

Manurial Trials with Major Millets at Tirupattur (North Arcot District)*

by

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Synopsis : At the Regional Millet Station, Tirupattur (North Arcot District) manurial trials were conducted on rainfed *cholam* and *cumbu*, with organic and inorganic manures for three years from 1955 to 1958. The highest yields were obtained from the treatment involving 40 lb. N as Ammonium sulphate and 20 lb. P₂O₅ as Superphosphate over a basal dressing of five tons of farm yard manure per acre.

Introduction : *Cholam* (*Sorghum vulgare*) and *cumbu* (*Pennisetum typhoides* S. & H.) are the millets of major importance in this State and over 80 percent of the total area under these crops are on drylands. The average acre yields of grain are low, primarily due to lack of conservation or augmentation of soil fertility and secondarily due to the frequent failure of rain or its erratic distribution. Since soil fertility in cultivated lands is directed by manurial practices and since moisture is a pre-requisite for the proper utilisation of applied manures, the problem of upgrading the yield of the entirely rainfed crops by manurial treatments is a difficult one, as dependence on rain for moisture is both inevitable and uncertain. Perhaps on account of this uncontrollable factor, little information is available on manurial possibilities with dryland millets in this part of the country. However, *cholam* and *cumbu* are capable of responding to intensive manuring, as evidenced by their development under irrigated conditions where regular manuring forms a part of the cropping operations. If such capabilities could be exploited economically under rainfed conditions, the resulting additional production of these food grains should be considerable, as several lakhs of acres are under these crops. To gather data on the response of these crops to specified dosages of manuring combining both organics and inorganics, trials were conducted on rainfed *cholam* and *cumbu* at the Regional Millet Station, Tirupattur, North Arcot District and the results of these trials are embodied in this paper.

Previous Work : Application of farm yard manure to *Irungu cholam* was not found to improve the yield in experiments conducted at Kovilpatti. At Nandyal, it was observed that *Sorghum* responded well to manuring with farm yard manure and that a beneficial residual effect was also present. On the contrary, similar experiments conducted at Hagari were indicative of no

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residual effect. In experiments conducted at Central farm, Coimbatore, on Sorghum, it was seen that both compost and cattle manure increased yields significantly in higher doses. At Nandyal, however, compost and cattle manure were observed to be better than 'no manure' only in yield of straw but not in grain. At Hagari, farm yard manure appeared to influence the yield of Sorghum better than 'Indore' compost. As regards application of fertilisers, it was observed at Hagari that ammonium sulphate and superphosphate did not increase the yield of Sorghum. But, in Guntur, direct application of ammonium sulphate and superphosphate over a basal dressing of farm yard manure was found to increase the yield of the October sown crop up to 67 per cent.

In *cumbu*, direct application of ammonium sulphate at 2 cwts. per acre with one cwt. of superphosphate increased yields by more than 100 per cent in experiments at Kovilpatti. At the same station, trials conducted during the years 1923—'26 showed that calcium cyanamide, by itself or with superphosphate increased the yields of *cumbu* and that superphosphate by itself had little effect (Anon. 1954).

Jain and Mathur (1961) have reported, from experiments conducted on rainfed *bajra* (*cumbu*) in Rajasthan, that urea applied at 10 lb. N per acre gave the highest percentage of profit over investment.

Materials and Methods: The local dryland varieties of *cholam* and *cumbu* are *Talaivirichan cholam* (with characteristically streaming and open earheads) and *Kullan cumbu* respectively. The sowing season is mainly in June but generally commences earlier in the latter half of May with the first showers of the season. The *cholam* crop matures in about 180 days while *cumbu* reaches maturity in about 90 days. Strain TPT. 1 of *cholam*, representing the local variety, and strain Co. 3 of *cumbu* allied to the local variety are being departmentally recommended in this tract. These strains formed the material for this study involving four manurial treatments in six replications of two cent plots. The treatments were:

- (A) No manure (Control).
- (B) Farm yard manure @ 5 tons per acre.
- (C) do. with 20 lb. N and 20 lb. P_2O_5 .
- (D) do. with 40 lb. N and 20 lb. P_2O_5 .

Farm yard manure was applied as a basal dressing along with superphosphate, as the last item of preparatory cultivation prior to sowing. To contribute the specific dosages of nitrogen ammonium sulphate was incorporated in a single dose between rows of the crop (the distance

between rows being 2 links) after thinning the seedlings in July or August, following rain sufficient to render the soil suitably moist for application of the fertiliser. The comparative yields of grain under respective treatments were estimated and analysed after harvest.

