



Tropentag, September 14-16, 2010, Zurich

“World Food System —
A Contribution from Europe”

The Effects of Different Land Use Types on Soil Compaction and Infiltration Rate in the Drylands Vertisol of Gadarif Region, Sudan

KHALID BIRO¹, BISWAJEET PRADHAN¹, MANFRED BUCHROITHNER¹, FRANZ MAKESCHIN²

¹*Technische Universität Dresden, Institute for Cartography, Germany*

²*Technische Universität Dresden, Institute of Soil Science and Site Ecology, Germany*

Abstract

The dryland vertisol of Gadarif region in Sudan produced more than one-third of the national production of sorghum – the main food stuff in the country. In the past three decades, different land use types were occurred throughout the region. Soil strength and infiltration rate are important variables for understanding and predicting a rate of soil processes. This study investigated the effects of three different land use types namely; cultivated land, fallow land and woodland on soil compaction and infiltration rate. Remote sensing data was used to map land use/cover for the study area. The penetration resistance of the soil was measured into three depths using manually operated cone penetrometer. Infiltration rate was measured in the field using a double-ring infiltrometer. In addition to reference soil profiles, soil samples were collected to determine the variables that affect soil strength and infiltration rate viz. particle size, dry bulk density, soil moisture content and organic carbon content. All field measurements and soil samples were collected for each of the land use types. The results showed that with compared to the woodland, the soil penetration resistance was 29% and 14% larger and infiltration rate was 60% and 45% smaller for the cultivated land and fallow land respectively. Interestingly, it has observed that dry bulk density was increased and soil moisture content was decreased in the cultivated land and fallow land compared to the woodland. Tillage operations at constant depth and animal trampling in wood and fallow lands coupled with a smaller soil organic carbon content are likely to be the main factors causing the decline in the infiltration rate and increasing the hazard of soil compaction after changing of woodland to cultivated and fallow lands.

Keywords: Gadarif region, infiltration rate, land use types, soil compaction, Sudan