

Tillage and Nitrogen Placement Effects on Yields in a Short-Season Corn/Wheat/ Double-Crop Soybean Rotation

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Summary

In 2018, adding nitrogen (N) greatly improved average wheat yields with about a 10% increase with knife compared to broadcast application methods. Even though tillage did not affect wheat yields, soybean yield was about 10% greater with no-till.

Introduction

Many crop rotation systems are used in southeastern Kansas. This experiment is designed to determine the long-term effect of selected tillage and N fertilizer placement options on yields of short-season corn, wheat, and double-crop soybean in rotation.

Experimental Procedures

A split-plot design with four replications was initiated in 1983 with tillage system as the whole plot and N treatment as the subplot. In 2005, the rotation was changed to begin a short-season corn/wheat/double-crop soybean sequence. Use of three tillage systems (conventional, reduced, and no-till) continued in the same whole plots as the previous 22 years. The conventional system consisted of chiseling, disking, and field cultivation. Chiseling occurred in the fall preceding corn or wheat crops. The reduced-tillage system consisted of disking and field cultivation prior to planting. Glyphosate was applied to the no-till areas prior to planting. The four N treatments for the crop were: no-N (control) and N fertilizer placement as broadcast, dribble (surface band), and knife (sub-surface band at 4 inches deep) UAN (28% N) solution. The N rate for the corn crop grown in odd-numbered years was 125 lb/a. The N rate of 120 lb/a for wheat was split as 60 lb/a applied pre-plant as broadcast, dribble, or knifed UAN. All plots except for the no-N controls were top-dressed in the spring with broadcast UAN at 60 lb/a N.

Results and Discussion

In 2018, tillage system did not affect wheat yield (Table 1). Overall, fertilizing with N quadrupled wheat yield. Preplant N application by knifing resulted in 10% greater wheat yield than with broadcast, with dribble application resulting in intermediate yields. The average yield of soybean planted doublecrop after wheat harvest was nearly

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50 bu/a in 2018 and no-till was about 10% greater than with tillage. There was no residual effect on soybean yields from N applied by different pre-plant methods to the previous wheat crop.

Table 1. Effect of tillage and fall nitrogen (N) fertilization on yield of wheat and following double-crop soybean in 2018

Treatment	Wheat yield	Double-crop soybean yield
	----- bu/a -----	
Tillage		
Conventional	31.2	46.5
Reduced	29.7	46.4
No-till	31.9	50.9
LSD (0.05)	NS	3.8
N Fertilization		
No-N control	9.0	48.0
Broadcast UAN†	38.2	48.5
Dribble UAN	40.4	48.9
Knife UAN	42.2	46.4
LSD (0.05)	3.0	NS

†UAN: urea-ammonium nitration solution, 28% N.