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Soils of lower Moshi irrigation scheme, northeastern Tanzania: their implications for agricultural land management

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Abstract

A standard soil survey was conducted in Lower Moshi Irrigation Scheme, Tanzania to investigate the soils and their implications for agricultural land management. It has been operational since 1987 and produces a considerable amount of rice for the natives of Kilimanjaro, Tanzania, and Kenya. These soils have never been studied since the scheme became in operation. Soil morphological and physico-chemical properties were studied in three soil pits dug to a depth of 150 cm. Bulk samples were taken in triplicate at the depth of 0–20 cm on-farm plots under continuous irrigated rice, irrigated maize rotation, and rainfed maize for soil fertility characterisation. Two-way ANOVA was conducted to test the significance of site and treatment. Soils were classified according to the World Reference Base for Soil Resources (WRB). They are fine-textured (clayey) developed from young fluvial-volcanic deposits. The three soil profiles analysed comprise the following: : (1) deep, well-drained very dark grayish brown, clayey soil over a layer of gravel and brittle pumice or tuffite below a depth of 110 cm in the rainfed maize; (2) Deep, well-drained, brown sand clay loam over a layer of massive gravel and murram below a depth of 90 cm in the maize-rice rotation; and (3) Very deep, well-drained reddish-brown clayey soil over a layer of unconsolidated gravel below a depth of 150 cm under continuous paddy farming. These soils were classified as Eutric Cambisols. Although the studied soils portray an impression of good fertility, they are characterised by the following problems: low soil fertility as shown by low organic carbon (< 1.0 %), low levels of major nutrients (nitrogen <0.1 % and phosphorus < 1 mg P/kg). The soils under Maize-rice rotation have unfavourable Mg/K ratios of > 7 below a depth of 25 cm. pH values of the topsoil (0–20 cm) were significantly higher ($p = 0.1$) for maize-rice rotation farm plots than continuous paddy farming plots. The results obtained in this study should therefore be considered for guiding sustainable agricultural management of the scheme. This includes the application and management of fertilisers; their interaction and their effect on crop performance.

Keywords: Agricultural land management, lower Moshi irrigation scheme, soil management, soils, Tanzania

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