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# Effect of Intensive Cultivation of High Yielding Rice Varieties on Soil Properties. I. Physical

A. RAJAMANNAR[1] and A. VELAYUTHAM[2]

To study the status of organic matter and its role on the physical properties of soil under intensive cultivation of paddy, a field trial was conducted. Paddy was cultivated in the sequence of IR 8 - IR 8 in 1972-73, Karuna - IR 20 in 1973-74 and Co 36 - IR 20 in 1974-75 following all the package of practices. Fertilizer at 185-85-85 kg of NPK/ha was applied with a basal dressing of 25 tonnes compost. The study revealed increase of organic matter content which resulted in decrease of bulk density and improvement of water-holding capacity and porespace.

Organic matter influences physical and chemical properties of soils far out of proportions to the small quantities present. Soil organic matter is associated with soil fertility (Cooks, 1967) and it is responsible for the physico-chemical changes in soils. Addition of organic matter is a source of plant nutrients. The original source of the soil organic matter is plant tissues ( Buckman and Brady, 1971 ) Under natural conditions, the tops and roots of trees, shrubs, grasses and other native plants annually supply large quantities of organic residues to the soil. Its role in physical condition of the soil under intensive cultivation of paddy has not been studied adequately. Earlier studies have revealed that, judicious application of manures or balanced inorganic fertiliser particularly of phosphatic ( Biswas *et al.*, 1967, 1969 ) have improved the soil organic matter status. The present paper deals with the study of changes in physical properties of soils due to organic matter status by adopting intensive cultivation practices.

## MATERIALS AND METHODS

A field trial was laid out during the year 1972-73 adopting all the intensive cultivation practices. High yielding paddy varieties like IR 8 followed by IR 8 were raised during 1972-73. Karuna followed by IR 20 was raised during 1973-74 and Co 36 followed by IR 20 was raised during the year 1974-75. The fertilizers N,P and K at 185 - 85 - 85 kg per ha were applied after the application of 25 tonnes of compost. All the intensive cultivation practices like inter-cultivation, spraying, dusting etc. were followed periodically. Soil samples were drawn before the commencement of agricultural practices and after the

1 - 2 : Department of Soil Science and Agricultural Chemistry, Agricultural College and Research Institute, Madurai 625104.

harvest of first and second crop. During the fallow period the samples were drawn monthly. Samples drawn were analysed for their physical properties and organic carbon (Piper, 1966). The pore space and water holding capacity were worked out by using the Keen - Raczkowski (1921) brass cups. A simple correlation was worked out between organic carbon and bulk density, water holding capacity and pore space.

## RESULTS AND DISCUSSION

The results revealed that there was an improvement of organic matter status in the soil (Table) which is in concurrence with the work of Biswas *et al.* (1967, 1969). The organic matter content was observed to be low first at the time of harvest of crop while the content increased during the fallow period which may be due to the addition of crop residues. Eventhough the organic matter content was found to be increased, the significance of increase could not be worked out as organic matter was analysed for composite soil sample. The increase in organic matter content may be due to the application of organic matter and also due to the addition of large quantities of paddy stubbles and plant wastes. This improvement in organic matter status has decreased the bulk density which is in concurrence with the work of Adams (1973). A sudden decrease in bulk density from 1.45 to 1.31 was observed in the case of IR 8 paddy which might have added huge quantity of crop residues. Highly significant negative correlation ($r = 0.74^{***}$) was observed between organic carbon content and bulk

TABLE. Changes in physical properties in Soil by Intensive Cultivation

| Year and Season | Date of soil sampling | Crop | Bulk density | Maximum water holding capacity % | Pore space % | Organic carbon % |
|---|---|---|---|---|---|---|
| Initial | 15.7.73 | — | 1.45 | 31.34 | 38.88 | 0.600 |
| 1972-73 I | 24.10.72 | IR 8 | 1.35 | 34.61 | 45.33 | 0.766 |
| 1972-73 II | 29.3.73 | IR 8 | 1.31 | 42.24 | 53.35 | 0.738 |
| 1973-74 I | 19.10.73 | Karuna | 1.42 | 32.83 | 42.66 | 0.604 |
| 1974-74 II | 8.3.74 | IR 20 | 1.45 | 33.27 | 43.88 | 0.610 |
| 1973-74 | 8.4.74 | Fallow | 1.45 | 36.28 | 45.91 | 0.605 |
| 1973-74 | 8.5.74 | Fallow | 1.43 | 38.68 | 49.87 | 0.612 |
| 1973-74 | 8.6.74 | Fallow | 1.41 | 37.56 | 46.08 | 0.642 |
| 1974-75 | 11.10.74 | Co 36 | 1.30 | 33.50 | 43.21 | 0.611 |
| 1974-75 | 8.2.75 | IR 20 | 1.31 | 33.25 | 43.25 | 0.610 |
| 1974-75 | 8.3.75 | Fallow | 1.35 | 36.51 | 46.11 | 0.618 |
| 1974-75 | 8.4.75 | Fallow | 1.31 | 32.31 | 38.91 | 0.641 |
| 1974-75 | 8.5.75 | Fallow | 1.30 | 41.19 | 43.21 | 0.648 |
| 1974-75 | 8.6.75 | Fallow | 1.29 | 42.22 | 45.91 | 0.639 |

density. The organic matter content has also improved the water holding capacity and pore space. Significant correlation was also observed between organic carbon and water holding capacity (0.57**) and organic carbon and porespace (0.45*). The physical properties, water holding capacity and pore space of the soil have been improved over that of the initial value before the commencement of the trial. This work is in confirmation with the work of Biswas and Ali (1969).

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