Arkansas Corn and Sorghum Board
2002 Annual Report
Cropping Systems by 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.

ACTIVITIES: Corn growth was better than previous years even though there were numerous rain events. Harvesting was completed when the grain moisture was between 12 and 15%. Measurements were taken on the volume of irrigation applied to one no-till and one conventional till treatment. Rainfall patterns were ideal thus one-irrigation was applied to the no-till plot while 3 applications were made to the conventional till plot.

RESULTS: Overall grain yields were 103 bu a^{-1} that was 6 bu a^{-1} less than the previous year (Table 1). This overall drop in grain yield was attributed to a significant decrease in the no-till treatment combinations. This trend was not expected because the vegetative growth on the no-till plots was better than in previous years. The substitution of the variety DKC69-70 for N75-T2(90) in an effort to improve no-till yields did not result in any improvement. Unlike the previous year there was no difference between fertility treatments.

Comparing only treatment main effects (Table 1) does not always identify individual treatment combinations that are high yielding. Table 2 presents average grain yields for each treatment and the range of yields across the four replications. From these results it is clear that the variety DKC69-70 did not perform well in no-till conditions and that grain yields were consistently higher in the standard fertility treatments compared to the enhanced fertility treatment in the conventional till plots. These results show that the best management combination would be conventional tillage, standard fertility, and the variety Pioneer 31B13.

Soil resistance data presented earlier in the year indicated that soil resistance had declined in the no-till plots and it was observed that there was fewer water logging problems than in previous years. Apparently there has not been sufficient change in soil resistance to allow for full root development. These results suggest that management directed at reducing soil resistance would be expected to pay large dividends. If current trends continue we expect corn grain yields to increase as soil physical properties improve.

Table 1: Summary of main treatment effects on corn grain yield from 1999 to 2002.

Effect	Treatment	1999 yield* bu a^{-1}	2000 yield bu a^{-1}	2001 yield bu a^{-1}	2002 yield bu a^{-1}
All	All	135	73	109	103
Rotation	After rice	-	73	109	103
Tillage	No-till	-	42	104	82
	Conventional	-	103	115	124
Fertility	Standard	135	75	104	104
	Enhanced	134	70	113	102
Variety	N75-T2(90)	134	61	88	-
	Pioneer 31B13	136	85	124	117
	DKC69-70	-	-	-	89

Table 2: Summary of corn grain yields (bu a^{-1}) for main effects and treatment combinations in the long-term cropping systems study for the year 2002.

System	Tillage	Fertility	Variety	Mean and range of Grain yield (bu a^{-1})
all	all	all	all	103 (16-143)
all	no-till	all	all	82 (16-141)
all	conventional	all	all	124 (102-143)
all	all	standard	all	104 (16-142)
all	all	enhanced	all	102 (60-143)
all	all	all	DKC69-70	89 (16-142)
all	all	all	P31B13	117 (61-143)
after rice	no-till	standard	DKC69-70	49 (16-65)
after rice	no-till	standard	P31B13	106 (61-137)
after rice	no-till	enhanced	DKC69-70	74 (60-97)
after rice	no-till	enhanced	P31B13	101 (69-141)
after rice	conventional	standard	DKC69-70	125 (111-142)
after rice	conventional	standard	P31B13	135 (130-141)
after rice	conventional	enhanced	DKC69-70	108 (102-116)
after rice	conventional	enhanced	P31B13	126 (110-143)

Note: The only rotation represented in these data is a rice – corn rotation
Standard fertility = N = 200 lb a^{-1}, P_2O_5 = 60 lb a^{-1}, K_2O = 100 lb a^{-1}
Enhanced fertility = N = 300 lb a^{-1}, P_2O_5 = 80 lb a^{-1}, K_2O = 150 lb a^{-1}