

# SOIL PHYSICAL PROPERTIES AS AFFECTED BY THREE YEARS OF TILLAGE, COVER CROP AND CROP ROTATION

Samuel I. Haruna \* 1,2 , and Nsalambi V. Nkongolo<sup>1</sup>

<sup>1</sup> 307 Founders Hall, Lincoln University, Jefferson City, MO 65101

<sup>2</sup> 321 Anheuser-Busch Natural Resources Building, University of Missouri, Columbia, MO 65211-7250

## INTRODUCTION

Soil productivity is not fixed or guaranteed. It can be affected by various factors, chief among which are the management practices of tillage, crop rotation and cover crop. Tillage has been used as a mechanical method of killing weeds and seedbed preparation. However, research has shown that tillage can destroy soil structure and reduce water infiltration into the soil, thereby increasing soil and nutrient erosion. Crop rotation contributes to yield enhancement by improving soil physical properties like tilth and bulk density. Rotation also leads to a more efficient use of plant nutrients, reducing economic loss from nutrient leaching and erosion. Cover crops have the benefit of fixing atmospheric nitrogen into the soil, reducing cost of nitrogen fertilizers. Their roots also improve water infiltration into the soil, which leads to increased productivity. The objective of this study was to understand how three years of tillage, crop rotation and cover crop affects soil physical properties.

## MATERIALS AND METHODS

The experimental field is Lincoln University's Freeman farm, in Jefferson City, Missouri (Fig. 1). Soil samples were taken from four depths in each plot: 0-3.9 in (0-10 cm), 3.9-7.9 in (10-20 cm), 7.9-15.9 in (20-40 cm) and 15.9-23.6 in (40-60 cm) .

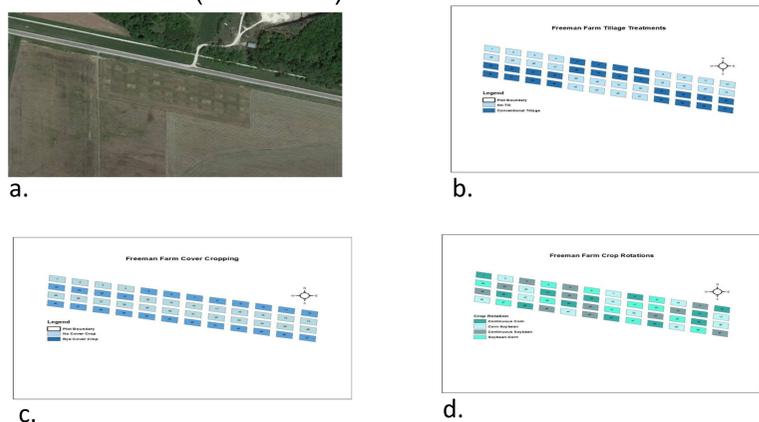


Fig. 1. Research field showing, a) aerial view b) Tillage plots c) cover crop plots d) Crop rotation plots

## RESULT AND DISCUSSION

❖ Tillage destroys soil structure, increasing the susceptibility of the fertile topsoil and nutrients to erosion (Fig. 2).



Fig. 2. Different tillage types; a) Conventional till (moldboard plow), b) No till

❖ Crop rotation, if well managed, can improve soil tilth and some other soil physical properties. If legumes are used in the rotation, they can fix atmospheric nitrogen into the soil, thereby reducing fertilizer cost.

❖ The roots of cover crops open can open up pore spaces in the soil and this increases water infiltration into the soil and improves air movement in the plant root zone thereby increasing crop yield (Fig. 3.)

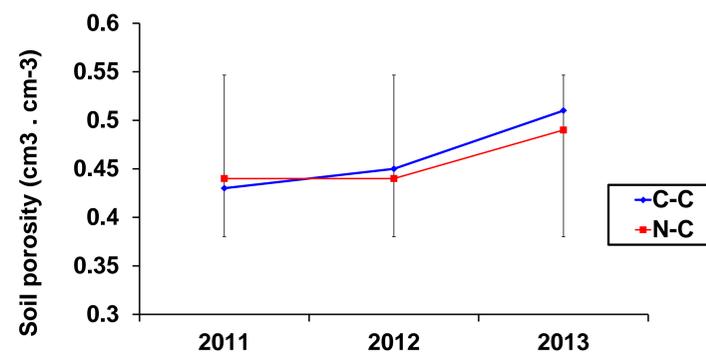


Fig. 3. three years effects of cover crop on soil porosity.

## RESULT AND DISCUSSION

❖ Several researchers in the Midwest have reported between 10-11% increase in corn yield and between 12-14% increase in soybean yield when cover crops were planted before these crops (fig 4).

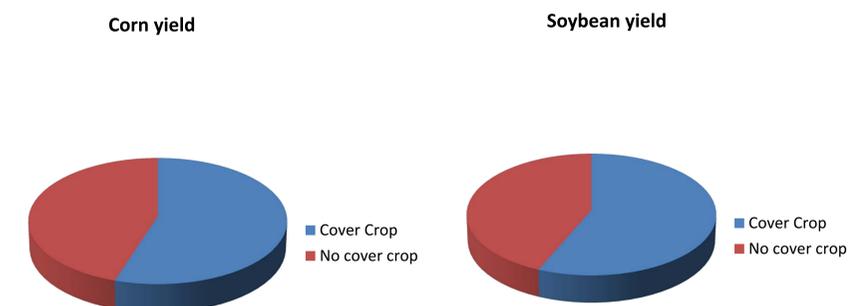


Fig. 4. Corn and soybean yield with/without prior cover crop

## CONCLUSION

There are many benefits that can be derived from various agricultural management practices. However, the risks should also be considered. Tillage can increase soil susceptibility to erosion and can increase emission of greenhouse gasses. Therefore, no-till practice is more beneficial to the environment. Cover crops, when well implemented and establish has a lot of benefits on the soil and this translates to better yield and sustainability of the soil. It should be noted that it takes time for these management practices to be established.

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