Crop productivity and soil fertility restoration in rice-based cropping system as influenced by fertility levels

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ABSTRACT

Field experiment was conducted during 2002-03 and 2003-04 to study the production potential and soil fertility restoration in rice based cropping system under hill zone of Karnataka. The treatment comprised eight main plot treatments of cropping systems and five sub plot treatments of nutrient management. In cropping system rice-soyabean, followed by rice-bell pepper and rice-marigold recorded the highest productivity (REY) and returns. Application of 100% RDF (to respective crop) recorded significantly higher rice grain equivalent yield, energetics and net returns and that was at par with integrated use of 50% RDF and 5.0 t of *Chromoleana Odorata* compost than other treatments tried. Integration of major nutrient through chemical fertilizer in conjunction with organic manure (compost of *Chromoleana Odorata*) enhanced the soil fertility.

Key words: Productivity, Soil Fertility, Restoration, Cropping systems, RGEY

INTRODUCTION

Rice based cropping system has assumed paramount importance to meet the dietary habit of 42 per cent population of India (Nanda *et al*; 1999). In hill Zone of Karnataka, rice is being cultivated in an area of 1.73 lakh hectares with an average productivity of 2.5 t/ha, which is 20% lower than the state average. The existing mono-rice cropping system in low lands of the zone is becoming less remunerative, as only one crop of rice is being cultivated in a year. In order to harvest economic yields, rice alone will not be remunerative, thus a cropping system under this situation demands proper nutrient management by utilizing the available resources more effectively and efficiently. It is also necessary to find out suitability of short duration crops, which are suitable for the soils of the zone having acidic in nature for higher returns by efficient utilization of residual soil mixture with minimum expenditure. Keeping these in view a study was conducted to examine the production potential and soil fertility restoration in rice-based cropping system as influenced by fertility levels under hill zone of Karnataka.

MATERIALS AND METHODS

The field experiments were conducted during rainy (June-December) and post-rainy season (January-May) seasons of 2002-03 and 2003-04 in the farmer field of Amour village, near to Zonal Agricultural Research Station, Mudigere, University of Agricultural Sciences, Bangalore. The soil of the experimental site was red sandy loam with soil pH of 5.50, medium in available nitrogen, phosphorous and potash.

The annual rainfall was 1875 mm and 1760 mm and mean maximum and minimum temperature 26.53 and 17.43 C respectively during cropping years. Treatment comprised eight main plot treatments of cropping systems viz; C_1: Rice-fallow, C_2: Rice-rice, C_3: Rice-Soy bean, C_4: Rice-cowpea, C_5: Rice-radish, C_6: Rice-bell pepper, C_7: Rice-fodder maize and C_8: Rice-marigold and five sub plot treatments of nutrient management were F_1: Control, F_2:50% RDF, F_3:75% RDF, F_4: 100% RDF and F_5:50% RDF+5.0t of well decomposed *Chromoleana Odorata* compost. The experiment was laid out in split-plot design with three applications. For reasonable comparison between crop sequences, the yield of all crops were converted into rice grain equivalent yield using prevailing market prices (Yadav and Newaj, 1990). The land Use Efficiency (LUE) was calculated by dividing the total duration of different crops in a sequence by 365 days expressed in percentage. The Production Use Efficiency (PUE) value in terms of kg/ha / day was obtained by total production in a sequence divided by total duration of crops in that sequence (Tomar and Tiwari, 1990). The energetic of the different crops and different cropping systems were computed using the values as provided by Gopalan *et al.*(1978), and economics was calculated based on prevailing market prices. The recommended varieties were used. Also recommended fertilizers were applied as per the treatment and management practices followed for raising different crops in the cropping system. The organic source *Chromoleana odorata* compost applied at the rate of 5.0 t/ha (equivalent to 35.5-38 kg N, 11.5-12.5 kg P_2O_5 and 29-30 kg K_2O/ha) and soil samples were collected before sowing of rice and after harvesting of rice and analysed for organic carbon, available N (Subbaiah and Asija, 1956), P and K (Jackson, 1973) content.

RESULTS AND DISCUSSION
Crop productivity:

The total productivity of rice-based cropping system differed significantly due to cropping sequences and fertility levels. Rice-fodder maize (25948 kg/ha) and rice-marigold (13451 kg/ha) recorded highest system productivity than rest of the sequences (Table 1). It may probably on account of higher yields of succeeding crops and confirms the

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