

Johnson Godlove Mtama

Pedology of Corn Productivity Indices for Selected Parts of the Southern Highland Zone of Tanzania

Abstract

Research was undertaken to determine land use planning and related interpretations for corn productivity potential in the Southern Highland Zone of Tanzania. The corn growth potential under varying soil conditions was assessed in four selected pedons, namely, Uyole, Mbimba, Inyala and Seatondale. Soils were characterized according to their pedological, physical, and chemical dimensions. Pedotransfer functions were also estimated. The results indicate that the soils have deep to very deep sola, subangular blocky structures, evidence of pedogenic clay movement and fine to coarse texture. Soil bulk density ranged from 0.79 to 1.46 g/cm³ and pH levels ranged from slightly acidic to slightly alkaline. Cation exchange capacity ranged from 16.0 to 36.4 cmol (+)/kg. Percent base saturation estimates ranged from 20.3 to 121.6 percent; organic carbon content ranged from 0.13 to 1.52 percent. And total N ranged from 0.01 to 0.11 percent. Extractable P ranged from 0.71 to 12.5mg/kg. Soils were classified as Alfisols, Ultisols and Andisols using the USDA Taxonomic classification. They were classified as Luvisols and Paeozems using the FAO world reference base soil classification system. Fertility levels of each of these soils were measured. They ranged from low to medium. Thus, fertilizer applications will be needed in order to increase crop productivity levels for them. Three pedotransfer functions were estimated, namely, to predict exchange capacity cmol (+)/kg, to estimate available water holding capacity (mm/m), and to estimate the percent soil organic carbon using the small data set available. These good quality data estimate suggest a great potential to achieve precise data predictors when using large data sets. Corn productivity indices were established through pedological characterization and soil classification. They ranged from 72, 56, 62 and 48 for Uyole, Mbimba, Inyala and Seatondale respectively. The Uyole, Mbimba and Inyala pedons showed good pedogenic potential for corn productivity, but a low potential for corn productivity for the Seatondale pedon due to high pedogenic limitations for corn productivity.