Arkansas Corn and Sorghum Board
2007 Annual Report
Merle Anders

TITLE: Helping Arkansas rice farmers exploit market opportunities by improved use of soybean, wheat, and corn in rice rotations.

OBJECTIVES:

1. Provide a set of management guidelines that farmers can use to assist them in maintaining their profitability should they change their rotations.
2. Explore the potential of using short-duration rice, soybean, wheat, and corn varieties in a range of crop rotations.
3. Measure the effects of fertility levels and crop sequences on pest and disease incidence in existing and new rotations.
4. Explore the use of conservation tillage in a range of rotations.
5. Determine the feasibility of using corn in rice based cropping systems.
6. Test existing cropping systems models that include the crop species used in this study.

PROGRESS:

Rotation study: Conventional and no-till plots in the long-term rotation study were planted into DKC 66-23 and Pioneer 33M57 on March 27, 2007. All plots were planted into 30 in rows at a plant population of 45,000 plants acre^{-1}. Cold wet weather following planting did not impact plant stand but wet soil conditions did which resulted in a poor plant stand in some plots thus those plots were replanted on April 23, 2007. Unlike previous years when replanting was confined to no-till plots, there was a need to replant portions of conventional-and no-till plots. Plant stands in replanted plots were satisfactory in most cases. Harvesting was completed on August 20, 2007. All grain yields were adjusted to 15% moisture.

Grain yields averaged 109 bu a^{-1} with rotation, fertility, and variety significantly affecting grain yield (Table 1). Of the two varieties used Pioneer 33M57 appears to be the most adapted to the conditions we have in rice rotations thus the remainder of the data presented for this study will focus on the results of this variety. There was a 75 bu a^{-1} advantage in growing corn after soybeans verses growing corn after rice. Differences in plant growth were evident throughout the season with corn planted after rice having difficulties in establishing an acceptable plant stand and nutrient deficiencies/toxicities present after N applications. There were no significant differences between tillage treatments (Table 1) even though there was a 16 bu a^{-1} yield advantage in the conventional-till plots verses the no-till plots. There was a response to increased fertility levels in the no-till plots (Figure 2) while there was no response in the conventional-till plots. This is a recent trend and suggests there is more root system present in the no-till plots thus a better availability to take up nutrients.

A comparison of average grain yields between conventional-and no-till plots from 2000 to 2006 (Figure 3) indicates a steady trend of reducing the difference between tillage treatments with no-till steadily gaining on the conventional-till treatments. Our data indicate there has been a continual reduction in the plow layer in the no-till plots and it is expected this reduction in soil strength will allow for better root penetration and nutrient uptake.

Fertilizer study: In order to address possible problems with water management this field was ripped with a John Deere 2100 no-till ripper. Immediately following ripping the field was bedded into 30 inch beds. No other field operations were used. Three corn varieties (Pioneer 38P09, Pioneer 36B11, Pioneer 33M57) were planted on April 6, 2007. These varieties represent early (95 day), mid (105 day), and late (115 day) season varieties. All plots were sown on 30 inch beds at a plant population of 36,000 plants acre^{-1}. Three urea sources (standard, Agrotain, and controlled release) were applied as a single application at a rate of 150 lbs. N acre^{-1} when the plants were approximately at the 4 leaf growth stage. A single fertilizer application was used. Immediately following the fertilizer application water was applied to the field.

Grain yields in this study were high with a significant difference between varieties (Table 2). Grain yields increased as the duration of each variety increased. There were no significant differences between fertilizer sources (Figure 5). Variation between plots was lowest for the Agrotain treatment making it a better selection for field N applications. What is unique with this study is the number of field operations used. They are a follows:

1. Fall-removal of levees, disk x float.
2. Spring-ripped with no-till ripper, bedded and planted (fertilizer applied prior to ripping)
3. All N applied as single application
4. Irrigated 5 times

Ripping with a no-till ripper did not disturb the field and resulted in significantly less soil resistance and better nutrient uptake. There was significant growth of volunteer corn in the plots following harvest to suggest that a significant amount of N remained in the soil at harvest.

Table 1: Grain yields for each main effects comparisons for the 2007 corn treatments in the long-term rotation study.

Source	P value	Treatment	Yield bu/a
Rotation	0.018	Rice-corn	71
		Rice-soybeans-corn	146
Tillage	0.570	Conventional	116
		No-till	100
Fertility	0.033	Standard	96
		Enhanced	121
Variety	<0.000	DKC 66-23	86
		P33M57	131

Figure 1: Grain yield for the variety Pioneer P33M57 in rice-corn and rice-soybean-corn rotations in the long-term study at Stuttgart Arkansas in 2007.

