specimen crops of improved strains of important food crops were exhibited. The uses of iron ploughs and bund former were demonstrated. A series of lectures on Grow More Food were made during the festival period.—D. A. O. Cuddapah.

Peruvalapur An agricultural exhibition was held at Peruvalapur in the Lalgudi taluk during the Annual Day Celebrations of the Rural Welfare Association, on the 22nd and 23rd June 1943. Besides improved implements, a collection of different strains of paddy, millets and green manure seeds was on show. Models of cattlesheds and manure pits, a bee hive and its accessories, and pictorial posters on pests and diseases of crops were exhibited. Posters on Grow More Food were put up prominently. Leaflets and other Departmental publications were distributed to the visitors.

Sunaipugazhnallur An agricultural exhibition was held at Sunaipugazhnallur (Lalgudi taluk) on 27th June during the Conference of the Melpattu Village Agricultural Association. Strains of paddy and millets and green manure crops suitable to the tract were exhibited. Pictorial posters on Grow More Food campaign and on improved methods in agriculture were put up prominently. The Agricultural Demonstrator, Lalgudi, addressed the gathering on improved methods of agriculture.—D. A. O. Trichinopoly.

College and Estate News

Students' Corner The first Year B. Sc. and the Short Course in Farm Management classes were formed on the 2nd and 5th July with 48 and 10 students respectively.

Students' Club The first general body meeting of the Students' Club was held on the 8th July with Mr. H. Shiva Rao in the chair. The following office bearers were elected for the year 1943-44.

Club Secretary	... K. R. Narayanaswami
Games "	... G. H. Sankara Reddy
Cricket Captain	... T. Venkataraya Pai
Hockey "	... M. Ramanadham
Tennis "	... M. Suryanarayana Sastry
Football "	... R. Bettai Gowder

Class Representative III year	...	P. Ammiraju
" " II "	...	K. Narasimbalu
" " I "	...	N. Akkayya.

Lecturer in Agricultural Economics A new post of Lecturer in Agricultural Economics has been sanctioned for the Agricultural College and Mr. K. C. Ramakrishna Ayyar, M.A., lately Lecturer in Economics in the University of Madras, has been appointed to the post. He took charge of the post on the 12th of this month.

A. R. P. Practice There was an A. R. P. practice at the Agricultural College Estate, between 2 and 3 p. m. on Saturday the 24th July 1943. An "incident" was staged in the south-west wing of the Research Institute where a high explosive bomb was "dropped" resulting in 4 "trapped cases" and 20 other "casualties". The A. R. P. personnel of the Estate arrived on the scene and phoned for help. A Heavy Rescue party and First Aid unit of the Coimbatore A. R. P. Division arrived in motor vans and rescued the "trapped cases" which were in the first floor and rendered first aid to the "injured". The more "serious cases" were transported to the Devangapet Hospital in an Ambulance Car and attended to.

Officers' Club The President and Members of the Agricultural College Officers' Club entertained Sri T. S. Ramasubrahmanya Ayyar at a farewell tea on the 24th July. Sri T. S. Ramasubrahmanya Ayyar has availed of leave preparatory to retirement and is leaving Coimbatore shortly to his village.

Departmental Notifications

Gazetted Service—Appointments

Sri C. S. Krishnaswami Ayyar, Assistant in Mycology, is appointed to act as Assistant Mycologist in the temporary post sanctioned for the Scheme of Research for the investigation of Blast and Foot Rot diseases of rice.

Sri G. Seshadri Iyengar, a servant of the Indian Central Cotton Committee, is appointed to act temporarily as Assistant Cotton Specialist, Mungari Cotton Scheme, Adoni.

Sri P. Krishna Rao, on the termination of his appointment as Superintendent, Dry Farming Scheme, Hagari, is reappointed to the M. A. S. as Temporary Development Officer for Dry Farming on the same Station, with effect from 1st July 1943.

Postings

On the expiry of his leave on 8-7-43 Sri P. N. Krishna Ayyar will resume his original post of Assistant Entomologist, Agricultural College, Coimbatore.

Sri C. Jaganatha Rao, Assistant Cotton Specialist, Adoni, is reverted to his substantive appointment and is posted to the Agricultural Research Station, Hagari, as Assistant in Cotton.

Leave

Sri K. Jagannatha Rao, D. A. O. (on leave) extension of l. a. p. for 1 month from 22-6-43.

Sri C. Jaganatha Rao, Offg. Asst. Cotton Specialist, Adoni, l. a. p. for 1 month from 17-7-43.

Sri T. G. Muthuswami Ayyar, D. A. O. (on leave) extension of l. a. p. for 1 month from 1-7-43.

Subordinate Service—Appointment

Sri L. Venkatarathnam, is appointed to officiate as Upper Subordinate, Science section and is posted as Asst. Fruit Section, F. R. S. Kodur, from 1-7-43.

Promotions

The following provisionally substantive promotions are ordered with effect from 27-9-41.

Sri M. Suryanarayana, Asst. in Chemistry, new I Grade to III Grade (old).

Sri S. M. Kalyanarama Ayyar, Asst. in Cotton, IV Grade (old) to new I Grade.

Sri K. Brahmachari, Asst. in Entomology, V Grade (old) to IV Grade (old).

Sri K. P. Anantanarayana Ayyar, Asst. in Entomology, V Grade (old) to IV Grade (old).

Sri M. S. Kylasam, Asst. in Entomology, V Grade (old) to IV Grade (old).