Experimental Data: The trials were run identically and consecutively for three seasons from 1955 to 1958. In each year, the crops were sown in the month of June at the proper season and harvested after the completion of maturity. The vegetative development of the crops in the plots under manurial combinations evidenced vigour throughout the growth-phase and ocularly distinguished the respective plots from others. The grain-yield differences were statistically significant (at $P=0.35$) in all the seasons. The results of trials are tabulated below:

TABLE 1.

Crop and Treatment	1955-'56 season		1956-'57 season		1957-'58 season		
	Grain yield		Grain yield		Grain yield		
	as % of stand-ard	In lb. per acre	as % of stand-ard	In lb. per acre	as % of stand-ard	In lb. per acre	
<i>Cholam:</i>							
D.	...	181.3	1151	156.8	1279	148.8	1301
C.	...	161.9	1028	137.9	1140	122.9	1075
B.	...	124.5	703	107.0	873	98.7	863
A.	...	100.0	635	100.0	816	100.0	874
Critical Difference	...	39.8	253	24.3	198	28.3	247
<i>Cumbu:</i>							
D.	...	195.0	984	129.7	419	161.3	382
C.	...	160.9	812	113.8	368	150.6	357
B.	...	107.8	544	94.7	306	114.7	272
A.	...	100.0	504	100.0	324	100.0	236
Critical Difference	...	10.4	72	14.7	48	16.3	38

Remarks: (i) The *cholam* crop was normal in all the three seasons.
(ii) The season was normal for *cumbu* only in 1955-'56. The other two seasons were adverse.

It may be seen from the above data that treatment D has consistently and significantly been superior to the control and also to treatment B in all the seasons, while treatment C has been superior

to control in two out of the three seasons, in respect of both the crops. Treatment B involving the basal dressing alone (of 5 tons of farm yard manure per acre) has only been on par with the control statistically, though registering higher yields upto 14·7% in the case of *cumbu* and upto 24·5% in the case of *cholam*.

Discussion: Treatments A and B fairly represent the average of ryots' conditions, where manuring of *cholam* or *cumbu* in the drylands is either totally absent or is confined to five or six cart-loads of farm yard manure.

Compared with such conditions, the trials under discussion have brought out clearly that by adopting a combination of organic manure and fertilisers, the yield of *cholam* and *cumbu* could be considerably increased even under rainfed conditions. An obvious inference emerging from the data is that in both rainfed *cholam* and *cumbu* the increase in grain yield is largely parallel to the level of applied nitrogen and that the addition of superphosphate accentuates the trend of increase. Following this inference, it is to be considered if treatment D which has given the maximum increase in all the seasons with both the crops, could be made an economic and practical proposition for the ryots. Compared to absence of manuring, the average expenditure involved in adopting the superior manurial treatment (under experimental conditions) would be:

TABLE 2.

Particulars (per acre)	No Manure Rs. nP.	Treatment D Rs. nP.
Preparatory cultivation 2 ploughings with country plough — 4 pairs @ Rs. 3/-	... 12·00	12·00
Working Junior Hoe once — 1 pair @ Rs. 3/-	... 3·00	3·00
Cost of 5 tons of Farm yard manure @ Rs. 2/- per ton and transport charges @ Rs. 2/- per ton	... —	20·00
Cost of 112 lb. of Superphosphate and cost of 200 lb. of Ammonium sulphate	... —	45·00
Spreading farm yard manure and super — 1 man @ Re. 1/- and 4 women @ 50 nP.	... —	3·00
Covering with country plough — 1½ pairs	... —	4·50
Line sowing by hand — 6 men and 6 women (15 lb. of seed)	... 11·50	11·50

TABLE 2. (Contd.)

Particulars (per acre)	No Manure		Treatment 'D'	
		Rs. nP.		Rs. nP.
Thinning of seedlings — 4 women	...	2.00		2.00
Hand hoeing and weeding once — 12 women	...	6.00		6.00
Incorporating Ammonium sulphate in grooves between lines — 6 women	...	—		3.00
Harvesting operations: cutting plants, earheads, bundling and stocking straw, cattle threshing of earheads, cleaning, winnowing and bagging of grain etc. — 3 pairs of cattle, 7 men & 15 women	...	23.50		28.50
Total Expenditure	...	58.00		138.50

The labour charges would be nominally greater in the case of the manured plot since the out-turn of produce is also greater compared to 'No manure' plot.

