Conservation Tillage Practices for Rice in Southwest Louisiana

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INTRODUCTION

Approximately 540,000 acres of rice were grown in Louisiana in 1990. Virtually all of the state's acreage is planted into conventionally tilled seedbeds, the only recommended method of planting. Rice is produced on clay and silt loam soils, and the field operations required for conventional seedbed preparation on these different soils are very diverse. The number and type of field operations necessary are often related to weather conditions at the time of planting. When wet springs occur, the amount of tillage required for conventional seedbed preparation generally increases, and planting is delayed. The additional tillage operations result in higher production costs, and delays in planting can result in decreased yields.

Conservation tillage practices have been researched and are being adopted in Louisiana for many other crops (Griffin et al., 1984; Griffin and Taylor, 1986; Hutchinson and Shelton, 1990). Advantages to such tillage practices include fuel and equipment savings, less delay in planting and moisture and soil conservation. Information concerning conservation tillage for rice in Louisiana is limited. Preliminary studies conducted in Crowley, Louisiana, have shown potential for utilizing conservation tillage practices in rice production (Bollich et al., 1987,1988, 1989). The objective of this study was to evaluate the performance of rice grown in no-till and stale seedbeds as alternatives to rice planted into conventionally prepared seedbeds.

MATERIALS AND METHODS

The experiment was conducted at the Rice Research Station in Crowley, Louisiana, on a Crowley silt loam (fine, montmorillonitic, thermic, Typic Albaqualf). The test area was previously cropped to soybeans. Tillage operations for seedbed preparation consisted of disking, vibra-shanking and conditioning with a roller harrow until a smooth, level, weed-free seedbed was formed. Rice establishment consisted of 1) no-till planting into previous crop residue, 2) planting into a stale seedbed tilled in the spring four to six weeks prior to planting, 3) planting into a stale seedbed tilled in the fall, about five to six months prior to planting, and 4) planting into a conventionally tilled seedbed. Treatments were arranged in a randomized complete block design with four replications.

A no-till grain-fertilizer drill was used during the study. With the exception of seedbed preparation in the conservation tillage treatments, agronomic management of the drill-seeded study was practiced according to current recommendations (L.S.U. Agricultural Center, 1987). In the conservation tillage treatments, glyphosate (1 lb ai/acre) was applied 3 and 21 days preplant in 1989 and 1990, respectively, to destroy existing vegetation. The test area received 300 lb/acre of 7-21-21 fertilizer, which was preplant incorporated. Rice (cv. Lemont) was drill-seeded at the rate of 110 lb/acre in 7-in. rows on 27 April 1989 and 21 May 1990. Three flush irrigations were required each year to facilitate seedling growth and stand establishment. A fertilizer application of 200 lb/acre of 46-0-0 was applied four to five weeks after planting and prior to the establishment of a shallow, permanent flood. An additional fertilizer application of 46-0-0 was applied during midseason each year (45 and 55 lb/acre in 1989 and 1990, respectively). In addition to the preplant application of glyphosate, the herbicides propanil, bentazon and molinate were used for postemergence weed control as required.

Stand density for each planting method was determined at the 4- to 5-leaf growth stage each year prior to permanent flood establishment. Individual whole plots (3250 ft^2) were combined-harvested and grain yields were adjusted to 12% moisture.

RESULTS AND DISCUSSION

Stand densities for each tillage practice are shown in Table 1. Difference in stand density between years was significant. Density was significantly higher in 1990 with an average increase of 28% across tillage methods. Different no-till planting equipment was used each year of the study. Uniformity of seed placement and soil coverage was much

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better in 1990, and the higher stand density could have been due to the equipment. Elapsed time between glyphosate application and planting was also quite different between years and may have influenced stand density. Planting followed glyphosate application by three days in 1989, and much of the collapse and decay of existing vegetation occurred during rice emergence and stand establishment. Planting was delayed after glyphosate application by three weeks in 1990 due to inclement weather. The vegetation was completely dessicated at the time of planting, and this situation was more conducive to rapid stand establishment.

Method of tillage significantly influenced stand density. Stand densities for tillage treatments averaged across years ranged from 17 plants/ft² in the fall-prepared seedbed to 21 plants/ft² in the spring-prepared seedbed. Compared with conventional tillage, density was significantly lower in the fall-prepared seedbed, but no differences in stand density occurred among the other tillage treatments. A stand of 15 to 20 plants/ft² is considered optimum in Louisiana (L.S.U. Agricultural Center, 1987), although successful yields have occurred at stand densities as low as 8 plants/ft² and as high as 30 plants/ft². No differences in grain yield occurred among method of tillage. Although differences in stand density were associated with tillage practice when measured at the 4- to 5-leaf growth stage, the tillering ability of Lemont resulted in compensatory growth later in the growing season.

Results from this study indicate great potential for conservation tillage practices in rice in Louisiana. Further studies will be required to answer questions relating to the economic potential of these practices, to identify varieties that are suitable in conservation tillage systems and to evaluate the soil conservation and water quality benefits derived from conservation tillage practices.

ACKNOWLEDGMENTS

The author wishes to thank the Louisiana Rice Research Board, John Deere Company and Monsanto Agricultural Company for their support of this research. A special thanks is owed to W.J. Leonards, Jr. and W. Faulk for their technical assistance.

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Table 1. Effect of seedbed preparation on stand density and grain yield of drill-reeded Lemont rice at Crowley, Louisiana.

Tillage Method	Stand density			Grain yield		
	1989	1990	Avg.	1989	1990	Avg.
	plants/ft²			lb/acre		
Conventional	16	24	20	5711	5828	5770
Stale - spring	16	25	21	5743	5410	5576
Stale - fall	12	21	17	5909	5714	5812
No-till	15	23	19	5843	5544	5694
LSD (0.05)			3			NS
Source of Variation	df					
Year (Y)	1					NS
Tillage (T)	2		*			NS
YXT	2		NS			NS

* Significant at P = 0.05.