

Evaluation of Different Nutrient Management Practices for Wheat-Rice Cropping System under Agroecological Zone 1 in Bangladesh

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A study on wheat (*Triticum aestivum* L.)-rice (*Oryza sativa* L.) cropping system using six different nutrient management practices was conducted during 2002–2004 in Panchagarh, under Agroecological Zone 1 in Bangladesh for the development of cropping pattern-based fertilizer recommendations. The six different nutrient management treatments were as follows: soil test-based inorganic fertilizer doses for moderate yield goal (MYG), soil test-based inorganic fertilizer doses for high yield goal (HYG), integrated nutrient management for HYG (INM), Agroecological Zone-based standard fertilizer recommendations given in Fertilizer Recommendation Guide '97 (FRG '97), local farmers' practice (FP) and unfertilized control.

The combined use of organic and inorganic fertilizer could increase system productivity compared with the use of inorganic fertilizer alone. In general, soil test-based fertilizer doses performed better than fertilizer applied at standard doses without prior soil testing. Based on the 2-yr study, soil test-based INM treatment produced the highest crop yields, improved yield-contributing characters, resulted in the highest gross margin and gave the highest marginal benefit cost ratio over the unfertilized control compared with the other nutrient management practices. Under such conditions, the application of farm yard manure in the form of cow dung in the INM treatment was found useful in increasing crop yields. To increase soil fertility and sustainable crop productivity, the farmers in Bangladesh should be encouraged to use farm yard manure such as cow dung along with INM treatment for wheat-rice cropping system.

Key Words: farm yard manure, inorganic fertilizers, integrated nutrient management, wheat-rice cropping system

Abbreviations: AEZ – Agroecological zone, FYM – farm yard manure, FP – farmers' practice, FRG '97 – fertilizer recommendation guide '97, HI – harvest index, HYG – high yield goal, INM – integrated nutrient management, MBCR – marginal benefit cost ratio, MYG – moderate yield goal, SOM – soil organic matter

INTRODUCTION

The economy of Bangladesh, one of the world's most densely populated countries, depends on the agricultural sector. More than 80% of the arable land in Bangladesh is used for food production. Wheat (*Triticum aestivum* L.)-rice (*Oryza sativa* L.) cropping system is the principal agricultural production system in southern and eastern Asia, covering an estimated area of 21.9 million ha in seven countries, i.e., Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan (Ladha et al. 2000; Mann and Garrity 1994). Rice and wheat cover about 83% of the total land planted to cereals (Ahmed and Meisner 1996). Food production in Bangladesh has increased from 10.97 million tons in 1971 to 25.9 million tons in 2007 (Datta 2008) due to

the introduction of high-yielding rice and wheat varieties, the adoption of modern cultivation technologies, the increased use of chemical fertilizers, the expansion of irrigated area and the increase in cropping intensity (Bhuiyan et al. 2002). Cropping intensity (the ratio of cropped area to cultivated area) in Bangladesh has reached about 179% (Saleque et al. 2004).

The International Maize and Wheat Improvement Center (CIMMYT 1990 and CIMMYT 1992) reported that the yields of rice and wheat in the Indo-Gangetic Plains Region of India, Pakistan, Nepal and Bangladesh had reached a plateau due to declining factor productivity (the ratio of production output to inputs used in the production at specific period of time) under increasing intensification. However, increasing cropping intensity with cultivation of mod-