

Manuring successive crops of rice with ammonium sulphate and super phosphate

By ANANDAN,

District Agricultural Officer, Tanjore

V. KRISHNASWAMY & V. SRINIVASAN,

Assistants, Agricultural Research Station, Aduturai (Tanjore District)

Introduction In the Tanjore delta which has nearly a million acres under irrigated rice, the rice growers are in the habit of applying ammonium sulphate to their rice crop without the addition of any organic matter. This was particularly so during the post war boom period of 1919—1929, when paddy was selling at Rs 3 to Rs. 3—12—0 a kalam of 64 lb. Later on there were complaints that the yields of rice crop declined in fields that received ammonium sulphate. Invariably such statements were made by persons who applied a bag (80 lb.) of ammonium sulphate to one crop and stopped applying it to the following crop. It might be that the reduction in yield was the result of discontinuance of manuring. There was also no experimental evidence to declare that continued application of an artificial manure like ammonium sulphate really brought down the yield of rice. With a view to find out the effect of continued applications of ammonium sulphate on the rice crop, the following experiment was designed and conducted at the Agricultural Research Station, Aduturai in the Tanjore district for a period of five years from 1935-36 to 1940-41.

Soil and cropping season The soil on the station, is typical alluvial clay of the Cauvery delta which cracks heavily in summer months and sticks badly when wet. It is well supplied with potash but is deficient in nitrogen and phosphoric acid (Harrison and Raghunathaswami Ayyangar). The cultivation season commences by the middle of June, with the receipt of water in the channels fed by the river Cauvery. The first crop which has a short duration of 3 to 3½ months occupies the ground from July to the end of September. The second crop, which is generally a long duration variety of five to six months is planted by the middle of October after the harvest of the first crop, and harvested by the middle of February.

The field where the experiment was conducted had two crops every year. In years previous to the starting of the experiment it received green leaves and bonemeal at 2,000 lb. and 200 lb. per acre respectively at the time of planting, and ammonium sulphate at 50 lb. per acre, fifteen days after planting as a top dressing.

Design of the experiment During the second crop season of 1935 an area measuring 45 cents was selected and laid out into six blocks. Nine manurial treatments mentioned below were tried on each block. In succeeding years and to each succeeding crop the same manures were applied to each plot to the same degree. This experiment was discontinued after taking ten crops in five years. Each experimental plot measured 14 ft. × 20 ft.

giving an area of half a cent. The seedlings were planted in singles spaced 6 in. either way. At harvest one border row of plants, was rejected all round and only the plants inside the plots were used for deriving the yields of individual plots. Each plot had 1053 plants. The manurial treatments were—

- A—No manure
- B—20 lb. nitrogen per acre
- C—30 lb. " "
- D—20 lb. phosphoric acid per acre
- E—30 lb. " " "
- F—20 lb. nitrogen and 20 lb. phosphoric acid per acre
- G—20 lb. " and 30 lb. " " "
- H—30 lb. " and 20 lb. " " "
- I—30 lb. " and 30 lb. " " "

Application of the manure Ammonium sulphate was the manure used to supply nitrogen and concentrated super phosphate was chosen to supply phosphoric acid in all years except in 1939-40 when ordinary super phosphate was used. The requisite quantities of manure were well mixed with an equal quantity of sand to increase the bulk to facilitate uniform distribution and they were sprinkled evenly over each plot just after the final levelling.

The accurate spacing of the seedlings 6 in. × 6 in. in the field was secured by planting them against bold tar markings spaced 6 in. apart on straight bamboo sticks.

The seedlings for the first crop were grown under semi-dry conditions and those for the second crop were invariably raised in wet nurseries according to the local practice. The results obtained in each year from the first and second crops are shown separately below.

TABLE I Percentage increases over control (No manure)

(a) First crop

Years	Treatments									Variety	Duration
	A	B	C	D	E	F	G	H	I		
1936-37	100.0	106.0	116.7	100.2	103.7	116.7	121.7	124.2	125.2	Adt. 12	107
1937-38	100.0	119.9	130.9	105.6	108.7	129.3	130.1	142.1	148.4	3	95
1938-39	100.0	109.4	129.0	114.2	121.0	132.4	133.1	143.9	136.5	9	115
1939-40	100.0	113.3	115.3	110.0	116.0	125.3	124.7	124.0	123.3	12	107
1940-41	100.0	125.5	134.2	111.0	113.0	130.7	130.3	136.6	142.6	4	100
Mean	100.0	114.8	125.2	108.2	112.5	126.9	128.0	134.2	135.2		

