

Field Hydraulic Properties Of An Alfisol Under Various Fallow Systems In Southwestern Nigeria

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Abstract

The effects of various fallow management systems and cropping intensities on water infiltration were measured on an Alfisol at Ibadan in southwestern Nigeria. The objective was to determine the influence of the land use systems (a combination of crop–fallow sequences and intercropping types) on soil hydraulic properties obtained by disc permeameter and double-ring infiltration measurements. The experiment was established in 1989 as a split-plot design with four replications. The main plots were natural fallow, planted *Pueraria phaseoloides* and planted *Leucaena leucocephala*. The subplots were 1 year of maize/cassava intercrop followed by 3-year fallow (25% cropping intensity), or 2-year fallow (33% cropping intensity), or 1-year fallow (50% cropping intensity), or no fallow period (100% cropping intensity). Water infiltration rates and sorptivities were measured under saturated and unsaturated flow. Irrespective of land use, infiltration rates at the soil surface (121–324 cm h⁻¹) were greater than those measured at 30 cm depth (55–144 cm h⁻¹). This indicated that fewer large pores were present below 30 cm depth compared with 0–30 cm depth. Despite some temporal variation, sorptivities with the highest mean value of 93.5 cm h^{-1/2} increased as the cropping intensity decreased, suggesting a more continuous macropore system under less intensive land use systems. This was most likely due to continuous biopores created by perennial vegetation under long fallow systems. Intercropped maize and cassava yields also increased as cropping intensity decreased. The weak relationship between crop yields and hydraulic conductivity/infiltration rates suggests that the rates were not limiting.

Keywords: Saturated flow; unsaturated flow; sorptivity; disc permeameter; double-ring infiltrometer; fallow; Nigeria