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CHANGES IN AVAILABLE NPK STATUS AFTER 8 YEARS OF CONTINUOUS MANURING AND FERTILIZATION IN RICE-RICE CROPPING SYSTEM

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ABSTRACT

The influence of long term fertilization with organic manure and inorganic fertilizers under Rice-Rice cropping system on the available NPK status was investigated in the permanent manurial experimental plots of Agricultural College farm, Madurai. Continuous addition of FYM along with NPK fertilizers for eight years resulted in higher available N and P content while addition of compost along with K fertilizer resulted in higher available K content. Accumulation of more of available NPK was observed in the surface soil than sub surface soil. Addition of N had a depressive effect on the available K status of soil.

Key words: Available NPK, continuous manuring, Rice-Rice cropping

Continuous application of manures and fertilizers over a period of time might alter the properties of soil especially the amount of available nutrients. The best tool to assess the effects of long term fertilization on the soil characteristics is the permanent manurial experiments. Acharya and Rajagopalan (1956); Ambica Singh and Roy Sharma (1968) and Muthuvel *et al.* (1977) have reviewed the efficiency of various organic and inorganic manures under continuous long term application in building up the fertility level of the soils under different agroclimatic conditions. With a view to find out the effects of continuous manuring and fertilisation on soil fertility in an intensive rice-rice cropping system, a study was made on the available NPK status of soils under long term fertilization and the results are presented in this paper.

MATERIALS AND METHODS

The long term field experiment on rice-rice cropping system conducted between 1975 and 1983 at Agricultural College Madurai had four organic manure treatments allotted to main plots and eight inorganic fertilizer treatments allotted to sub-plots. The organic manure treatments were control, farm yard manure (FYM) at 25 t/ha, green leaf manure (GLM), Glyricidia at 12.5 t/ha and compost at 25 t/ha. The inorganic fertilizer treatments were no fertilizer, N 100; P 26.4; K 49.8; N 100 P 26.4; N 100 K 49.8; P 26.4 K 49.8 and N 100 P 26.4 K 49.8. Altogether there were 32 treatments. Each treatment was replicated twice. The FYM (0.50, 0.26, 0.40% NPK), GLM (0.58, 0.10, 0.56% NPK) and compost (0.80, 0.24, 0.66% NPK) were applied a fortnight prior to transplantation. One half of N and entire P and K as urea, single superphosphate and muriate of potash respectively were applied basally. The remaining N was top dressed in two equal splits at tillering and panicle initiation. IR 50 was raised as a test crop. The surface (0-15 cm) and sub-surface (15-30 cm) soil samples collected after eight (1983) years of experimentation were analysed for available N and P by the method of Subbiah and Asija (1956) and Olsen *et al.* (1954) respectively. The available K was estimated by flame photometer (Jackson, 1973).

The surface and sub-surface soils were loamy sand and sandy clay loam with a pH of 8.1 and 8.3 and EC of 0.57 and 0.52 m.mhos/cm

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Table 1. Effect of continuous manuring and fertilization on available NPK status of soil after 8 years of continuous manuring and crop

Depth	Available N (ppm)		Available P (ppm)		Available K (ppm)	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
Treatments: Organic manures						
Control	124	80	6.51	4.25	108	64
GLM	162	104	7.42	5.09	214	99
GLM	129	91	7.31	4.76	151	81
Compost	154	101	7.11	4.95	232	127
CD (0.05)	2	14	0.18	0.08	3	7
Fertilizer Combination						
Control	123	83	4.26	3.19	125	88
N	146	102	4.84	3.35	154	67
P	135	83	8.87	5.99	190	96
K	133	91	4.78	3.10	219	128
NP	159	10	9.48	6.38	150	75
NK	139	90	4.99	3.58	184	99
PK	135	95	9.24	6.04	194	116
NPK	154	105	10.23	6.49	141	96
CD(0.05)	2	10	0.10	0.14	4	6
Initial values (1975)	95	55	2.50	2.00	50	35

respectively. The organic carbon contents were 1.19 and 0.49 per cent in surface and sub-surface soil. It was a typical Alfisol. The initial (1975) soil available NPK status are presented in Table 1.