(b) Second crop

1935-36	100.0	135.2	149.7	106.1	106.8	133.7	134.5	148.9	149.7	Adt. 2	165
1936-37	100.0	116.7	127.5	103.5	103.5	123.5	126.4	134.7	132.6	2	165
1937-38	100.0	125.3	148.1	102.5	115.5	135.5	135.5	150.6	149.4	11	175
1938-39	100.0	108.2	114.4	107.2	106.2	114.4	115.4	113.4	113.4	8	150
1939-40	100.0	129.2	140.0	103.1	106.2	136.9	136.9	152.3	152.3	8	150
Mean	100.0	122.9	135.9	104.9	107.6	128.8	129.7	140.0	139.5		

In all the years 'Z' test was satisfied. The conclusions obtained each year for the two crops are given below.

	First crop		Second crop
1936-37	I H G F C B E D A	1935-36	C I H B G F E D A
1937-38	I H C G F B E D A	1936-37	H I C G F B D E A
1938-39	H I G F C E D B A	1937-38	H I C F G B E D A
1939-40	F G H I E C B D A	1938-39	G F C H I B D E A
1940-41	I H G F B C E D A	1939-40	H I C G F B E D A

The following conclusions can be drawn from them:—

(a) The average figures for increases show that the application of nitrogen in the form of ammonium sulphate has given both in the first and second crops much bigger increases in yield than the application of phosphoric acid, either in the shape of concentrated or ordinary superphosphate (treatment B & C versus D & E).

(b) Generally speaking, 30 lb. of nitrogen in combination with 20 lb. of phosphoric acid (treatment H) has given about 10 % extra yield over 20 lb. N plus 20 lb. of phosphoric acid (treatment F), but the addition of an extra dose of 10 lb. of phosphoric acid over 20 lb. of phosphoric acid does not seem to have improved the yield in any way (treatment G versus F).

(c) Increases in yield are noticed in all the years of the experiment invalidating the statement that ammonium sulphate does not give increased yields from crops after a year or two.

(d) Continuous application of manures has not produced appreciable cumulative effects in crops of both seasons.

The economic aspect of this system of manuring may now be considered. The following table gives the figures of acreage yield, net increase in yield of grain over control, cost of manure and the profit per acre from the different treatments.

TABLE II
(a) First crop.

Years	Acre yield in lb.								
	Treatments								
	A	B	C	D	E	F	G	H	I
1936-37	2600	2756	3034	2608	2699	3034	3163	3228	3279
1937-38	2217	2671	2906	2347	2417	2879	2897	3161	3306
1938-39	2596	2842	3351	2965	3133	3439	3456	3737	3544
1939-40	2653	2997	3052	2918	3071	3315	3309	3282	3265
1940-41	2176	2724	2921	2416	2459	2843	2900	2973	3102
Average	2448	2798	3053	2651	2756	3102	3145	3276	3299

(b) Second crop

1935-36	1712	2316	2560	1816	1829	2288	2301	2549	2560
1936-37	1872	2183	2380	1934	1934	2308	2362	2518	2479
1937-38	1386	1747	2056	1429	1617	1888	1886	2103	2088
1938-39	1702	1842	1947	1824	1807	1947	1964	1930	1930
1939-40	1144	1491	1609	1182	1215	1571	1571	1756	1756
Average	1563	1916	2110	1637	1680	2000	2017	2171	2163

TABLE III Statement showing the average increase in yield, cost of manuring and the net profit obtained per acre

	First crop								
	B	C	D	E	F	G	H	I	
Average increase over no manure per acre	lb. 350	lb. 605	lb. 202	lb. 308	lb. 654	lb. 697	lb. 828	lb. 851	
Average value of increased produce	Rs. A. 10-14	Rs. A. 18-4	Rs. A. 6-6	Rs. A. 9-8	Rs. A. 19-11	Rs. A. 20-14	Rs. A. 24-9	Rs. A. 25-5	
Average cost of manuring per acre	5-7	18-2	3-6	5-1	8-12	10-7	11-8	13-2	
Net profit over control	5-7	10-2	3-0	4-7	10-15	10-7	13-1	12-3	
Second crop									
Average increase over no manure per acre	lb. 353	lb. 547	lb. 74	lb. 117	lb. 437	lb. 454	lb. 608	lb. 599	
Average value of increased produce	Rs. A. 11-2	Rs. A. 17-3	Rs. A. 2-5	Rs. A. 4-7	Rs. A. 13-13	Rs. A. 14-5	Rs. A. 19-2	Rs. A. 18-14	
Average cost of manuring per acre	5-3	7-13	2-11	4-1	7-15	9-5	10-9	11-14	
Net profit over control	5-15	9-6	0-6	0-6	5-14	5-0	8-9	7-0	

