



Improvement and Assessment of Soil Quality under Long-Term Conservation Agricultural Practices in Hot, Arid Tropical Aridisol

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Soils in the hot, arid topical regions are low in organic matter and fertility and are structurally poor. Consequently, these soils suffer on account of poor physical, chemical, and biological soil quality traits, leading to miserably low crop yields. Long-term use of conjunctive nutrient management and conservation tillage practices may have a profound effect on improving the quality of these soils. Therefore, the objective of this study was to identify the key soil quality indicators, indices, and the best soil- and nutrient-management practices that can improve soil quality on long-term basis for enhanced productivity under a pearl millet-based system. The studies were conducted for the Hissar Centre of All-India Coordinated Research Project at the Central Research Institute for Dryland Agriculture, Hyderabad. Conjunctive nutrient-use treatments and conservation tillage significantly influenced the majority of the soil quality parameters in both the experiments. In experiment 1, the key soil quality indicators that significantly contributed to soil quality in a rainfed pearl millet–mung bean system were available nitrogen (N; 35%), available zinc (Zn; 35%), available copper (Cu; 10%), pH (10%), available potassium (K; 5%), and dehydrogenase assay (5%). The three best conjunctive nutrient-use treatments in terms of soil quality indices (SQI) were T3, 25 kg N (compost) (1.52) > T6, 15 kg N (compost) + 10 kg N (inorganic) + biofertilizer (1.49) > T5, 15 kg N (compost) + 10 kg N (green leaf manure) (1.47). In experiment 2, under a rainfed pearl millet system, the key indicators and their percentage contributions were electrical conductivity (15%), available N (19%), exchangeable magnesium (Mg; 18%), available manganese (Mn; 13%), dehydrogenase assay (19%), microbial biomass carbon (C; 5%), and bulk density (11%). The three best tillage + nutrient treatments identified from the viewpoint of soil quality were T1, conventional tillage (CT) +