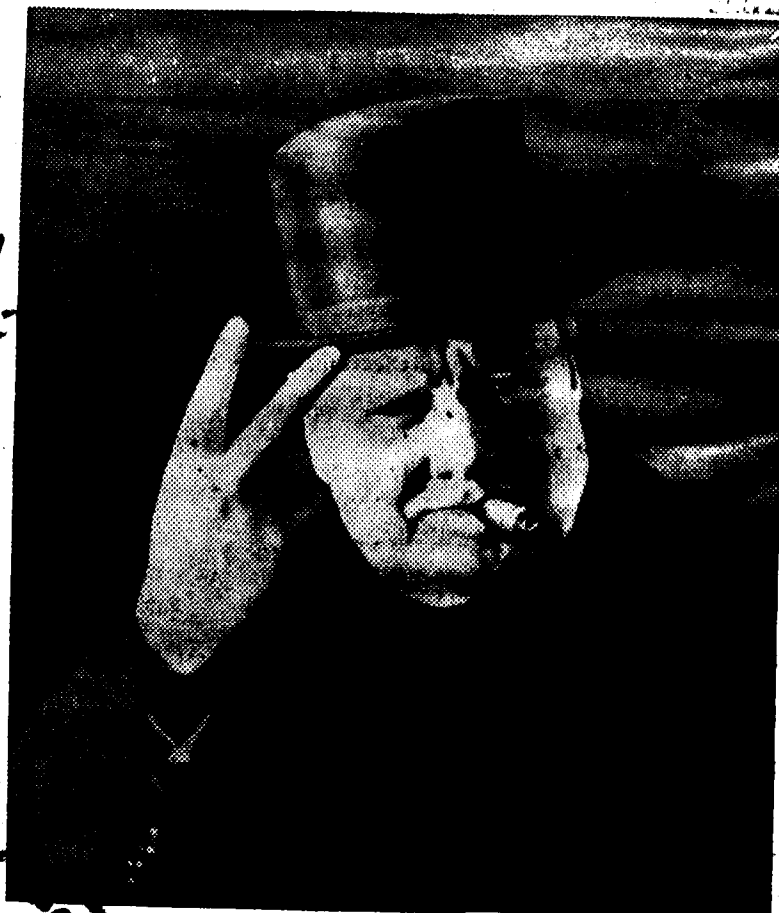
Sri G. K. Chidambara Ayyar, Asst. in Chemistry, V Grade (old) to IV Grade (old).

Transfers

Name of officers	From	To
Sri P. S. Krishnamurthi	Asst. in Entomology, Coimbatore	Entomology & Mycology Asst., Nellore.
" T. R. Narayanan	Asst. in Plants Physiology, D. F. S. Hagari	Asst. in Millets, Coimbatore.
" D. Rama Rao	Asst. in Millets, Hagari	A. D. Vizagapatam Dt.
" J. V. V. Surya-narayana	Asst. in Soil Physics, Hagari	Asst. in Chemistry, Siruguppa.
" N. S. Rajagopala Ayyar	Asst. in Fruit Section, Kodur	A. D. Cheyyar.
" P. V. Suryaprakasa Rao	Offg. Fieldman, Kodur	Asst. in Fruit Section, Kodur.
" V. Srinivasan	Asst. in Paddy Section, Coimbatore	Asst. in Pulses, Salem.
" B. Suryanarayana-murthi	Asst. in Millets, A. R. S. Guntur	Asst. in Pulses, Vizagapatam.
" P. Seshadri Sarma	Asst. in Millets, D. F. S. Hagari	Asst. in Millets, Dry Farming Development Research, Hagari.
" C. Bhujanga Rao	Nursery Asst., Kodur	Asst. in Fruits, Kodur.
" L. Venkatarathnam	Asst. in Fruits, Kodur	Nursery Asst., Kodur.
" A. H. Subrahmanya Sarma	Marketing Asst. under Grain Purchase Officer, Tanjore	Teaching Asst. in Agri. Coimbatore.
" V. Mahimai Doss	F. M. Central Farm, Coimbatore	Marketing Asst., Grain Purchase Officer, Tanjore.
" P. Narayanan Nayar	F. M. A. R. S. Taliparamba	F. M. A. R. S. Nanjanad.
" K. Parameswara Menon	F. M. A. R. S. Nanjanad	A. D. Malabar Dt.
" T. V. Krishnaswami Rao	A. D. Jami Hosur Cattle Farm, Hosur	A. D. Chicacole
" R. Anantapadma-nabha Pillai	F. M. Vegetable cultivation, Hosur Farm	F. M. Vegetable cultivation, Hosur Farm.
" S. Muthuswami	F. M. Vegetable cultivation, Hosur Farm	Hosur Cattle Farm, Hosur

Leave

Name of officers	Period of leave
Sri P. Vishnusomayajulu, Asst. in Mycology, Coimbatore	L. a. p. on m. c. for 8 months from 25-6-43.
„ D. Bapiah, F. M. A. R. S. Guntur	L. a. p. on m. c. for 3 months from 11-6-43.
„ I. Kruma Rao, A. D. Vuyyur	L. a. p. for 1 month from 1-7-43.
„ P. S. Krishnamurthi, Asst. in Entomology, Coimbatore	L. a. p. for 2 months from 19-7-43.
„ P. Narayanan Nair, F. M. A. R. S. Taliparamba	L. a. p. for 1 month from 14-7-43.
„ M. Narayana Ayyar, A. D. Hosur	L. a. p. for 2 months from 22-7-43.
„ G. Sakharama Rao A. D. Karakal	L. a. p. for 1 month from 15-7-43.



SN. 1. BRITAIN'S PRIME MINISTER REAFFIRMS HIS FAITH
IN AN ALLIED VICTORY

Mr. Winston Churchill, Prime Minister of Britain, caught by the camera in a typical pose. Picture was taken during a visit to war factory workers in Britain.

The Madras Agricultural Students' Union.

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