Introduction

In India, agriculture is the largest sector of economic activity. It provides not only food and raw materials but also employment to the largest portion of population. Being the dominant sector, the improvements or changes in the national output depend very largely on the output in agriculture. For the same reason, it has to provide the capital required for its own development and make available surpluses for the national economic development. In the country, a break-through in agricultural development could be achieved only after 1966-67. The impact of modernization in agriculture could be felt only during the Fourth Five Year Plan and in the subsequent plan periods, primarily due to the greater emphasis on the adoption of high yielding varieties (HYVs) and associated improved technology.

The food grain production in the country has doubtless increased over the years, and in the recent self-sufficiency has been achieved. This could be possible, to a large extent, due to the successful introduction of HYVs and the modern technology developed in the country. However, the success so far achieved is only partial owing to the fact that in several areas the high demanding HYVs are being grown under sub-optimal levels of inputs. This is not very

uncommon in the eastern region which is primarily rice growing and where the yield of rice, over the years, is not only low but inconsistent. Nevertheless, the pace of development is so far satisfactory only for a limited number of crops, and that in case of rice - the foremost cereal of the country contributing about 31 percent to the area and 37 percent to the production of food grains, is far below the level achieved in wheat.

The persistence of the undesirable plant type under low level of management is an indication of their survival and competitive ability. Poor management practices in combination with low levels of nutrition resulted in an unconscious natural selection of plant characters best suited for competitive ability and low levels of fertility. With the least amount of inputs and attention, a farmer was assured of a marginal yield. In short, these types were tolerant of all-treatment but not sufficiently responsive to better management practices (Weararatne, 1973). On the contrary, HYVs need a high level of management in terms of weed, pest and disease control, application of fertilizer, timely operations and constant attention, but they are more demanding with regard to ecological conditions, especially water, soil and light. These requirements make the new technology much more complex and sophisticated than that which the rice farmers had been accustomed to. Even more important, the farmer must depend on many factors beyond his control if he is to perform this complex operation

successfully. Adequate information on most of these aspects are inadequate for a precise assessment of the extent to which sub-optimality affects the efficiency of new plant types, but it is clear that, while the socio-economic and ecological conditions may adversely affect all varieties of rice, their effect on more efficient plant types is of greater magnitude (Green Revolution by B.H.Farmer) and the conditions required to attain high potential yields are available to only a few farmers. Hence, adoption by itself, or even an application of the complexity of the new technology, may not provide the farmer with the expected results. The results obtained by the majority of farmers, therefore, fall far short of the potential, and well within the less complex and less demanding technologies available to them. This implies that the farmers employed a technology which requires considerable improvement to achieve the untapped yield potentials of the new plant types.

Given the urgent need to increase rice production in the country, it is essential that the performance of the improved technology and the constraints on its spread be studied - particularly in the areas which are less studied and mono-cropped with rainfed rice. In such areas, poor impact of HYVs are yet to be investigated and the causes identified. This would actually help to find out the measures to overcome the limitations and make the improved production technology more viable and feasible under the existing farming condition of the rice growers.

In the eastern states including West Bengal, about 72 percent of the total rice area (about 16 m ha) is rainfed where the crop often suffers either due to flood or drought or both. Moreover, the socio-economic condition of the majority of farmers is so deplorable that they possess very little or practically no risk-bearing capacity. Even the HYVs are grown under sub-optional level of inputs with similar management as that of traditional varieties. This will mean that the need exists to explore and assess the developed technology as far as possible with the limitations of the present crop culture, soil, climate, the land-holding sizes and the institutional frame-work that influence the supply of the different production inputs and others.

The marginal and small farmers constitute a very high percentage (85.3 percent) of those engaged in cultivation, and a significant part of the land is taken away by plot demarcating bunds. Small, intensely fragmented and scattered holdings further aggravate the problem. These often compell the farmers to resort to a sub-standard level of management in farming. Besides, the pressure of population is very high (0.47 ha/per person) and nearly half of them are below the poverty line with a literacy of only 30 percent. The extensiveness of such areas and the traditional culture of paddy production make it imperative to study the feasibility of growing HYVs of rice with an ultimate objective to boost the economy of production by the different categories of

farmers. This is to be achieved to ensure upgraded nutritional status and a better standard of living for all categories of farmers in general and for marginal and small farmers in particular.

The optimum input utilization may not necessarily guarantee high efficiency of available resources. This is particularly true as, apart from high levels of management, high-yield technology also involves energy utilization to a greater degree than is required in traditional cultivation. Consequently, limitation of energy as an essential input is likely to affect the impact of the other resources. Thus, any investment already made must take into account the precise energy requirement to ensure an appreciably high turn over. With years to come, the energy requirement is bound to increase and become more of a limiting factor, considering the large-scale diversion of the agricultural labour force towards industry and to urban areas (industrialized urban areas).

Summarily, the adoption and success of HYVs and associated improved technology will call for a study on the variability of rainfall distribution pattern, the time of transplantation and its effects on the yield levels, farmers response to modern inputs, package of practices like tillage, fertiliizer applications, and plant pprotection within the limitation of the different sizes of holdings, family labour, family size and their socio-economic status.

Further, a comparative assessment of these improved varieties over the traditional types under the existing management and age-old practices are necessarily to be made as a pre-requisite for future planning and development.

Keeping the above points in view, the study has been planned through survey of a representative small unit - a village, and field experiments under the prevailing conditions of the village with the following objectives.

1. To assess and identify the existing resource constraints of different categories of farmers with respect to labour, capital, land, essential inputs and management for the adoption of HYVs and improved technology.

2. To find out the impact of HYVs with respect to yield economy and energy requirement under the existing farming and socio-economic conditions of the farmers.

3. To find out the resource productivity and feasibility of adoption of HYVs and associated technology under the socio-economic and farming conditions of the rice growers.