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Abstract: An investigation was undertaken on Permanent Manurial Trial (PMT) initiated during 1956 at BAU, Kanke, Ranchi to evaluate the long term effect of nutrient management practices on soil quality parameters, development of soil quality index (SQI) and sustainability of the system in an acid soil under maize-wheat cropping system. The experiment consisted of fourteen treatments replicated thrice in a randomized block design, out of which eight treatments were selected for the present study. The selected treatments were T1-N0P0K0 (control), T2-100%N, T3-100%NP, T4- 100%NPK, T5-100%NPK+Lime, T6-FYM alone, T7-NPK+FYM (INM) and T8-Lime+N. Surface soil samples were collected after the harvest of maize during 2015-16. Soil samples were divided into two parts, one air dried and another set stored under refrigeration for estimating soil microbial biomass carbon (SMBC). Soil quality parameters analyzed under this study were bulk density, soil texture, soil reaction (pH), electrical conductivity (EC), organic carbon, labile carbon, total nitrogen (N), available nitrogen, available phosphorus (P), available potassium (K), available sulphur (S), exchangeable calcium (Ca) and magnesium (Mg), hot water soluble boron (HWS-B), DTPA extractable micronutrients viz., Fe, Cu, Mn and Zn, dehydrogenase activity (DHA), microbial count (bacteria, fungi, actinomycetes), soil microbial biomass carbon (SMBC) and potential mineralisable nitrogen (PMN). System productivity in terms of MEY (maize equivalent yield in kg ha-1) followed the following order: Lime+ NPK (7843) >INM (6673) > FYM (5449) > Lime+N (4091) > NPK (3487) > NP (2768) > Control (1295) > N (623). Sustainable yield index (SYI) of the system varied from -0.03 to 0.43. Highest sustainable yield index (SYI) of the system 0.43 for 100%NPK + lime treatment followed by integrated use of organics & chemical fertilizers (0.36) followed by application of FYM alone (0.28) and least and negative SYI values were recorded in application of N alone (-0.03). The data pertaining to soil quality parameters was statistically analyzed for their level of significance using RBD. Bulk density varied from (1.31-1.53 Mg m-3), pH (4.2- 6.3), EC (0.05-0.11 dSm-1), organic carbon (5.4-11.0 g kg-1), labile carbon (627.5-948.7 ppm), total N (821.7-1117.5 ppm), available N (163.8-193.3kg ha-1), available P (5.6-661.4 kg ha-1), available K (112.4-203.0 kg ha-1), available S (12.2-64.4 ppm), exchangeable Ca (1.6-7.0 meq 100g-1), exchangeable Mg (0.5-3.6 meq 100g-1), DTPA-Fe(11.75-28.89 ppm), DTPA Cu (0.34-0.61 ppm), DTPA-Mn (4.47-12.44 ppm), DTPA-Zn (0.50-2.56 ppm), hot water soluble B (0.51-1.44 ppm), SMBC (228.7-363.7 ppm), DHA (6.67-18.33 µg TPF formed day-1 g-1 soil), PMN (55.6-78.6 ppm), bacterial count (10.1-18.3 x106 cell g-1 soil), fungal population (10.0-13.1x103 propagules g-1 soil) and actinomycetes population (8.6- 12.2 x106 cell g-1 soil). Among the soil quality parameters, bulk density and available nitrogen showed no significant difference and therefore dropped for further statistical analysis. The 21 parameters which showed significant difference among the treatments were subjected to principal component analysis (PCA) using the SPSS software to identify the minimum dataset. Principal components which received eigen values> 1 and explained at least 5% of the variation in the data and variables which received the highest factor loading were considered as the best representative indicator for computation of soil quality index. Values of soil quality parameters were transformed into unit less score (between 0 to1) using linear transformation. The most sensitive indicators in descending order of importance as revealed by principal components (PC) were as follows: soil pH> soil organic carbon> exchangeable magnesium> hot water soluble boron> available S. Soil Quality Index (SQI) was calculated using weightage from the respective principal components and varied from 0.46 (100%N) to 0.89 (FYM), whereas, the treatments with chemical fertilizers alone or integrated use of chemical fertilizers along with Lime/FYM was in between the two. Based on the results of the present investigation it can be concluded that soil pH, organic carbon, exchangeable magnesium, HWS-B and available S may be used for characterizing the soil status under intensively cultivated acid soils. Mean percentage contribution from different parameters towards SQI was soil pH (53.8%) followed by soil organic carbon (23.7%), exchangeable magnesium (10.5%), hot water soluble boron (7.8%) and available sulphur (4.2%) The higher SQI values and sustainable yield index in treatments receiving lime/FYM along with NPK fertilizers suggest that these nutrient management options are good to maintain better soil quality, system productivity and sustainability.

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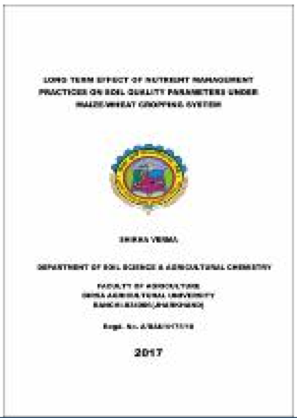
1612 Shikha verma.pdf		5.47 MB	Adobe PDF	 View/Open (/displaybitstream?handle=1/5810029765)

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