

## Rice response to manures and fertility levels in Kosi region of Bihar, India

D.K. DWIVEDI\* AND S.P. SINGH<sup>1</sup>

Department of Agronomy, Regional Research Station, R.A.U., PUSA (BIHAR) INDIA

### ABSTRACT

A field experiment was conducted during the rainy (*kharif*) season of 2002 and 2003 at RRS, Agwanpur, Saharsa (Bihar), to study the effect of manures and fertility levels on the production potential of rice (*Oryza sativa* L.) crop. Green manuring with *dhaincha* [*Sesbania cannabina* (Retz.) Pers.] gave significantly higher yield attributes, grain and straw yield, nutrient uptake, apparent nutrient recovery (%) & agronomic nutrient-use efficiency with low production efficiency of nutrients, followed by other manurial treatments. Higher economic return was received with *Vigna radiata* green manure treatment due to its bonus yield of pulse grain. Optimum fertility level (120 : 60 : 30 kg/ha of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O) recorded higher response than lower levels with higher nutrient uptake, lower apparent nutrient recovery (%), lower agronomic nutrient use efficiency and lower production efficiency of nutrients. Higher benefit : cost ratio was recorded maximum by application of optimum fertility level. The interaction between organic and inorganic sources of nutrients was found significant and saved 66 per cent N : P<sub>2</sub>O<sub>5</sub> : K<sub>2</sub>O in *Sesbania cannabina* and 33 per cent in *Vigna radiata* as well as *Crotalaria juncea* green manures, respectively. Application of FYM @ 10 t/ha also saved 33 per cent of nutrients. Nata Mahsuri (MTU-7029), a high yielding semi dwarf variety of rice was taken up for the experimentation. Significant nutrient balance due to application of FYM and optimum fertility level has been recorded compared to others and all other green manurial and lower fertility levels showed lower balance of nutrients, while the plots received no nutrients showed a negative balance of nutrients (N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O).

**Key words :** Manures, Fertility levels, Yield, B:C, Nutrient uptake. Apparent fertilizer recovery, Agronomic nutrient use efficiency, Production efficiency of nutrients, Soil nutrient status.

### INTRODUCTION

Neither the organic manures alone nor the mineral N, P and K fertilizers can sustain high productivity under modern intensive cropping system, where the nutrient turnover in the soil-plant system is quite high. Several researchers have reported decline in rice production due to deficiency of macro and micro nutrients in soil due to use of only inorganic fertilizers and suggested that integrated use of organic and inorganic becomes imperative in increasing the productivity of cereal crops and sustaining soil health (Modgal *et al.* 1995 and Prasad *et al.* 1995). Kosi zone is a major rice growing area of Bihar during rainy, winter as well as summer season and has adopted rice-rice system in wetlands and rice-wheat/maize in mid uplands. Therefore, keeping all above facts, an investigation was carried out to know the effect of organic and inorganic fertilizers on the productivity, nutrient uptake, nutrient efficiency and nutrient status of soil in rice crop.

### MATERIALS AND METHODS

A field experiment was conducted in *kharif* 2002 and 2003 at Regional Research Station, Agwanpur, Saharsa

(Bihar) on sandy loam typic ustifluent soil with pH 7.4 low inorganic carbon (0.30 %), available N 180 kg/ha, available P<sub>2</sub>O<sub>5</sub> 25.20 kg/ha and available K<sub>2</sub>O 172 kg/ha. Treatments were laid out in a split plot design, keeping 5 organic manures viz. no organic manure, green manure of *Sesbania cannabina*, *Vigna radiata*, *Crotalaria juncea* and FYM @ 10 t/ha in main plots and 4 levels of fertility viz., 0 : 0 : 0, 40 : 20 : 10, 80 : 40 : 20 and 120 : 60 : 30 N : P<sub>2</sub>O<sub>5</sub> : K<sub>2</sub>O kg/ha in subplots with 3 replication. Seeds of *dhaincha* and sunnhemp were sown in plots before 50 days of rice transplantation, while mung was sown in first week of April after wheat harvest and FYM was incorporated one month prior to rice transplanting. All organics were buried properly during final field preparation. Half of N, whole P and K were applied at the time of puddling. Rest half N was applied in two equal splits, one fourth at maximum tillering stage and one fourth at panicle initiation stage. The "Nata Mahsuri" (MTU 7029) rice variety was used for the experimental purpose (50 kg seed/ha) and transplanted at 15 cm x 15 cm distance using 2-3 seedlings/hill in mid July during both the years. A thin layer of water (2-3 cm) was maintained during initial stage of seedlings establishment. Thereafter the water was raised to 5 cm and attempts were made to maintain this level upto milk dough stage and all other

\* Author for correspondence.

<sup>1</sup> Department of Horticulture, Regional Research Station, R.A.U., PUSA (BIHAR) INDIA