Corn Yields Following Rye Cover Crops in Fields with Diverse Terrain

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Introduction

Rye as a cover crop has shown to have a positive effect on important soil properties, such as improving water infiltration, improving soil organic matter, reducing loss of excess inorganic nitrogen and many more. The presence of a rye cover crop can have both positive and negative effects on yield of the subsequent corn crop. Our preliminary results have shown variations amongst corn grain yields with regards to a rye cover crop and fallow plots at different topographical positions. Literature findings often discuss these yield variations, however most of the discussions and results are limited to areas with flat and level terrain. Very little has been done to explore how topography might affect performance of rye cover crop and its influence on the subsequent corn. Farmers understand that not all fields are as ideal as research plots, therefore making this research important for farmers managing acres in areas considered marginal.

Our objective was to quantify these yield differences at four different research locations within the CSCAP network.

Materials & Methods

Mason

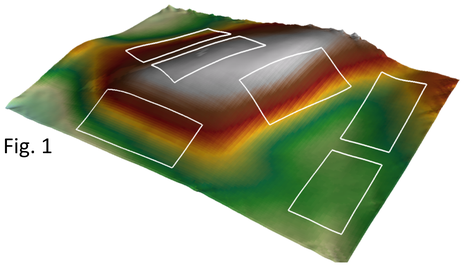

Fig. 1

KBS

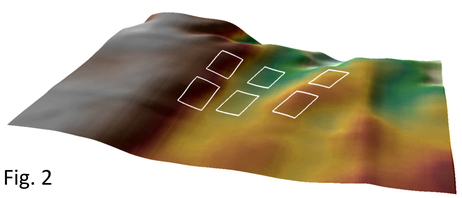

Fig. 2

SEPAC

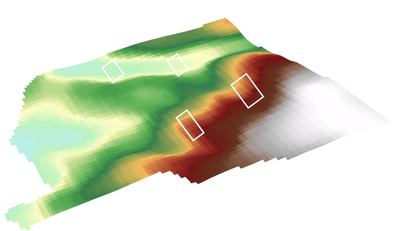

Fig. 3

Experimental Sites
- SEPAC, IN - No-Till
- Mason, MI - Chisel
- KBS, MI - Chisel
- Bradford.C, MO - No-Till

Studied Experimental Factors

Topography
- Summit
- Slope
- Depression

Crop
- Corn
- Soybean

Cover Crop
- Winter Rye
- No Cover (Fallow)

Yield differences were calculated by subtracting grain yield of rye cover plot from grain yield of no cover fallow plot. Numbers are reflected as actual differences.

Topography was established as a main factor for Mason, KBS and Bradford.C field sites. Each location has specific plots for each topographical position: summit, slope and depression. The SEPAC site's topography was classified using a digital elevation model and yield monitor data collected from a combine that was processed in order to determine yield differences.

