

## Climate-Smart Agriculture for Sustainable Maize-Wheat Production: Effects on Crop Productivity, Profitability and Irrigation Water Use

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**Abstract :** The traditional rice-wheat (RW) system in the IGP of South Asia is tillage, water, energy, and capital intensive. Coupled with more pumping of groundwater over the years to meet the high irrigation water requirement of the RW system has resulted in over-exploitation of groundwater. Replacement of traditional rice with less water crops such as maize under climate-smart agriculture (CSA) based management (tillage, crop establishment and residue management) practices are required to promote sustainable intensification. Furthermore, inefficient nutrient management practices are responsible for low crop yields and nutrient use efficiencies in maize-wheat (MW) system. A 7-year field experiment was conducted in farmer's participatory strategic research mode at Taraori, Karnal, India to evaluate the effects of tillage and crop establishment (TCE) methods, residue management, mungbean integration, and nutrient management practices on crop yields, water productivity and profitability of MW system. The main plot treatments included four combinations of TCE, residue and mungbean integration [conventional tillage (CT), conventional tillage with mungbean (CT + MB), permanent bed (PB) and permanent bed with MB (PB + MB)] with three nutrient management practices [farmer's fertilizer practice (FFP), recommended dose of fertilizer (RDF) and site-specific nutrient management (SSNM)] using Nutrient Expert® as subplot treatments. System productivity, water use efficiency (WUE) and net returns under PB + MB were significantly increased by 25-30%, 28-31% and 35-40% compared to CT respectively, during seven years of experimentation. The integration of MB in MW system contributed ~25and ~ 28% increases in system productivity and net returns compared with no MB, respectively. SSNM based nutrient management increased the mean (averaged across 7 yrs) system productivity by 12- 15% compared with FFP. The study revealed that CSA based sustainable intensification (PB + MB) and SSNM approach provided opportunities for enhancing crop productivity, WUE and profitability of the MW system in India.

**Keywords :** Conservation Agriculture, Precision water and nutrient management, Permanent beds, Crop yields

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