

Results of Manurial trials in Madras State on Millets

Part I — *Cholam* and *Cumbu*

by

A. MARIAKULANDAI¹ and Y. B. MORAOHAN²

Synopsis: The paper presents the review of manurial trials done in Madras State for the past fifty years on the following millets viz *Cholam* (*Sorghum spp*) and *Cumbu* (*Pennisetum typhoides*). The trials were conducted primarily at the Agricultural Research Stations, Coimbatore, Kovilpatti and Palur.

Reviews on manurial experiments on potato, cotton and oilseeds have already been published in previous issues. In the present paper a review of manurial experiments on millets is presented.

Dry Cholam (Sorghum spp): It is well adapted for regions of low rainfall and grown in all types of soil. It is grown both for grain and fodder purposes.

Nitrogenous Manures: *Ammonium sulphate compared to groundnut cake:* This was tried at the Agricultural Research Station, Koilpatti between the years 1930—'40. Ammonium sulphate and groundnut cake alone and in combination, was tried over a basal dressing of six cart loads of farm yard manure and one cwt of super phosphate. There was significant response to nitrogen in both forms when compared to control which gave only 210 lb grains per acre. Maximum response of 144 per cent was recorded for groundnut cake (500 lb) followed by ammonium sulphate (2 cwt) with 133 per cent and groundnut cake (250 lb) + ammonium sulphate (1 cwt) with 123 per cent (9).

Ammonium sulphate in combination with super phosphate: This was tried at Central Farm, Coimbatore in the years 1929—'31 with 2 cwt of ammonium sulphate and 1 cwt of super phosphate. There was no significant response, the yield being 1960 lb as compared to 1880 lb of fodder in no manure plot (10).

In a similar experiment conducted at Central Farm in the same year over a basal dressing of 9 cart loads of farm yard manure, there was no significance, though the treated plot gave 870 lb of grain as compared to no manure plot yield of 700 lb. The straw yield was 3380 lb as compared to 3350 lb for no manure plot (10).

¹ Principal, Agricultural College, Madurai. ² Lecturer in Agronomy, Agricultural College and Research Institute, Coimbatore-3.

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Calcium cyanamide: In an experiment conducted at Koilpatti, in the years 1923—'26 on the response of calcium cyanamide with super phosphate an increased yield of 50 per cent was obtained over no manure (10).

In a similar experiment conducted at Coimbatore the response was 18 per cent increased yield (1).

Nitrolime: This was tried at Koilpatti in the years 1918—'21. Significant response of 46.4 per cent was obtained over no manure plot with 6410 lb of straw when two cwt of nitrolime was applied (10). When fish guano of 560 lb was added along with nitrolime, the response was 64 per cent over no manure plot of 6410 lb of straw (10). Thus, it is seen that *chulam* responds well to nitrogenous manures and ammonium sulphate seems to be the best among the different forms.

Phosphatic Manures: Comparison of different forms of phosphate:
BONE MEAL: This was tried at Koilpatti over a basal dressing of green manure in 1911—'15. There was no response to bone-meal, the yield being 680 lb as compared to 640 lb for no-manure plot (10).

FISH GUANO: This was tried at Koilpatti in 1918—'21 to supply 45 lb N and 55 lb P_2O_5 . There was significant response of 33.3 per cent over no manure plot of 4150 lb of straw (10).

There seems to be no marked effect on the application of phosphates.

Bulky Organic Manure: Farm Yard Manure: In an experiment conducted at Koilpatti, application of farm yard manure had given 70—100 per cent additional yield over no manure plot (1).

Comparison of Farm Yard Manure with different doses of artificials: The response of farm yard manure at different levels (a) 5 tons (b) 5 tons farm yard manure plus 20 lb N plus 20 lb P_2O_5 and (c) 5 tons farm yard manure plus 40 lb N plus 20 lb P_2O_5 were compared on Co. 1 *chulam* at the Millet Breeding Station, Coimbatore in the Years 1954—'57. The treated plots gave 3 per cent to 25 per cent additional yield over no manure plot. But the difference among the levels was not significant. The application of 5 tons of farm yard manure appears to be more economical and profitable (3).

In an experiment conducted at the Regional Millet Station, Tirupathur between 1955—'58 with TPT 1 *Chulam*, significantly higher yields of grain were obtained in the treatment with 5 tons of farm yard manure plus 40 lb N plus 20 lb P_2O_5 (4).

