Evaluation of Crop Management Practices on Soil Infiltration

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INTRODUCTION

Water infiltration rate is an important indicator of soil structure and function. Favorable management practices may increase infiltration rates and reduce surface runoff and loss of nutrients and soil. Our objective is to study the impact of crop management practices on infiltration rates in corn based cropping systems.

MATERIALS & METHODS

To evaluate the impact of no-tillage and cover crop treatment practices, infiltration experiments under saturated conditions were performed near Gilmore City, Iowa on a clay loam soil. The study portion of the site consisted of subsurface drained field plots with a corn-soybean rotation. To study the impacts on saturated infiltration rates, field measurements were taken with a ponded ring infiltrometer at a target simulated rainfall rate of 0.5 cm/min for 60 minutes (or until steady state conditions were reached).

Data were collected on 16 plots during September and October 2011. The plots were soy planted (following corn) and include the control plots (till/no cover) and three tillage cover crop combinations (no-till/rye cover, till/rye cover, no-till/no cover) with four replications. Measurements include time to runoff, saturated infiltration rate and runoff rate.

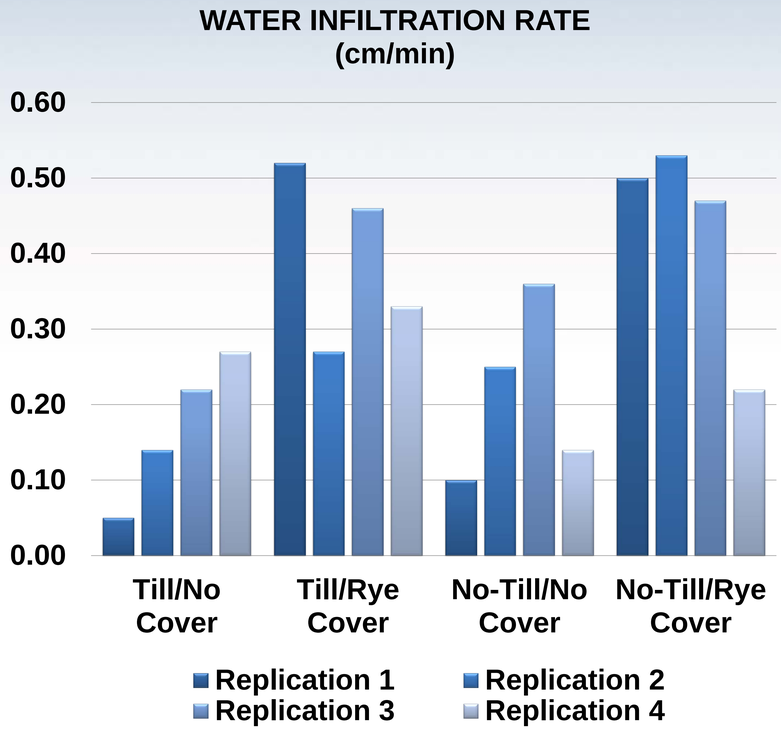

FIGURE 1: WATER INFILTRATION RATES FOR A CLAY LOAM SOIL NEAR GILMORE CITY, IOWA

Note: Infiltration rates greater than or equal to 0.50 cm/min exceeded the simulated rainfall rate capacity of the infiltrometer (i.e. no surface runoff occurred). Therefore actual infiltration rates were higher than indicated for these plots.

RESULTS & DISCUSSION

Utilizing cover crops, no-till or a combination of practices has the potential to improve soil structure and increase water infiltration rates. Based on limited data collected to date, till/rye cover and no-till/rye cover crop combinations resulted in higher average infiltration rates than the control plots (Figure 1). The no-till/no cover crop combination had minimal effect on infiltration rates in comparison to the control plots. The highest average infiltration rates occurred in the no-till/rye cover plots with the lowest rates in the till/no cover crop control plots. Based on preliminary results, the data suggests improved soil structure and function attributed to practices associated with cover crops and possibly no-tillage.

CONCLUSION

A conclusion has not be reached due to limited, one time measurements. Additional field experiments will resume prior to planting in early Spring 2012 to further evaluate the impact of cover crops and no-tillage methods on water infiltration rates.

POTENTIAL FUTURE WORK

While higher infiltration rates reflect good soil structure and reduced susceptibility to erosion, the potential for nitrate to leach into subsurface drainage flow increases. To evaluate limiting nitrogen losses, this study may be supplemented by additional grant funds through a recently submitted BARD proposal. The additional research would utilize high resolution rainfall to study the impacts of spatially variable rainfall on optimum nitrogen management for corn and estimate erosion associated with localized high intensity rain events.

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