

EFFECT OF LAND-USE SYSTEMS ON PHYSICO CHEMICAL PROPERTIES OF THE SOIL FROM VAVUNIYA DISTRICT

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Abstract

Land degradation is the major threat which leads to decline in soil fertility and other challenges to the Sri Lanka's dry zone agriculture. The effective land use system is one of the ways to improve and restore soil fertility. In this background, this study aimed to evaluate the effects of six land use systems: permaculture, organic, inorganic, integrated, forest, and bare land; physical and chemical soil properties; to identify effective management strategies. Soil samples were collected from six lands uses in Vavuniya District at two depths (0 - 15 cm and 15 - 30 cm) and analysed for physical parameters (texture, bulk density, porosity, and dry aggregate stability) and chemical characteristics (pH, EC, CEC, available N, P, K, total organic carbon, and soil colour). The treatments were arranged in complete randomized design with three replicates and statistical analysis was done by using ANOVA (SAS 9.4) at a 0.05 significance level. The results revealed significant variations across land-use systems and depths. Forest and permaculture soils exhibited significantly improved properties, low bulk density (1.55–1.56 g/cm³), high porosity (>50%), high CEC (>25 cmol+/kg), and greater total organic carbon (2.46%). In contrast, inorganic and bare lands showed higher compaction (1.64–1.67 g/cm³), reduced porosity, and nutrient depletion. Organic and integrated systems demonstrated moderate improvements, suggesting their potential in rehabilitating degraded soils. These findings emphasize that land-use type profoundly influences physical and chemical properties of the soil. Further studies are needed to document the effect on biological indicators of the soil and the potential of carbon sequestration.

Keywords

Land degradation; Land use system; Soil fertility; Permaculture; Sustainable agriculture