Farm yard manure compared with night soil compost: This was tried at the Agricultural Research Station, Koilpatti in the years 1939—'42. There was no difference (1).

Thus, it is clear that farm yard manure increases the yield of rainfed *cholam*.

Combination of manures: Farm yard manure at 6 cart loads along with 2 cwt of ammonium sulphate and 1 cwt of super phosphate had given 300 per cent additional yield over no manure at Koilpatti (9).

In the permanent manurial experiments conducted at Coimbatore, the maximum response was obtained by N plus P plots followed by N plus P plus K and farm yard manure plots (9, 10).

Thus, the combination of N and P manures always gave better yield than N alone.

Irrigated *Cholam* (*Sorghum* Spp)

Nitrogenous Manures: Ammonium sulphate compared to groundnut cake: This was tried at Koilpatti between the years 1930—'40. Ammonium sulphate and groundnut cake alone and in combination was tried over a basal dressing of 6 cart loads of farm yard manure plus 2 cart loads of cotton compost and 1 cwt of super phosphate. Maximum increase of 352 per cent over control (farm yard manure and compost treated plot) yield of 500 lb was obtained with ammonium sulphate while 266 per cent increase in yield was obtained in groundnut cake plot (9).

Ammonium sulphate in combination with super phosphates: This was tried at Coimbatore with 2 cwt of ammonium sulphate and 1 cwt of super phosphate over 9 cart loads of farm yard manure in the years 1929—'31. The treated plot had given 19 per cent increased yield (870 lb) over the control plot yield of 700 lb of grain which received the farm yard manure alone (10).

In a similar experiment on fodder *cholam* at Coimbatore during the same year with 4 cwt of ammonium sulphate and 2 cwt of super phosphate over 9 cart loads of farm yard manure, the treated plot had given 11 per cent increased yield (12,790 lb over control yield of 9,950 lb (10).

Phosphatic Manures: Different forms of phosphates compared: This was compared at the Agricultural Research Station, Bhavanisagar between the years 1957—'61. Three types, namely, super phosphate, ammonium phosphate and dicalcium phosphate were compared at 20 and 40 lb P_2O_5

over 30 lb N with three methods of placement (broadcast, $2\frac{1}{2}$ " below and in bands). Though there was significant response to phosphate except in the first year, the difference between ammonium phosphate and super phosphate were erratic and did not follow any trend (6).

Bulky Organic Manure: *Farm Yard manure with different doses of inorganics compared:* The response of farm yard manure at different levels (a) 5 tons (b) 5 tons farm yard manure plus 20 lb N plus 20 lb P_2O_5 were compared at Agricultural Research Station, Tirupathur with *chulam* TPT. 1. in the years 1955-'57. Ninetyfive per cent additional yield was obtained with treatment (c) followed by 61 per cent in (b) and only 7.8 per cent in (a) (3).

Combination of Manures: To find out the optimum requirements of NPK, different levels of N, P and K in the form of ammonium sulphate, super phosphate and potassium chloride were tried at Agricultural Research Station, Bhavanisagar, in the years 1957-'61.

The response to different levels were erratic and did not follow any trend. But the dose of 40 lb N plus 20 lb P plus 40 lb K plus 5000 lb farm yard manure seems to give maximum yield (6).

At Central Farm, Coimbatore, 9 cart loads of farm yard manure with 4 cwt of ammonium sulphate and 2 cwt of super phosphate had given 11 per cent additional yield over the farm yard manure (control plot) with 16970 lb of fodder in the years 1928-'30 (10).

In the new permanent manurial experiments conducted at Coimbatore, the maximum response was obtained by N plus P plots followed by N plus P plus K and farm yard manure plots (9, 10).

Thus, the combination of N and P manures always give better yield than N alone both under dry and irrigated conditions.

Tillage cum manure and irrigation: This was carried out at the Central Farm, Coimbatore in the years 1957-'60, to assess the influence of three agronomic factors of tillage, manures and irrigation. Two levels of tillage (shallow by country plough and deep by Victory plough) three levels of manure (30 lb N plus 30 lb P_2O_5 ; 60 lb N plus 45 lb P_2O_5 plus 50 lb K_2O ; 90 lb N + 60 lb P_2O_5 + 50 lb K_2O over basal dressing of 5 tons of farm yard manure) and three levels of irrigation (20 acre inches; 25 acre inches and 30 acre inches) were tried.