(The particulars given above are based on standard labour requirements and current market rates and the figures may be safely taken to represent the average, though they may be slightly more in the case of *cholam* due to larger quantity of material handled at harvest or slightly less in the case of *cumbu* due to the smaller quantity handled.)

The average receipts from the crops based on actual figures for normal seasons at this station under the respective treatments would be :

TABLE 3.

Particulars per acre	No Manure		Treatment 'D'	
	Yield in lb.	Value Rs. nP.	Yield in lb.	Value Rs. nP.
<i>Cholam</i> :				
Receipts by grain @ 16 nP. per lb.	775	124.00	1245	199.20
Receipts by straw @ 160 lb. per rupee	3500	22.50	6000	37.50
Total Receipts		146.50		236.70

TABLE 3. (Contd.)

Particulars per acre	No Manure		Treatment 'D'	
	Yield in lb.	Value Rs. nP.	Yield in lb.	Value Rs. nP.
<i>Cumbu</i> :				
Receipts by grain @ 16 nP. per lb.	500	80.00	980	156.80
Receipts by straw (the value is only nominal as <i>cumbu</i> straw has no merit as fodder)	1550	8.00	2800	12.00
Total Receipts		88.00		168.80

ABSTRACT.

	<i>Cholam</i>		<i>Cumbu</i>	
	No manure Rs. nP.	Treatment 'D' Rs. nP.	No manure Rs. nP.	Treatment 'D' Rs. nP.
Average Total Receipts	146.50	236.70	88.00	168.80
Average Total Expenditure	58.00	138.50	58.00	138.50
Average Net Receipts	88.50	98.20	30.00	30.30

It may be seen from these calculations that in the case of rainfed *cholam*, adopting a manurial schedule of 40 lb. N as Ammonium sulphate and 20 lb. of P_2O_5 as Superphosphate would be economically advantageous to the ryot in normal cropping season. In the case of *cumbu*, the additional returns and the proposition of such manuring is rendered still more risky and uneconomical by the fact that in this tract *cumbu* crop fails more often than not as it behaves very sensitively to seasonal fluctuations within its short duration. These inferences in respect of rainfed *cholam* and *cumbu* can at best be regarded as general indications only, in the context of the data on hand and the basis of calculations. Line sowing of the crop and pure cropping as adopted in the experiments are practically non-existent under the ryots' conditions in this tract. On the other hand, the additional expenditure involved in the superior manurial treatment might possibly become reduced, under adoption by a working agriculturist with a pair or

two of cattle and contributing family labour, since production of basic manure on the farm and own labour would certainly be more economical than otherwise. In such a case, the margin of additional profit per acre for *cholam* may easily be Rs. 10/- or Rs. 15/- more than the average figures given. Another point worth pursuance would be the residual effect of the superior manurial treatment (particularly in the case of rainfed *cumbu*, as the fallows after *cumbu* are usually and immediately cropped with horsegram) since any beneficial effect on the succeeding crop may also be taken into consideration in assessing the overall economic status of the manurial recommendation.

In the drylands of this tract it is very common to find *cholam*, *cumbu* and redgram as companion crops mixture. In most seasons there would be enough rains in July, facilitating the application of fertilisers. The success of *cumbu* crop depends largely on the proper distribution of rains in July-August. But *cholam* and redgram because of their prolonged period of growth (6 to 6½ months), get the benefit of later rains and make up for deficiencies suffered earlier. Hence, though manuring *cumbu* alone with fertilisers may be an uncertain and an uneconomic venture such manuring in a system of mixed cropping may be profitable from the combined response of all the crops. In this and other directions, further work is needed before a general manurial recommendation with fertilisers can be made for the major dryland millets.

Summary and Conclusions: Manurial trials were conducted at the Regional Millet Station, Tirupattur with rainfed *cholam* and *cumbu*, under four treatments, including the absence of any manuring as the control. Significantly higher yields of grain in respect of both the crops were obtained consistently in three seasons of trial. The highest yields were obtained from the treatment involving 40 lb. N as Ammonium sulphate and 20 lb. P₂O₅ as Super over a basal dressing of five tons of farm yard manure per acre. The treatment rendered a small margin of additional profit in the case of *cholam*, but in the case of *cumbu* it was not of distinct advantage. Further trials are necessary before a standard economic manurial formula applicable to major dryland millets can be evolved.

REFERENCES

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| Anonynous | 1954 <i>Memoirs of the Department of Agriculture, Madras.</i> |
| Jain, S. V. and C. V. Mathur | 1961 Efficiency of different Nitrogenous Fertilizers for Bajra production in different soils of Rajastan. <i>Indian J. Agron.</i> V |