1.0 INTRODUCTION

Due to package of practice recently introduced for high yielding varieties in a system of intensive cropping for higher agricultural products, the amount of soil nutrients removed by crops grown per unit area is becoming much higher leading to a heavy uptake from the soil. Under natural conditions a good amount of plant nutrients is lost from the soil. The farm-yard manure added through the age-old practice has undoubtably checked to some extent the rapid deterioration of fertility on the soil but the addition is not adequate enough to maintain the soil productivity at a satisfactory level and to meet the high nutritional requirement for high yielding varieties. Thus the demand for inorganic fertilizer is increasing day by day so as to maintain nutrient status of the soil. Moreover, the yield potential of the high-yielding varieties is being exploited with the heavy dose of plant nutrients through the fertilizer.

In order to get the yield production at the expected level, it is absolutely necessary to look into the effect of fertilization and system of cropping practice for a good number of years on the yield performance of crops, uptake of nutrients and consequent fertility status of the soil. A short term nature of cultivation aims mainly of the returns of quick production through the adequate addition of chemical fertilizers and
the results are often met with a great success for the
time-being but such an attempt generally overlooks the key
aspects of productivity and maintenance of soil fertility which
are indispensable in running a permanent practice of agriculture.
In connection with this a long-term field experimentation
based on continuous manuring and intensive cropping with high
yielding varieties bears a great value to assess the effect of
added plant nutrients on crop yield production over years and
to examine critically the changes that might have occurred in
nutrient status of the soil. For intensive system of agriculture
on a sound footing, for a long term planning the correct informa-
tion on the evaluation of soil fertility bears a special
significance.

Lots of evidences regarding agronomic experimentations
involving continuous cropping with the application of manures
and fertilizers are found in world literatures. Some of these
are of special significance due to their continuation over many
years. The famous Broadbalk field experiment at Rothamsted
(England) is a classical example where the effect of annual
dressing with organic manures and inorganic fertilizers to some
plots has been studied for about a century and a quarter ago.
Following a similar design several field trials were started
in many parts of the world. Towards the beginning of the
present century long-term manurial experiments came into
operation in this country at Kanpur (U.P.), Coimbatore (Tamilnadu)
and Pusa (Bihar), subsequently followed by several others
(namely one at Indore (M.P.)) to study soil fertility problems
under dry land farming and two others at Padegaon (Maharashtra)
and Sahajahanpur (U.P.) to investigate on the effect of cropping
and manuring on sugar cane. These experiments have provided
some valuable information on the influence of organic manures
and chemical fertilizers applied continuously on a fixed crop
rotation with a view to assess their direct and cumulative
effect on crop yield. Unfortunately some of these were either
discontinued or seriously altered as they might have been
considered faulty in respect of statistical need. Only a handful
of these trials are being still conducted at Coimbatore, Pusa
and Padegaon on their original lines.

The above experiments designed mostly according to the
prevailing concepts were conducted to largely suit agronomic
requirement and several findings emanated from the experiments
carried obviously limited significance. Moreover, the intensity
of cropping and manuring with the traditional varieties was of
much smaller magnitude than what are being advocated for the
present days' intensive cropping with high-yielding varieties.

With a view to carry out detailed investigations under
the major soil-climatic situations in the country on a direct,
residual, and cumulative effect of continuous application of
chemical fertilizers, organic manures, pesticides, fungicides
and weedicides for a number of years on soils and crop environments under the intensive system of the modern agricultural technology, the Indian Council of Agricultural Research sponsored an All India Coordinated Project on Long Term Fertilizer Experiments in eleven centres all over the country. The broad outlines of the said Coordinated Project formulate an integrated programme of study involving multiple cropping system with well-accepted crop rotation (three crops a year), and use of heavy doses of inorganic fertilizer in single and in various combinations, and also to examine critically the effect of farm yard manure, zinc, sulphur and weed control over and above 100 per cent of the optimum NPK fertilisation as determined by soil tests. It may be mentioned here that similar type of coordinated approach has not so far been featured in other long-term experiments.

The long-term fertilizer experiments laid down all over India in eleven selected centres are on the basis of specific design and adjustment according to local crop sequence and varieties so as to provide the best possible conditions for the modern intensive cropping practices. However, it is necessary to study the pattern of crop yield response and soil fertility status which would create an interest. Therefore, it was considered desirable to undertake a systematic study on the long-term field experiment laid out at the main farm of Jute Agricultural Research Institute, Barrackpore, West Bengal,
with a well-accepted crop sequence—Jute—Rice—Wheat during the kharif season of 1971. The present investigation was carried out during the period of 1971-72 covering ten cycles of cropping sequence up to 1980-81 with the following objectives:

1. To examine the effect of continuous use of plant nutrients, singly and in combination, in organic and inorganic forms and in graded level of NPK nutrients on the yield performance of high yielding crops over a number of years in a multiple cropping pattern.

2. To study the effect of secondary and micronutrients viz. sulphur and zinc on crop yields and to assess their role under the intensive cropping system.

3. To find out different nutrient composition of plant parts and to determine the nutrient uptake pattern by the crop.

4. To determine the changes in soil properties brought about by intensive cropping and manuring in respect of total and available nutrient status and physico-chemical characteristics of soil from the point of view of its productivity.