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Profile distribution of chemical, physical and microbial characteristics in four land use systems of *Sadh Di Khad* watershed in submontaneous tract of Punjab

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ABSTRACT

The results of the study conducted at PAU, Zonal Research Station for Kandi area, *Ballowal Saunkhari* in *Sadh Di Khad* watershed, cultivated land use system exhibited significantly higher levels of chemical and physical characteristics of soil quality, whereas, significantly higher levels of biological characteristics of soil were reported in forest land use system compared with undisturbed and pasture land use systems. Thus, cultivated and forest land use systems had better soil quality due to addition of chemical fertilizers and farm yard manure in cultivated land use system and due to regular addition of organic matter in forest land use system. Soil samples from profiles in cultivated and forest land use systems had higher levels of soil quality characteristics as compared to undisturbed and pasture land use systems. The soil quality characteristics decreased with depth in profile. Higher levels of soil quality characteristics in profile were associated with lowering of pH and higher content of organic matter and clay.

Key words : Chemical, Physical and microbial characteristics, Land use system.

Distinct land use systems exist in *Sadh Di Khad* watershed which is located near Zonal Research Station (PAU) for *Kandi* Area, *Ballowal Saunkhari* in submonetaneous tract of Punjab and covers about 10 % of the geological area of the state. Cultivated, forest, pasture and undisturbed land constitute four major land use systems in the region. Different chemical, physical and microbial parameters play an important role in determination of soil fertility of different land use systems in the watershed. However, the major improvement in the soil chemical conditions arises from the fact that organic matter is the basic resource of several nutrient elements. These land use systems were compared on the basis of their physical, chemical and microbial parameters. Karlen *et al*. (1997) compared pH and EC values under three different land use systems in surface soils (0-10 cm) and suggested that cultivated system had higher pH (6.3) compared with forest system (5.9) followed by organic system (5.8). Reganold and Palmer (1995) studied two land use systems based on CEC of soil in the surface layer and reported that pasture system (24.1 Cmol(+) kg^{-1}) had higher CEC compared to conventional vegetation system which recorded 16.9 Cmol (+) kg^{-1}. Karlen *et al*. (1994) and Reganold and Palmer (1995) observed higher levels of organic matter in pasture system (5.13%) followed by conventional vegetation system (3.06%). Carter and Rennie (1982) reported that in surface soils available N, P and K were more under undisturbed system compared to in cultivated system whereas, in profile, the available N, P and K levels decreased with depth and no significant change was detected in total N in both the systems. Karlen *et al*. (1994) studied higher levels of available N, P, K and total N under undisturbed system as compared to in cultivated land use system followed by deep tillage system. Reganold *et al*.(1993) reported that the available N, P and K were higher in pasture system compared with organically managed system followed by cultivated system. However, total N and total P were higher in pasture and organically managed systems, respectively. Hargrove *et al*. (1982) reported greater accumulation of Mn and Zn in the surface layers of undisturbed system compared to cultivated system whereas, Franzluebbers and Hons (1996) reported greater accumulation of Zn and Mn in organic land use system as compared to cultivated system in upper 5 cm layer. Rattan *et al*. (1999) reported higher amount of available Zn (6.00 mg kg^{-1}), Cu (2.33 mg kg^{-1}), Fe (30.70 mg kg^{-1}) and Mn (29.10 mg kg^{-1}) in organic system as compared with amount of Zn (3.90 mg kg^{-1}), Cu (1.42 mg kg^{-1}), Fe (2.30 mg kg^{-1}) and Mn (25.0 mg kg^{-1}) in conventional system. Maddonni *et al*. (1999) reported that available Zn and Cu were higher in undisturbed system compared with soil systems having long term cropping history. Katyal and Sharma (1991) reported that available Zn, Fe and Mn declined with rise in pH and fall in organic matter content whereas, available Cu increased with increase in OM and clay content. However, total content of Zn, Cu, Fe and Mn increased with lime and clay content. Myrold (1987) reported that potentially mineralizable nitrogen increased in forest land use systems.

So far meager attention has been paid to monitor