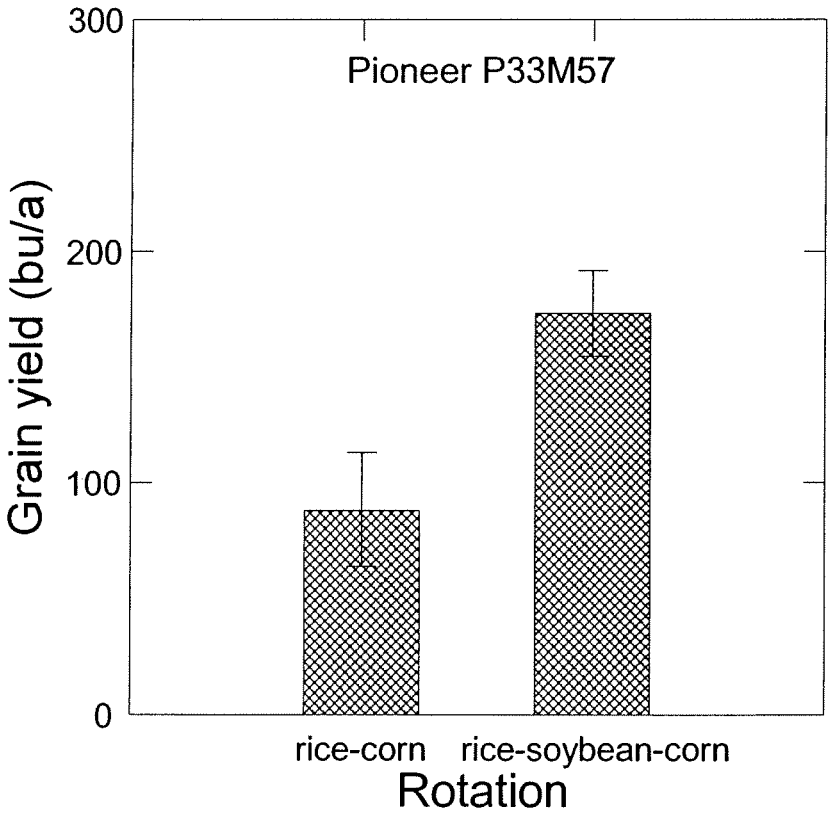

Figure 2: Corn grain yields for conventional-and no-till plots that were treated with at 'standard' (200# N, 60# P_2O_5, 100# K_2O) and 'enhanced' (300# N, 80# P_2O_5, 150# K_2O) fertilizer levels and planted with Pioneer P33M57.

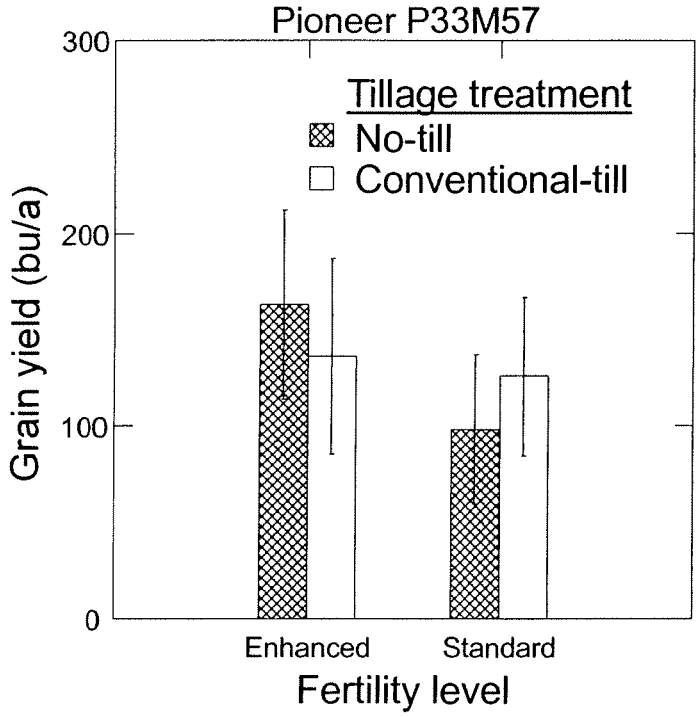

Figure 3: Comparison of corn grain yields for conventional-and no-till treatments in the long-term study.

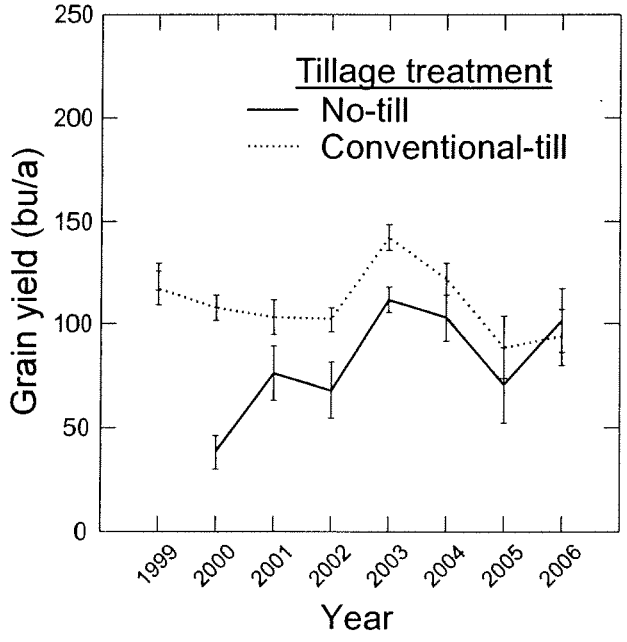

Table 2: Grain yields for main effects in the 2007 corn nitrogen source study.

Source	P value	Treatment	Yield bu/a
Variety	<0.000	P38P09	146
		P36B11	175
		P33M57	230
Fertilizer source	0.952	Urea	184
		Agrotain	184
		Slow release	182

Figures 4 & 5: Grain yields for three varieties and three nitrogen fertilizer sources in a fertility study at the RREC in 2007.