Arkansas Corn and Grain Sorghum Board
2008 Annual Report
Merle Anders

TITLE: Helping Arkansas 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.

RESEARCH FINDINGS:

*Rotation study***:** Conventional and no-till plots in the long-term rotation study were planted into DKC66-23 and Pioneer 33M57 on April 16, 2008. All plots were planted into 30 in rows at a plant population of 35,600 plants acre^{-1}. Temperatures were sufficiently high to not slow growth throughout the season. Plant stands were acceptable in all plots with less variation within treatments than in previous years. There was some deer and raccoon damage in selected plots later in the season. Grain yields were adjusted for plots were animal damage could be quantified. Harvesting was completed on September 18, 2008. All grain yields were adjusted to 15% moisture.

Grain yields, averaged across all treatments, were 164 bu a^{-1} with no statistical differences between any of the treatments (Table 1). Despite the lack of statistical differences between treatments there were numerical differences that will be significant for producers. Conventional-till treatments yielded, on average, 47 bu a^{-1} more than no-till treatments. There was a trend of higher grain yields in the higher fertility treatment and an average increase in grain yield for the variety P33M57 over DKC66-23. This variety trend was the same as in 2007.

Benefits from increased fertility were present in the no-till plots and not in the conventional-till plots (Fig. 1). Varieties differed in how they responded to tillage treatments (Fig. 2) with both varieties yielding the same in conventional-till plots while P33M57 yielded more than DKC66-23 in the no-till plots. These data suggest that P33M57 is better suited for no-till management. Grain yields were similar for both varieties at the higher fertility level (Fig. 3) while P33M57 yielded, on average, better than DKC66-23 at the lower fertility level. We observed less lodging in P33M57 and better plant stands for this variety in wetter parts of the field suggesting it might be better adapted to rice soil conditions.

Tillage, variety, fertility study: In a follow-up study from our 2007 study on the effects of soil ripping on corn yields we selected an area that was ripped in 2007 and compared it to one that was ripped in 2008 prior to corn planting. Ripping was completed with a John Deere 2100 no-till ripper. Three corn varieties (P35F40, P33M57, P31P42) were sown on April 15, 2008 into 30" rows at a plant population of 35,600 plants ac^{-1}. Weed control consisted of a single Liberty application and roundup following plant emergence. These three varieties represent 105, 115, and 120 day maturity times. A single Agrotain N treatment was applied at approximately the 4 leaf growth stage at 100, 150, or 200 lbs N $ac.^{-1}$. Immediately following N application the filed was watered. All varieties were harvested on September 19, 2008. Grain weights were adjusted to 15% moisture.

Tillage treatments were not significantly different (Table 2) with grain yields averaging 5 bushels higher in the field that had been ripped for soybeans in the previous year. There was a significant difference in grain yields between varieties with grain yields increasing as variety duration increased. Grain yields increased significantly as nitrogen application rates increased with a 16 bu a^{-1} increase when N was increased from 100 to 150 lbs a^{-1} and an additional 15 bu a^{-1} increase with the addition of another 50 lbs of N a^{-1} (Fig. 4). These results indicate the effect of ripping was carried across one season. Acceptable grain yields were obtained combining ripping and a single N application.

Table 1: Grain yields for each main effect comparisons in the 2008 long-term rotation study.

Source	P value	Treatment	Yield bu/a
Tillage	0.113	Conventional	188
		No-till	141
Fertility	0.620	Standard	155
		Enhanced	174
Variety	0.254	DKC 66-23	154
		P33M57	174

Figure 1: Grain yield (bu/a) averaged for two varieties (DKC 66-23, P33M57) grown in no-and conventional-till plots that received standard (200# N/a, 60# P_2O_5/a, 100# K_2O/a) or enhanced (300# N/a, 80# P_2O_5/a, 150# K_2O/a) fertility levels.