Results & Discussion

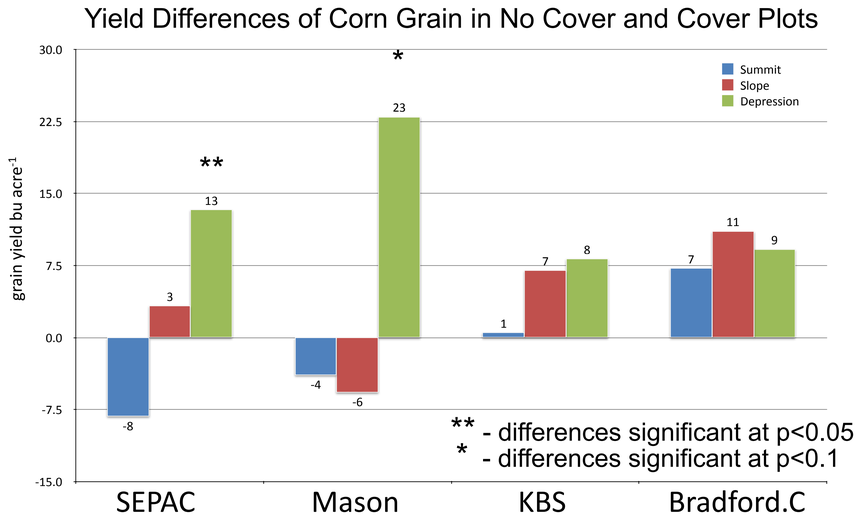

Fig. 4. Summary of the differences between corn yields in plots with and without cover crops averaged over 2012 & 2013 in three topographical positions of the studied sites. Positive values indicated corn yields performed better in plots without rye cover, negative values indicate the no cover (fallow) plots yielded higher. Numbers present the actual yield differences in bushels per acre.

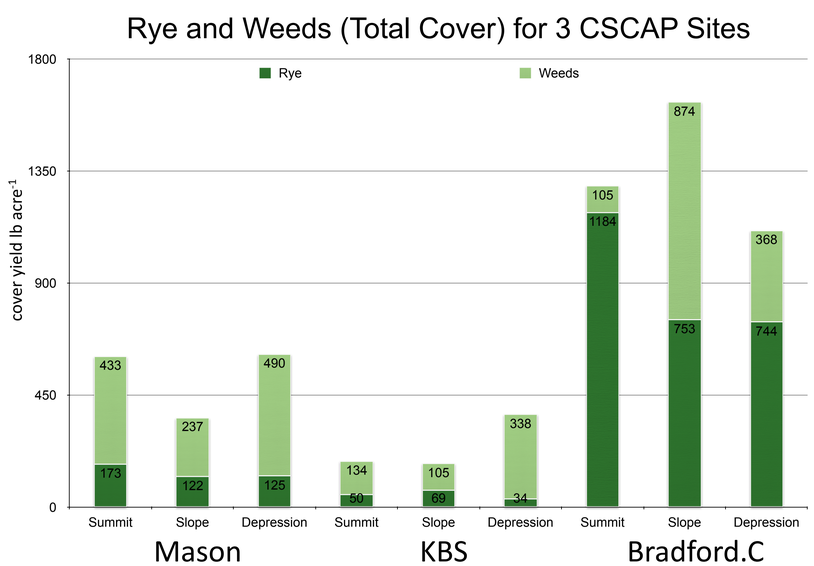

Fig. 5. Summary of the total amount of cover biomass (rye+weeds) collected in spring (before termination and corn planting) at three studied sites averaged over 2013 & 2013.

Site	*Dominant Soil Texture*	*Annual Precipitation (in)*
SEPAC	Silt Loam, Silty Clay Loam	37 (2012), 42 (2013)
Mason	Sandy Loam, Loamy Sand	24 (2012), 37 (2013)
KBS	Sand, Sandy Loam, Sandy Clay Loam	29 (2012), 44 (2013)
Bradford.C	Silt Loam, Silty Clay Loam	26 (2012), 37 (2013)

Conclusions

- In depressions, the plots without rye cover tended to have higher corn yields.
- In summits of SEPAC and Mason sites, the plots with rye cover tended to have higher corn yields.
- Published studies present different results regarding influence of a rye cover crop on corn yields. Some studies suggest that presence of rye cover crop (if terminated early) offer these benefits without reducing yield (Krueger et al., 2011), while others suggest rye can reduce corn yield significantly (Raimbault et al., 1990).
- Our results suggest that how rye cover crop influences yield of a subsequent corn crop can be affected by topography, that is opposite effects can be observed even within a single agricultural field, if the field's terrain is sufficiently diverse.

References

Krueger, E. S., T.E. Ochsner, P.M. Porter, and J.M. Baker. 2011. Winter rye cover crop management influences on soil water, soil nitrate and corn development. Agron J. 103: 316-323.

Raimbault, B.A., T.J. Vyn, and M. Tollenaar. 1990. Corn response to rye cover crop management and spring tillage systems. Agron. J. 82: 1088-1093.

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