There was no difference due to forms and levels of manures tried and tillage (4, 5)

Manuring versus spacing: This was tried at the Agricultural Research Station, Bhavanisagar between 1957—'61 with 0,20,40 lb N as ammonium sulphate, 0,20,40 lb P₂O₅ as super phosphate with three different spacings of $\frac{1}{2}$ ' , 1' and 1 $\frac{1}{2}$ '. The spacing of 1 ft with 40 lb N and 40 lb P₂O₅ seemed to be optimum (6).

Cumbu (Pennisetum typhoides): There are long and short duration varieties in *cumbu*. The former are generally grown on dry lands under monsoon season and the latter with irrigation under hot weather. As a dry crop, it is generally grown on soils of poor fertility.

Response to ammonium sulphate: In an experiment conducted between the years 1930—'40 at Agricultural Research Station, Koilpatti for a period of two years, under irrigated conditions ammonium sulphate at 1 cwt per acre gave 74 per cent additional yield of grain over that of the no manure plot (9).

In another experiment conducted in the same place in 1931—'35 ammonium sulphate at 2 cwt gave 26 per cent (342 lb) of additional yield of grain per acre over the control which gave 270 lb (9).

Ammonium sulphate along with super phosphate: This was tried at Agricultural Research Station, Palur, in 1923—'31 for two years by application of 2 cwt of ammonium sulphate and 1 cwt of super phosphate and comparing it to no manure plot. Though a significant response of 38 per cent was obtained in the first year over the no manure yield of 825 lb grain, it was not so in the second year, wherein the treated plot gave 6 per cent over the no manure yield of 3400 lb.

In case of residual effect of manure on *cumbu* (*cumbu* raised after *cumbu* in the same field treated with manure) significant response of 13.5 per cent was obtained (10).

In a similar experiment conducted in 1930—'31 at Central Farm, Coimbatore, with 4 cwt of ammonium sulphate and 2 cwt of super phosphate over 2 cart loads of farm yard manure, the additional yield was 29 per cent over the farm yard manure plot with 16,970 lb of fodder (10).

Ammonium sulphate compared to groundnut cake with and without super phosphate: In an experiment conducted at the Agricultural Research Station, Palur comparing ammonium sulphate to groundnut cake with or without super phosphate, 2 cwt of ammonium sulphate or groundnut cake at 500 lb plus 1 cwt of super phosphate was found to be the best (1).

In a similar experiment conducted at Agricultural Research Station, Koilpatti, between the years 1930—'40, ammonium sulphate was found better than groundnut cake (10).

Response to nitro-lime (containing 15 per cent N and Ca CO₃, 48 per cent). In an experiment conducted at Agricultural Research Station, Koilpatti, between the years 1923—'26 the application of 1 cwt of nitro lime (17 lb N) gave 25 per cent additional yield, while 2 cwt (34 lb N) gave 35 per cent additional yield over the no manure yield of 560 lb of grain (10).

Response to calcium cyanamide alone or in combination with super phosphate: This was tried at the Agricultural Research Station, Koilpatti, in the years 1923—'26. Calcium cyanamide, either alone or with super phosphate, increased the yield, but super phosphate by itself had no effect (10).

From the above experiments, it is clear that *cumbu* responds well to nitrogenous manures and that ammonium sulphate seems to be the best when compared to other forms of nitrogenous fertilisers tried so far.

Phosphatic Manures: Super phosphate: This was tried at the Agricultural Research Station, Koilpatti in the years 1923—'26. The application of 56 lb of super phosphate had no response. But when super phosphate at 56 lb was applied along with nitrolime at 224 lb there was a good response of nearly 44 per cent of additional yield over no manure plot (10).

In a similar experiment conducted at Agricultural Research Station, Koilpatti in the years 1923—'26 with calcium cyanamide, it was found that super phosphate by itself had no effect and that along with calcium cyanamide, the yield was increased (10).

Bone meal: This was tried at the Agricultural Research Station, Koilpatti from the years 1911 to 1915 by applying 224 lb bone meal along with sunnhemp as green manure. There was additional yield of 49 per cent over the control plot of green manure with 630 lb (10).

Thus, it will be seen from the experiments carried out with phosphatic manures on *cumbu* that these have better effect when applied along with nitrogen, than when applied alone.