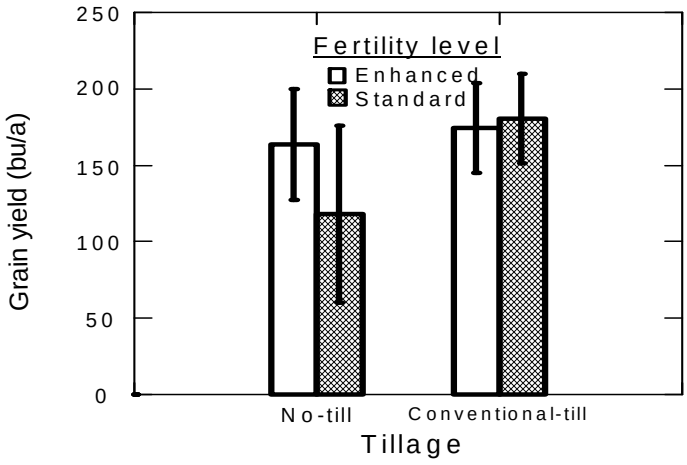

Figure 2: Corn grain yield (bu/a) for conventional-and no-till plots averaged across fertility treatments for the corn varieties DKC 66-23 and P33M57.

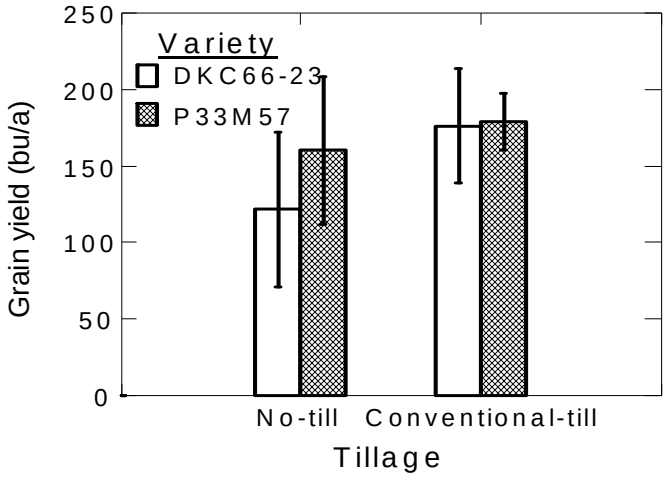

Figure 3: Corn grain yields (bu/a) for two corn varieties (DKC66-23, P33M57) grown at standard (200# N/a, 60# P_2O_5/a, 100# K_2O/a) or enhanced (300# N/a, 80# P_2O_5/a, 150# K_2O/a) fertility levels.

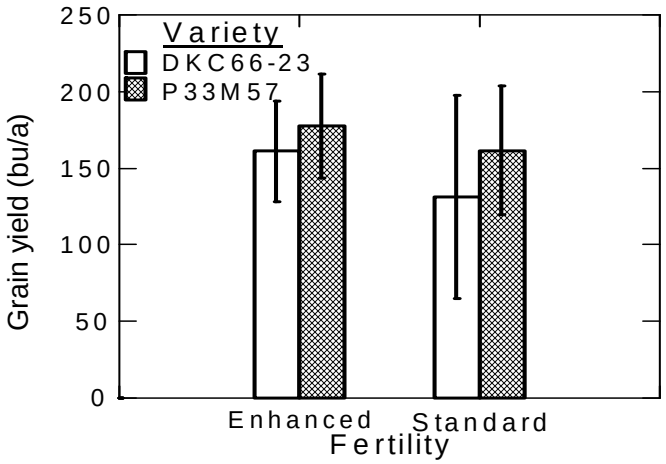

Table 2: Grain yields for main treatment effects of tillage, variety, and fertility in the 2007 corn tillage, variety, and nitrogen level study.

Source	P value	Treatment	Yield bu/a
Tillage	0.372	2008 ripping	189
		2007 ripping	194
Variety	P < 0.001	P35F40	176
		P33M57	196
		P32P42	204
Fertility	P < 0.001	100	176
		150	192
		200	207

Figures 4: Grain yields for three varieties and three nitrogen fertilizer levels in a fertility study at the RREC in 2008.