RESULTS AND DISCUSSION

Available N:

Among the different organic manures, FYM treated plots had higher available N than other organic manures. The GLM treated plots had generally lower available N than FYM and compost. Gasser (1962) and Muthuvel *et al.* (1977) have also reported an increase in available N content due to application of N through organic sources.

Among the fertilizer combinations the NPK or NP treatments registered higher amount of available N. Prasad and Singh (1980) have reported higher available N in fertilizer combinations of NPK. The present study also indicates a similar trend in the case of continuous application of NPK fertilizers.

The available N in the sub-surface soil was less than the surface possibly due to the accumulation of applied N in the surface and also due to the reason that under irrigated conditions, root growth was probably restricted to surface layer alone.

Available P :

Continuous addition of FYM resulted in higher available P than the others. This could be

attributed to continuous addition of P through organic sources. Continuous P addition through fertilizers invariably increased the available P status in soil. Among the fertilizer combinations, NPK treatment had higher available P than other P combinations. Anand and Ghosh (1979) and singh *et al.* (1980) also reported similar findings which corroborates with the results of the present study. The available P was more in surface soil, possibly due to the addition of fertilizer to the surface soil and the poor mobility of the added P.

Available K:

Continuous organic manure addition resulted in build up of available K in soil. Among them, compost treated plots recorded higher available K than FYM and GLM. Most of the K treated Plots invariably had higher available K content than other fertilizer treatments. Similar results have also been reported by Negi *et al.* (1981). Among the K combinations, the NPK treatment gave lower available K possibly due to the heavy removal of K by the higher yields of paddy crops observed in those plots continuously. Invariably, the N treated Plots had lower available K than other treatments.

REFERENCES

ACHARYA, C.N. and RAJAGOPALAN, K. 1956. Effect of continuous application of manures and fertilizers on the carbon and nitrogen levels of soil. J. Indian soc.Soil Sci.4: 111.

AMBIKA SINGH and ROYSHARMA, R.P. 1968. Long term experiments with fertilizers and manures on sugarcane in India. *Emp. J. Exp. Agric.*, **4** : 65-75.

ANAND, S. and GHOSE, A.B. 1979. Effect of intensive fertilizer use based on soil tests on the available phosphorus status of soil. *Bull. Indian Soc. Soil Sci.*, **12**: 334-338.

GASSER, J.K.P. 1962. Effect of long continued treatment on mineral nitrogen content of soil. *P. Soil.*, **17**: 209-220.

JACKSON, M.L. 1973. Soil chemical Analysis. Prentice Hall of India Private Limited, New Delhi.

MUTHUVEL, P., KANDASWAMY, P. and KRISHNAMOORTHY, K.K. 1977. Availablity of NPK under long term fertilization. *Madras agric. J.* **64**: 358 -362.

NEGI, A.S., SHARMA, R.C., SUN, K.C. and BIST, B.S. 1981. Effect of long term manurial applicaton on soil potassium and suitability of different chemical methods for determining available potassium. *J Indian Soc. Soil Sci.* **9**: 86-91.

OLSEN, S.R., COLE, C.V., WATANABE, F.S. and DEAN, D.A. 1954. estimation of available phosphorus in soils by extraction with sodium bicarbonate. U.S.D.A. Circ. 939.

PRASAD, B. and SINGH, A.P. 1980. Changes in soil properties with long term use of fertilizers, lime and farm yard manure. *J. Indian Soc. Soil. Sci.* **28**: 463-468.

SINGH, L., VERMA, R.N.S. and LOHTA, S.S. 1980. Effect of cotinuous application of FYM and chemical fertilizers on some soil properties. *J. Indian Scc. Soil sci.*, **28**: 170-172.

SUBBIAH, B.V. and ASIJA, C.L. 1956. A rapid procedure for estimation of available nitrogen in soils. *Curr. Sci* **25**: 259-260.