Bulky Organic Manures: Response of cattle manure at different doses: This was tried at the Agricultural Research Station, Tirupattur in the years 1955—'58 on the *cumbu* variety Co. 3 with the following doses (1) No manure, (2) Cattle manure at 5 tons (3) Cattle manure at 5 tons plus 20 lb P₂O₅ and (4) Cattle manure at 5 tons plus 40 lb N plus 20 lb P₂O₅. The treatment (4) gave the maximum yield increase consecutively than others. But economically it was on par with no manure (4).

Farm Yard manure compared to compost: This was tried at the Agricultural Research Station, Palur comparing farm yard manure to compost, prepared by Bangalore method and by the modified Indore method, at 5 and 10 tons per acre. Indore method of compost at 10 tons was found to be the best followed by 5 tons (1).

Farm yard manure compared to "Synthetic" farm yard Manure: (Synthetic farm yard manure or cane trash compost is prepared in the same way as that of compost with addition of bone meal. It contains 0.36 per cent N; 0.45 per cent P_2O_5 ; 0.76 per cent K_2O and 1.11 per cent lime).

Farm yard manure prepared under the "Loose box system" was compared to "synthetic" farm yard manure at 10 cart loads per acre in the Agricultural Research Station, Palur in the years 1928-'30. While there was an increased yield of 25 per cent over the control of 600 lb grain the difference between the different forms of farm yard manure was insignificant (10).

Farm yard manure prepared by different methods compared: This was done at the Agricultural Research Station, Koilpatti during the years 1923-'26 for comparing the efficacy of farm yard manure prepared under different systems namely: (a) loose box, (b) byre pit with trap and (c) pit with soil and (d) heap. Though there was significant response over the yield of no manure plot (400 lb grain) with the additional yield going upto 40 per cent over control, the difference among the different manures was not significant.

Farm Yard Manure obtained from different types of fodder fed to cattle, compared: Farm yard manure obtained after feeding animals with *cumbu* straw was compared with farm yard manure obtained after feeding with *cholam* straw at the Agricultural Research Station, Koilpatti in the years 1923-'26. There was no significant difference on the yield. It was 520 lb of grain in the case of *cumbu* straw and 490 lb of grain in the case of *cholam* straw (10).

Farm Yard Manure-Method of Application Compared: Application of farm yard manure with different systems (a) broad cast; (b) 2/3 broadcast and 1/3 in furrows; (c) full dose in furrow, all at 12,000 lb was compared at the Agricultural Research Station, Kovilpatti in the years 1916 to 1917. Treatment (d) gave significantly higher yield of 240 lb over the control yield of 200 lb grain. The differences between the treatments were insignificant (10).

Combination of farm yard manure with inorganic fertilisers: Farm yard manure at 9 cart loads along with ammonium sulphate at 448 lb and super phosphate at 224 lb were compared with farm yard manure at nine cartloads alone, under irrigated conditions at Central Farm, Coimbatore in the years 1928-'30. Significant increase in yield was obtained with combination of inorganic fertilisers, the yield being 12,790 lb of fodder as compared to 9,950 lb of fodder with farm yard manure alone (10).

In a similar experiment conducted at the Agricultural Research Station, Koilpatti high response was obtained for inorganic manure over farm yard manure (10).

Residual effects: This was tested at the Agricultural Research Station, Koilpatti between the years 1930—'35. The residual effect of ammonium sulphate (at $\frac{1}{2}$ cwt; 1 cwt; 2 cwt) and groundnut cake (at 125 lb) applied individually and in combination with that of super phosphate (at 112 lb) to supply levels of nitrogen ranging from 50 to 70 lb over a basal dressing of 6 cart loads of cattle manure to the previous cotton crop was tested in comparison to cattle manure alone. The results were in favour of the higher doses of N tried, with a yield ranging from 15.21 per cent over the control yield of 385 lb grain per acre.

When *cumbu* crop was raised in the second year as a residual crop (Cotton followed by *cumbu*, followed by cotton and then *cumbu*), the increase in yield was 12 per cent in the treated plots over the control yield of 303 lb grain (9).

Hence, farm yard manure by itself increases the yield of *cumbu* and applying it half in broadcast and half in furrows is better. Its residual effect is also seen in the subsequent two years. But, better results were obtained with combination of inorganic fertilisers.

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