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Abstract: Maize (*Zea mays*) - wheat (*Triticum aestivum*) is third most important cropping system in India and is practiced on 1.8 million ha. It is also prevalent cropping system adopted in uplands of Jharkhand. Most of the farmers use only urea (N fertilizer) for crop cultivation and this fertilizer use pattern results in multiple nutrient deficiencies as well as promotes soil bankruptcy. Therefore, it is needed to maintain long term soil health and crop productivity in intensive cropping system through integrated use of nutrient sources. A permanent manurial trial with different practices (inorganic & integrated nutrient management) under maize-wheat cropping system is in progress since 1983 at Birsa Agricultural University Farm, Kanke, Ranchi. On the plots of the ongoing trial, the present investigation was carried out during two consecutive years of 2009-10 and 2010-11. Experiment was laid out in RBD with 12 treatments replicated three times. RDF for each of the component crop was @ 100:50:25 kg ha⁻¹. Variety taken for maize (kharif) and wheat (rabi) was HQPM-1 and K9107, respectively. Treatment details in maizewheat cropping system were T1 : N0P0K0 - N0P0K0; T2 : 50% RDF -50% RDF; T3 : 50 % RDF -100% RDF; T4 : 75% RDF -75% RDF; T5 : 100% RDF -100% RDF; T6 : 50%N through FYM+ 50% RDF -100% RDF; T7 :25%N through FYM+ 75% RDF -75% RDF; T8 : 50%N through cut paddy straw+ 50% RDF -100% RDF; T9 : 25%N through cut paddy straw+ 75% RDF -75% RDF; T10 : 50%N through green Karanj leaves + 50% RDF -100% RDF; T11 : 25%N through green Karanj leaves + 75% RDF -75% RDF and T12 : 50kg – 50kg urea /ha. Results revealed that INM practice i.e. 50%N through FYM along with 50% RDF in kharif + 100% RDF in rabi produced highest mean grain yield (43.73 and 47.06 q/ha of maize and wheat, respectively) followed by use in each season 100% RDF (38.38 & 40.46 q/ha of maize and wheat, respectively) which was at par with application @ 25%N through FYM along with 75% RDF in kharif + only 75% RDF in rabi. Yield attributing characters in maize namely, no. of grains/row (32.9), no. of grains/cob (428) and 1000 grain weight (335.70 g) and in wheat namely, effective tillers /m² (351), no of grains/ear head (45), and 1000 grain weight (42.27 g) were highest in the same. In system also, it produced significantly highest wheat equivalent yield (82.04 q/ha), net return (Rs 51196/-) and B:C ratio (0.93) than use of inorganic fertilizer in each season @100% RDF (71.16q/ha, Rs 38846/-) & B:C ratio (0.73).It also recorded highest nutrient uptake(kg/ha) as 209 N,30 P &196 K. Analysis of soil for physical, chemical and biological properties of soil revealed that it improved bulk density (1.26), pH (6.7) and organic carbon (0.55) as compared to initial value 1.39 g/cc, 6.5 and 0.41%, respectively. It also, recorded highest population of bacteria (20.6 x10⁶ /g soil) and Actinomycetes (14.4 x10⁶ /g soil), enzyme activity & microbial respiration (20.87 mg CO₂ /100g soil per day). Sustainability of maize- wheat cropping system was analyzed after 28th years (1983-2010) in continuous use of inorganic fertilizer and INM practices. INM practice @ 50%N through FYM along with 50% RDF in kharif + 100% RDF in rabi produced the highest Sustainable Yield Index (0.46) of the system (with 0.28 for maize & 0.57 for wheat). Further, data revealed that highest (maize & wheat) yield was recorded by use of chemical fertilizer @100% RDF (each season) in initial 4 years. Thereafter for 12 years, INM practice @ 25%N through FYM+ 75% RDF in kharif & 75% RDF in rabi yielded the highest. But for the last 16 years (1995-2010), INM practice @ 50%N through FYM along with 50% RDF in kharif + 100% RDF in rabi continued to produce the highest (maize & wheat) yield. Conclusion: On the basis of above results, it is recommended that application of 50%N through FYM along with 50% RDF in kharif + 100%RDF in rabi season for maize-wheat cropping system in Jharkhand is a viable INM practice for obtaining higher grain yield- WEY-82.04 q/ha (43.73 of maize & 47.06 of wheat), net return (`51196 /ha), B:C ratio (0.93), sustainable yield index (0.46) along with improvement of soil physical properties (i.e. reduced bulk density, increased pH & organic carbon), higher microbial population and enzyme activity in soil.

Description: Effect of Integrated Nutrient Management on sustainability of maize-wheat cropping system.

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