

## Soybean Production Research: Breaking the Yield Barrier, Objective 2

### RFR-A1153

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### Introduction

In previous research, physiological responses to agronomic variables to help explain yield responses to our management decisions were identified. This is critical because the grower can see and understand not just from the yield but also from the physiological variables, what management decisions are important to achieve high yields. This project is a continuation of that work. The overall goal of this research is *to increase soybean yield and profit even faster than it currently is accomplished by intensive management*. This component of the project contributes to that goal by developing information on the impacts of tillage and crop rotation on soybean growth and development, soil borne diseases, and yield. This study was conducted at two locations—the ISU Bruner Farm, Ames and the ISU Northwest Research Farm, Sutherland, IA.

### Materials and Methods

The experimental design was a randomized complete block in a split-split plot arrangement with four replications. Main plots were a no-tillage system (NT) and a conventional tillage system (CT) that were established in 2003. Tillage operations for conventional tillage were chisel plowing in the fall and field cultivation in the spring before planting. For no-tillage, crops were planted directly in the residue of the previous crop. Subplots consisted of six rotation sequences involving soybean and corn. The sequences were initiated in 2003 on land previously

planted to corn. The sequences allow comparisons to be made of 1) first-year soybean (1SB), (after four consecutive years of corn), 2) soybean alternated annually with corn (SB/C), and 3) 2, 3, and 4 years of soybean (2SB, 3SB, 4SB) and continuous soybean (Ss). The sub-sub-plots were either ten rows of soybeans treated with a Poncho/Votivo/Fungicide package (PVF) or ten rows left untreated.

### Results and Discussion

During the growing season, there were no symptoms of sudden death syndrome (SDS), white mold, or brown stem rot (BSR) found in the plots at Sutherland. Treatments had strong effects on several of the measured traits. The interaction of rotation by tillage had a significant effect on early stem growth rates from V2 through R3 (Figure 1). The PVF treated plots had 8 to 12 percent higher dry stem weights than did non-treated plots for these same growth stages. Rotation by tillage had an effect on early canopy development. The CT plots had greater canopy growth for rotations 1SB, 2SB, and SB/C, and NT plots had greater canopy growth for rotations 3SB, 4SB, and Ss. Rotation by tillage had an effect on bean yield. The CT plots had higher yields for rotations 1SB, 2SB, 3SB, and SB/C and NT plots had a greater yield for rotation Ss (Table 1). Corn yields are shown for tillage systems and rotations in Table 2. Spring and fall soil samples had very low SCN egg counts, with a range of 100–300 eggs per 100cc of soil. Seed samples of each plot showed no presence of *Phomopsis* spp. We will also be testing seed samples from each plot for oil and protein percentages, using an NIR scanner. The experiment will be repeated in 2012.

### Acknowledgements

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**Table 1. Soybean yields by tillage system and rotation sequences at Sutherland.**

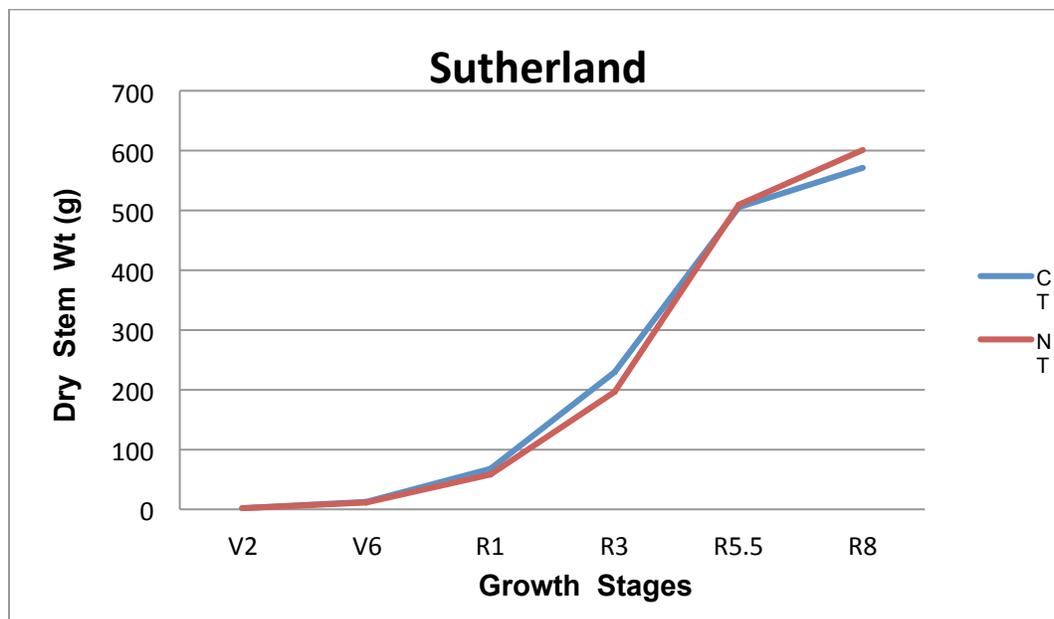
	Yield (bu/a)					
CT	66.1	66.6	65.7	65.3	67.2	63.9
NT	62.4	63.4	65.4	63.2	61.2	65.9
	1SB	2SB	3SB	4SB	SB/C	Ss

1SB = first year soybean; 2SB = 2 years of soybean; 3SB = 3 years of soybean; 4SB = 4 years of soybean; SB/C = soybean/corn rotation; Ss = continuous soybean. CT = conventional tillage; NT = no tillage.

**Table 2. Corn yields by tillage system and rotation sequences at Sutherland.**

	Yield (bu/a)					
CT	209.0	199.1	192.2	197.7	202.3	189.8
NT	211.6	196.8	191.6	195.0	207.8	179.9
	1C	2C	3C	4C	C/SB	Cc

1C = first year corn; 2C = 2 years of corn; 3C = 3 years of corn; 4C = 4 years of corn; C/SB = corn/soybean rotation; Cc = continuous corn. CT = conventional tillage; NT = no tillage.



**Figure 1. Dry stem weights over growth stages by tillage systems.**