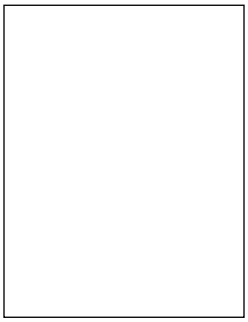

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PII: S1002-0160(17)60387-4
DOI: 10.1016/S1002-0160(17)60387-4
Reference: NA

To appear in:

Received date: NA
Revised date: NA
Accepted date: NA

Please cite this article as: Samuel I. HARUNA, Stephen H. ANDERSON, Nsalambi V. NKONGOLO, Syaharudin ZAIBON, Soil Hydraulic Properties: Influence of Tillage and Cover Crops, *Pedosphere* (2017), 10.1016/S1002-0160(17)60387-4.

PEDOSPHERE
Pedosphere ISSN 1002-0160/CN 32-1315/P doi:10.1016/S1002-0160(17)60387-4

Soil Hydraulic Properties: Influence of Tillage and Cover Crops

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ABSTRACT

Understanding the effects of cover crops and tillage on soil physical properties is important for determining soil productivity. This study was conducted at Lincoln University's Freeman Center to evaluate the effects of tillage and cover crop management on soil hydraulic properties. The field site included three replicate blocks in a randomized complete block design with each plot measuring 21.3 m length and 12.2 m width. Treatment factors were tillage at two levels (moldboard plow tillage vs. no till) and cover crop at two levels (cereal rye [*Secale cereal*] cover crop vs. no cover crop). Soil samples were collected in late spring/early summer from each treatment in 10 cm depth increments from the soil surface to a depth of 40 cm using 76.2 mm diameter x 76.2 mm long cores. Soil bulk density values for tillage were 13% lower compared with no-till management. Water content was significantly higher at the 0.0 and -0.4 kPa pressures for the tillage compared with no-till management. Tillage improved coarse mesopores by 32% compared with no-till and this resulted in 87% higher saturated hydraulic conductivity values. Cover crops improved macropores by 24% compared with no cover crop; this can potentially increase water infiltration and reduce runoff. As a result of higher macroporosity, saturated hydraulic conductivity was higher in the cover crop compared with no cover crop management. This study demonstrated that tillage can benefit soil hydraulic properties in the short term but these effects may not persist over time. Cover crops may slightly improve soil hydraulic properties but longer term studies are needed to evaluate its long term effects.

Key Words: pore size distribution, saturated hydraulic conductivity, soil bulk density, soil water retention.

INTRODUCTION

Increased water infiltration and retention in the soil, especially within the vadoze zone, are important factors that determine crop productivity and soil loss. These processes are especially important in less developed regions of the world where most producers have little or no access to irrigation. Soil water is important for nutrient availability and transport (Sparling and West, 1989) and microbial activity (Sylvia *et al.*,