

## EFFECT OF ORGANIC MATTER ON SOIL FERTILITY

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**Abstract:** In order to find out the long term effect of continuous application of organic and inorganic fertilizers on soil fertility and yield of rice, permanent **manurial** trial was started at the Rice Research Station, Kayamkulam since 1964. Data for seven years from **1978-79** to 1985-86 revealed that highest yield was recorded by treatments that received either full the quantity of N (80 kg/ha) as cattle manure or **three-fourth** the nitrogen requirement (60 kg/ha) as cattle manure and **one-fourth** (20 kg/ha) as ammonium sulphate along with 40 kg/ha each of phosphorus and potassium as superphosphate and muriate of potash, respectively. This emphasises the need of application of organic matter in this sandy loam tracts of Onattukara. The inferior yield recorded by treatments that did not receive either one or more of the three major nutrients again reveals the importance of phosphorus and potassium nutrition and shows that there is no scope for skipping P or K if long term soil fertility is to be maintained.

### INTRODUCTION

Organic manures are not to be regarded as **alternatives** to or substitution for chemical fertilizers. Application of organic matter definitely benefits the soil in its structure, water holding capacity as well as its nutritional status. Modern farming is quite rightly based on the skilful use of all sources of plant food, organic and inorganic alike. Permanent manurial trial with rice was started at Pattambi in 1962 with tall *indica* variety and later in 1972 a new series of experiment was started there with dwarf *indica* variety. The present **studuy** of Kayamkulam was also aimed at monitoring the effect of long term application of both organic manures and inorganic fertilizers on soil fertility and yield of rice.

### MATERIALS AND MEHTHODS

Permanent manurial trial at the Rice Research Station, Kayamkulam was started in 1964 and is being continued since. Here a monoculture of paddy in **virippu** and mundakan seasons with a summer fallow, is followed.

The soil is sandy loam in texture with pH 5.2. It is classified as low for available N, medium for available P and very low for available K. The experi-

ment was laid out in randomised block design with seven treatments and four replications. The dwarf *indica* variety Jaya was grown in both the first crop and second crop seasons. The treatment details are:

1. 80 kg N/ha as cattle manure
2. 80 kg N/ha as ammonium sulphate
3. 80 kg N/ha as ammonium sulphate + 40 kg  $P_2O_5$ /ha as superphosphate
4. 80 kg/ha as ammonium sulphate + 40 kg  $K_2O$ /ha as muriate of potash
5. 40 kg  $P_2O_5$ /ha as superphosphate + 40 kg  $K_2O$ /ha as muriate of potash
6. 80 kg N/ha as ammonium sulphate + 40 kg  $P_2O_5$ /ha as superphosphate + 40 kg  $K_2O$ /ha as muriate of potash
7. 60 kg N/ha as ammonium sulphate + 20 kg N/ha as cattle manure + 40 kg  $P_2O_5$  as superphosphate + 40 kg  $K_2O$ /ha as muriate of potash.

Cultural practices like irrigation, weeding, plant protection etc., were carried out uniformly in all the plots. The crop was harvested and processed as usual and the **plotwise** yields of both grain and straw were recorded. The yield data for both the seasons for seven consecutive years from **1978-79** to **1985-**

86 were subjected to pooled analysis.

## RESULTS AND DISCUSSION

The data on the yield of grain of permanent manurial trial during first crop and second crop for seven seasons are presented in Tables 1 and 2. From the above tables, it can be seen that during most of the first crop seasons, highest grain yield was recorded in treatments 1 and 7 which were themselves on par. **Kutsenko and Kunouskil (1972)** also made a similar observation where they recorded increased yield in treatments which received FYM and NPK fertilizers over the NPK fertilizer alone. Treatment 1 consisted of the application of 80 kg N/ha as cattle manure which provided besides N, 40 kg  $P_2O_5$ /ha and 80 kg  $K_2O$ /ha. So treatment 1 is comparable to treatments 6 and 7 in this respect as it can be considered as complete fertilization with all the three major nutrients (**Kurumthottical, 1982**). Treatment 7 supplies three-fourth the quantity of nitrogen as ammonium sulphate (60 kg/ha) and one-fourth the quantity as cattle manure (20 kg/ha) along with 40 kg  $P_2O_5$  and 40 kg  $K_2O$ /ha. The cattle manure applied here would have supplied 10 kg  $P_2O_5$ /ha and 20 kg  $K_2O$ /ha.

