Effect of cover crop and tillage on field saturated hydraulic conductivity in continuous corn systems

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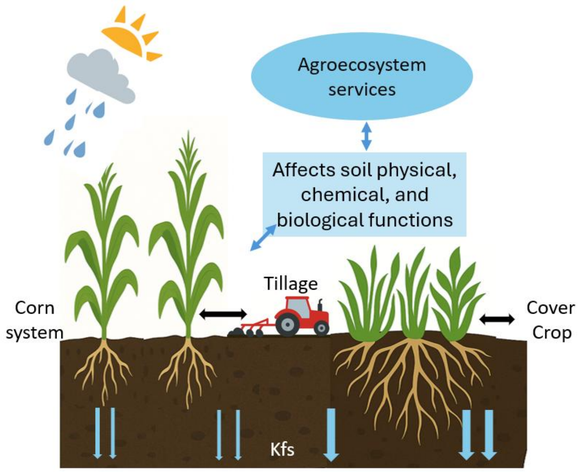
Introduction



- Field saturated hydraulic conductivity (Kfs) quantifies how easily water moves through the soil at saturation.
- Kfs is a key indicator of soil health and relates to the ability of soils to infiltrate and retain water.
- Cover crops and reduced tillage are widely used soil health management practices, but past studies have shown mixed impacts on Kfs.

Objective

- Assess effects of cover cropping and tillage on Kfs in corn production systems across five different locations.

Methodology

Figure 1: Geographic location of the five study sites.

Table 1: Dominant soil type at the study sites.

Locations	Dominant soil type
KS (Alton)	Harney silt loam
KS (Garden City)	Ulysses silt loam
NE (Gothenburg)	Hord silt loam
IA (Ames)	Canisteo silt loam
MS (Scott)	Commerce-Robinsonville soil (silty clay loam)

Figure 2: a) Field setup for Kfs measurement using Saturo and b) Hydrago used to measure soil moisture.

- Kfs was measured using dual head automated infiltrometer (Saturo) with 10 cm insertion ring.
- Soil moisture at the time of Kfs measurements was determined using HydraGo (figure 2b).
- Measurements taken in mid-summer (peak growth stage).

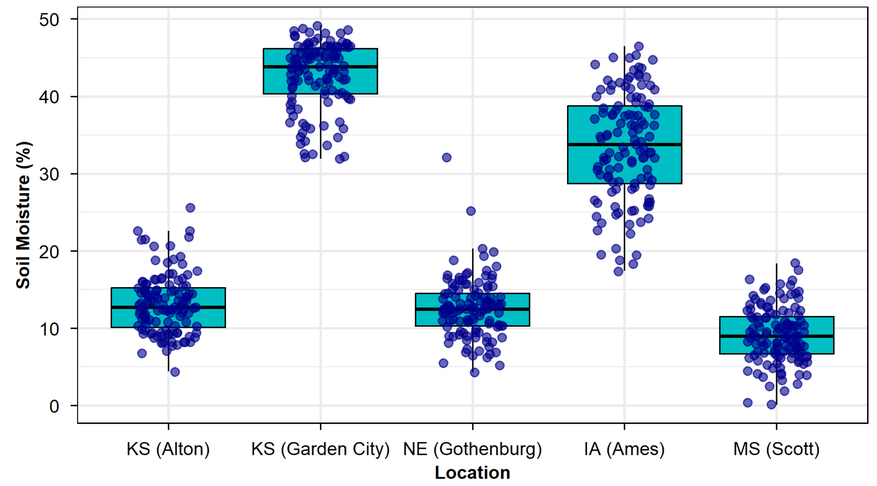


Figure 3: Soil moisture (%) distribution at the time of Kfs measurement at five study sites for surface soil.

Results

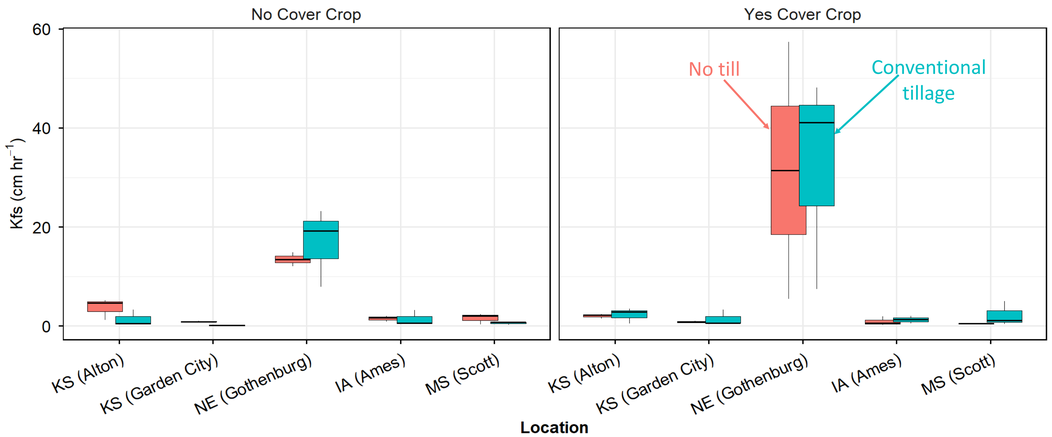


Figure 4: Distribution of field saturated hydraulic conductivity (Kfs) at five locations in relation to cover crop (Yes/No) and tillage (Yes/No).

- Without cover crops, Kfs is usually higher in no till
- With cover crops, Kfs is usually higher in conventional tillage

} Visual patterns

Table 2: Analysis of variance (ANOVA) showing main and interaction effects.

	F-value	P-value
Location	20.55	1.4 e-8***
Cover crop	1.19	0.28
Tillage	1.05	0.31
Cover crop * Tillage	6.74	0.01*
Location * Cover crop * Tillage	0.76	0.56

Preliminary Findings

- Location had a highly significant effect on Kfs suggesting strong spatial variability.
- Main effect of cover crop and tillage were not significant, but significant interaction.
- Implies that Kfs response to cover crops depends on the tillage practice (and vice versa).

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