INTRODUCTION

Amongst the cereal crops grown in India, rice (*Oryza sativa* L.) is the foremost both in area and in production. About 30 million tonnes of paddy is produced anually from about 32 million hectares of land (Anonymous, 1968), which is about 24 per cent of the total cultivated area. Cultivation of rice in this country extends from 8^{o} to 30^{o} North latitude and it is grown under widely varying conditions of altitude, rainfall and climate and shows considerable variations in its response to agronomic practices. However, reports indicate the potentiality of proper management of water, fertility and soil in optimizing rice yield. A brief resume of the characteristics of these three important factors as related to rice performance would, therefore, seem to be in order.

Rice is known to favour a submerged soil condition and appears to have the highest water requirement amongst crops of similar duration (Raheja, 1961). Its water requirement generally ranges from 800 to 1200 mm with extremes of 520 and 2549 mm in a crop season (Kung, 1964). Though, in India about 45 per cent of the total irrigation water is diverted to rice annually, it covers only about 24 per cent of the total rice area in this country. This would mean that 75 or 80 per cent of the rice area has to depend on monsoon rains as the primary source of water. This leads to the cropping in major rice areas during the monsoon months only.

Nevertheless, it becomes imperative to find out the effective rainfall during these months in order to plan supplemental irrigation for successful cultivation of rice. Information on the techniques of measurement of effective rainfall in upland crops are available but there is paucity of such information for lowland rice. Development of a suitable technique for lowland rice would help in proper scheduling of irrigation and may, consequently, increase the irrigated area under the existing resources.

It is understood that the losses due to evaporation, transpiration-including metabolic water use, and percolation alter the total water requirement in the field (Sato et al., 1954). But these losses are governed by the environmental factors which change with the seasons. A year round water budget on the above components for all the rice growing seasons of this country is almost absent. Information on the above will help for planning the crop areas in accordance with the water resources in different crop seasons. An attempt to this effect has been made following a drum-culture technique in the rice field.

From the information available on fertilizer experiments, there seems to be a general agreement that fertilizer responses of the rice crop, particularly in terms of utilization of nitrogen, phosphorus, iron, manganese and silicon, are relatively less conspicuous in upland (unflooded) soil than in lowland (flooded) soils. Nevertheless, nitrogen rather than phosphorus and potassium, appears to be the main source of fertility, involved in the interaction with soil moisture regimes in most of the paddy soils. But variations due to changes in the soil characteristics are not uncommon. Greater availabilities of phosphorus and iron to rice in submerged lateritic soil of West Bengal have been reported(Pande and Singh, 1969). Further, nitrogen response may vary with agronomical practices including soil water regimes, kind and method of the fertilizer application and soil manipulations. Considerable information are available on the suitable form of fertilizers and their methods of application to rice crop of this region. However, regarding the levels of fertilization, the genetic makeup of the variety (tall vs dwarf) make the situation somewhat complex. This complexity arises in areas where the rice growers have know how of growing low-responsive, tall indica varieties and are now adopting high responsive dwarf varieties of rice.

It is widely accepted that lowland cultivation promotes rice growth and is invariably adopted by puddling the land before transplanting. Such a practice decreases the hydraulic conductivity of the soil and consequently reduces the losses of water and nutrients. Further, puddling together with submergence helps to create a congenial reduced soil condition. As the above changes in physico-chemical condition of soil affects rice crop appreciably (Ponnamperuma, 1964), a knowledge about these changes for each soil and climatic conditions may help to form a sound base for devising a suitable tillage practice.

It has been reported that rice responses favourably to increased bulk density of soil (1.37 to 1.60 g/cc) which is induced by puddling. To increase the bulk density of soil through compaction using a roller was considered as an easier method of soil manipulation which fulfilled the objective without sacrificing the yield. Ref.

From what has been discussed in the foregoing paragraphs, it is apparent that the information on the basic requirements of the rice with reference to water, nutrients and soil environment are rather scanty, scattered and isolated. There is almost no information on the above for lateritic region of West Bengal, India. Keeping these points in view, a series of field and pot experiments were planned in order to develop an agronomic practice, involving levels of submergence, fertilization and manipulation of soil for successful cultivation of rice in the three crop growing seasons in a year.