In the second crop season also invariably treatments 1 and 7 were found to be the best and they were on par. Treatment 6 where inorganic fertilizers at the rate of 80:40:40: kg/ha alone were applied always gave an yield lower than that of treatment 7 during both the seasons which showed the complementary mature of organic matter in addition to inorganic fertilizers. All the other treatments where one or more of the three major nutrients were skipped recorded poor yield when compared to treatments 1, 6 and 7. A close study of the yield data revealed a decline

in trend for the yield in general for treatments 2, 3, 4 and 5 which were incomplete treatments with respect to major nutrients. Though the high yielding varieties showed highest response to N, their efficiency decreased considerably over the years in plots receiving no P or K (**IRRI, 1976**). This may probably be due to the continuous crop removal of major nutrients to below critical level.

Tables 3 and 4 present the data on the yield of straw for the first crop and second crop seasons, respectively. It can be observed that higher straw yield was recorded by treatment 7 followed by treatment 1 during the first crop season and treatment 1 followed by treatment 7 during the second crop season, the two being on par. The effect of FYM in treatment 1 and the judicious combination of FYM with NPK fertilizers in treatment 7 might have contributed to this result. A similar observation has been made by **Kutsenko and Kunouskil (1972)**.

During the first crop season, treatment 3 (plots lacking potassium) and during the second crop season, treatment 2 and 4 (plots receiving ammonium sulphate only and plots lacking phosphorus, respectively) recorded the lowest yield. Results of permanent manurial trial conducted at Pattambi indicated that during the first crop season maximum yield was recorded by treatments which received cattle manure alone and the lowest yield by treatments that received only ammonium sulphate. But during the second crop season those treatments that received organic as well as inorganic fertilizers gave the highest yield (**Kurumthottical, 1982**). Thus, the results of permanent manurial trial in sandy loam soil tracts of **Kayamkulam** emphasise the need for addition of cattle manure along with P and K as inorganic fertilizers.

Table 1. Grain yield from the permanent trial - fresh crop season (kg/ha)

Treatments	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	Mean
1	2189	2038	2440	2080	1610	715	1450	1789
2	528	861	746	1206	285	158	275	580
3	1057	975	528	1425	403	178	475	720
4	1322	1156	1298	1883	895	423	475	1051
5	1428	1449	1479	1184	695	300	925	1066
6	2053	1624	1836	2183	1113	763	663	1455
7	2989	1760	2530	2459	1583	695	1188	1886
CD (0.05)	467	443	306	584	490	391	450	369

Rank 7, 1, 6, 5, 4, 3, 2

Table 2. Grain yield from the permanent manurial trial - second crop season (kg/ha)

Treatments	1978-79	1979-80	1980-81	1981-82	1983-84	1984-85	1985-86	Mean
1	2929	2204	2349	1411	2120	1383	2138	2076
2	1117	966	553	379	640	483	640	683
3	1670	689	1232	1270	763	670	638	1016
4	1066	492	861	260	625	867	625	685
5	1730	1057	1504	1169	1426	850	1425	1309
6	2228	1117	1736	1176	2138	1200	2118	1673
7	2778	2288	2470	1640	2158	1533	2155	2146
CD (0.05)	330	669	381	383	429	297	491	359

Rank 7, 1, 6, 5, 3, 4, 2

Table 3. Straw yield from the permanent manurial trial - first crop season (kg/ha)

Treatments	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	Mean
1	3714	5163	4076	3490	1995	1258	1363	3008
2	1932	2868	2742	2964	678	300	845	1761
3	2174	2675	1851	3255	760	278	907	1700
4	2536	3569	3518	3618	1663	990	870	2395
5	2506	4010	3004	1945	1495	540	1658	2165
6	4106	3246	4680	3161	2275	997	1943	2915
7	4408	5208	5888	3653	2675	1245	2070	3592
CD (0.05)	745	1188	1152	1126	1000	612	850	805

Table 4. Straw yield from the permanent manurial trial - second crop season (kg/ha)

Treatments	1978-79	1979-80	1980-81	1981-82	1983-84	1984-85	1985-86	Mean
1	4016	2400	5933	2335	3675	2245	3683	3455
2	1546	1192	1555	1022	982	733	980	1144
3	2431	1132	2944	1784	1500	1363	1500	1808
4	1516	734	1661	111	1198	920	1198	1144
5	1902	1358	2702	2166	2190	1138	2195	1950
6	2567	1268	3240	2273	3683	1858	3575	2637
7	3201	2807	4644	2580	3935	2483	3935	3369
CD (0.05)	605	943	702	906	1060	621	1114	688

Rank 1, 7, 6, 5, 3, 4, 2

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