Data for calculating the profit and loss account

		35-36	36-37	37-38	38-39	39-40	40-41
Cost of ammonium sulphate per lb.	Rs.	0-0-9	0-0-10	0-0-9	0-0-11	0-0-11	0-0-11
Cost of concentrated super phosphate	Rs.	0-0-9	0-0-11	0-0-9	0-1-0	—	0-1-7
Cost of ordinary super phosphate	Rs.	—	—	—	—	0-0-5	—
Sale price of paddy kuruvai per 64 lb.	Rs.	—	1-6-0	1-10-0	1-14-0	2-0-0	2-8-0
Do. samba	Rs.	—	1-14-0	—	—	—	—
Do. sirumani	Rs.	2-0-0	1-12-0	—	2-4-0	2-6-0	—

Conclusions The figures given above bring to light the following:—

(a) The first crop is more responsive to manuring with the above manures than the second crop, the maximum increase in yield of grain due to manuring being of the order of 850 lb. an acre as against 600 lb. in case of the second crop.

(b) From the economic point of view it is clear that it is worthwhile manuring both the first and second crops and realising a profit of Rs. 10 to Rs. 13 an acre.

(c) It is not remunerative to manure the second crop with super-phosphate only.

(d) The most remunerative dosage is 30 lb. of nitrogen plus 20 lb. of phosphoric acid per acre. 30 lb. nitrogen also gives almost the same

yield but it is not advisable to supply nitrogen only, especially on soils as of Tanjore delta which are very deficient in phosphoric acid.

(e) For the second crop, application of ammonium sulphate to supply 30 lb. nitrogen per acre alone seems to be profitable but it is preferable to add 20 lb. of P_2O_5 to keep the soil well stocked with this valuable plant food.

Literature cited.

Harrison, W. H. and Ragbunathaswami Ayyangar, P. A. (1914) A soil survey of the Tanjore delta, *Madras Dept. Agric. Bul.* 68.

Economies in Feeding Cattle

By V. J. SUBBIAH MUDALIAR

The prices of commodities have risen considerably of late, particularly during the last twelve months. In certain cases the rise is phenomenal, so phenomenal as to be almost incredible. The rise in prices is also general and all classes of commodities are affected to a greater or lesser degree. Neither the rise in prices nor the factors conducive to such rises are in the control of individuals, but wise and judicious spending is in the hands of the discriminating people. It is becoming increasingly important to be extremely circumspect in choosing the right type and quantity of the various commodities for purchase. This choice is the problem today that confronts people with limited incomes, including agriculturists.

Cattle feeds are registering unprecedentedly high price levels, in common with other articles. Many of the common and usual feeds are getting scarce and costly. These may be the result of restricted transport facilities or of diversion of productive activity to more profitable fields or diversion of commodities for other and new uses. Early in 1940, the market for groundnut was cut off by the war and the farmers had in their hands large stocks of groundnut. Other crops could not satisfactorily replace groundnut in the prevailing system of cultivation. The same war has since come to the rescue. The conditions created by it found new uses for groundnut—kernels, oil and cake. The high prices of agricultural produce stimulated the use of manures for paddy and other crops. The import of fertilisers dwindled and people turned to groundnut cake for manuring the fields to a greater degree. The high prices of produce made manuring, even with costly manures, an economic proposition and certainly not uncertain as heretofore. Groundnut cake was selling at about Rs. 30 a ton early in 1940, at Rs. 60 in 1942 and is now at about Rs. 150 a ton. The peasants who maintain cattle find it increasingly difficult to feed the animals with concentrated feeds at the present high prices. The prices of other feeding stuffs also are on the upward trend. Cotton seed, sold at about Rs. 60 a ton early in 1942, is now selling at Rs. 240 a ton. One of the problems of the day for the cultivator is the feeding of his animals with concentrates. Is he to continue to feed his animals with concentrates priced so high and would it pay? Or alternatively is he to stop feeding