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

Abstract

In 2016, adding nitrogen (N) greatly improved average wheat yields, but the response to tillage and different N placement methods was minimal. Double-crop soybean yields were unaffected by tillage or the residual from N treatments that were applied to the previous wheat crop.

Keywords

tillage, no-till, nitrogen placement, corn, wheat, soybean

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

D.W. Sweeney

Summary

In 2016, adding nitrogen (N) greatly improved average wheat yields, but the response to tillage and different N placement methods was minimal. Double-crop soybean yields were unaffected by tillage or the residual from N treatments that were applied to the previous wheat crop.

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) continues in the same areas as the previous 22 years. The conventional system consists of chiseling, disking, and field cultivation. Chiseling occurs in the fall preceding corn or wheat crops. The reduced-tillage system consists of disking and field cultivation prior to planting. Glyphosate is applied to the no-till areas prior to planting. The four N treatments for the crop are: no-N (control), broadcast urea-ammonium nitrate (UAN; 28% N) solution, dribble UAN solution, and knife UAN solution at 4 inches deep. The N rate for the corn crop grown in odd-numbered years is 125 lb/a. The N rate of 120 lb/a for wheat is split as 60 lb/a applied preplant as broadcast, dribble, or knifed UAN. All plots except for the no-N controls are top-dressed in the spring with broadcast UAN at 60 lb/a N.

Results and Discussion

In 2016, conventional tillage resulted in 2 bu/a greater yield than with no-till (Table 1). Overall, fertilizing with N quadrupled wheat yield, but preplant application method (broadcast, dribble, or knife) did not affect yields. Average yield of soybean planted doublecrop after wheat harvest was nearly 40 bu/a in 2016, but was not affected by tillage systems or the residual from N fertilizer treatments that were applied to the wheat.

Table 1. Effect of tillage and fall N fertilization on yield of wheat and following double-crop soybean in 2016

Treatment	Wheat yield	Double-crop soybean yield
	----- bu/a -----	
Tillage		
Conventional	37.8	39.0
Reduced	36.8	39.9
No-till	35.8	39.7
LSD (0.05)	1.1	NS
N Fertilization		
No-N control	9.8	40.0
Broadcast UAN†	45.5	39.4
Dribble UAN	45.1	39.7
Knife UAN	46.4	39.0
LSD (0.05)	1.4	NS

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