NO-TILL PRODUCTION IN THE ARKANSAS SOYBEAN RESEARCH VERIFICATION PROGRAM

R.A. Klerk, J.D. Beaty, L.O. Ashlock, C.D. Brown and T.E. Windham[1]

INTRODUCTION

The Arkansas Soybean Research Verification Program (SRVP) was established 14 years ago to improve soybean production and profitability in Arkansas. In this program, the SRVP coordinator and county Extension agent prescribe Extension recommendations in a very timely manner, resulting in more profitable commercial soybean production. Essential to the program is participation from the individual soybean producer, cooperation from soybean researchers and Extension specialists and continued funding from the Arkansas Soybean Checkoff Program.

Research continues to indicate that no-till or reduced-tillage methods can produce yields comparable to those with conventional tillage and that certain inputs are often reduced (Mayhew et al., 1995). Therefore, 28 out of 102, or 27.5%, of the commercial soybean fields enrolled in the SRVP from 1993 to 1997 were planted no-till (Ashlock et al., 1993 through 1997). Twelve different soybean production systems are utilized in the SRVP. These include early-season, full-season, doublecrop (soybean following wheat) planting dates, with and without irrigation. These six systems are further divided into conventional and no-till practices. The early-season and doublecrop systems have the highest percentage of no-till entries. Agronomic and economic comparison of the doublecrop irrigated production system are presented since this system comprises the largest number of both no-till and conventional tillage fields (13 fields apiece) (Table 1).

MATERIALS AND METHODS

Twenty-six commercial soybean fields enrolled in SRVP were planted in a doublecrop irrigated production system between 1993 and 1997. Thirteen of these fields were planted no-till with the other thirteen planted using conventional tillage practices. The field size, planting date, row spacing, number of cultivations and yield are listed for these fields in Table 2.

Weed control was achieved with a variety of herbicides. Only one of the no-till planted fields received cultivation for weed control with eight of the conventional planted fields receiving at least one cultivation (Table 2).

Yields on the SRVP fields were calculated from weigh tickets and field size where possible. In some fields weigh wagons were used to determine yields. The yields reported are based on 13% moisture.

All operations and inputs into a field were compiled for economic evaluation. The budgets for each field were generated with the Mississippi State Budget Generator (MSBG) developed by Spurlock and Laughlin (1992). The MSBG is a computer-based budgeting program that estimates costs and returns for specified crop or livestock enterprises (Windham and Brown, 1998). The program contains data regarding the input quantities and prices as well as output levels and prices. Operating costs (seed, fertilizer, chemicals, fuel, labor and repairs) and ownership costs (depreciation, interest, taxes and insurance) were estimated for all SRVP fields on a per acre basis. Production costs for all the fields were recalculated using a constant set of equipment and input prices. This procedure eliminates many of the market influences that affect production costs but were unrelated to the production technology being evaluated.

RESULTS AND DISCUSSION

No-till represents another viable management tool for soybean producers in Arkansas to increase net returns from soybean. No-till practices have been used in a higher percentage of fields planted in the early-season or doublecrop production system. The average no-till doublecrop irrigated soybean yield during the period from 1993 to 1997 was 43.6 bu/acre. The conventionally tilled fields averaging 41.9 bu/acre (Table 2).

Comparisons between the no-till and conventionally tilled fields indicate that the no-till fields on average were smaller in size, 54 verses 65 acres, respectively, while the planting date for the no-till fields averaged four days earlier. The rows were also narrower in the no-till fields compared to the conventionally tilled fields, averaging 9.9 in. verses 23.5 in., respectively. The more narrow row spacing in the no-till fields undoubtedly was responsible for the fewer cultivations when compared to the conventionally tilled fields.

Table 3 indicates that the no-till SRVP fields had an average operating cost of $115.02/acre while the averaged operating costs for the conventionally tilled fields

[1]First and third authors are with Agron. Sec., Coop. Ext. Ser., Univ. of Ark., located at Little Rock, AR., second author is with Agron. Sec., Coop. Ext. Ser., Univ. of Ark., located at Monticello, AR., and other authors are with Agric. Econ. Sec., Coop. Ext. Ser., Univ. of Ark., located at Little Rock, AR.

were $124.42/acre. No-till fields reflected a higher operating cost in both seed and custom work, while conventionally tilled fields reflected higher operating costs for fertilizer, operating labor, irrigation labor and repair and maintenance (Table 4). Similar costs between the two methods were obtained with seed treatment, herbicide, diesel and interest. Herbicide costs were the highest operating cost for both systems.

Additionally, Table 3 depicts that ownership costs were similar with no-till fields having a $50.17/acre charge verses a $51.46/acre charge for conventionally tilled fields. The total costs (operating plus ownership) averaged $165.18/acre for the no-till fields and $175.88/acre for the conventional fields.

A ten-year average soybean price of $6.29/bu was used plus a 25% cropshare land rent for economic evaluation. Net returns for no-till were higher, with an average return of $40.61/acre while net returns for conventional till above total costs and land rent averaged $21.78/acre.

In addition, no-till offers many advantages to management in soybean production. These include planting earlier than would have been possible with tillage and the ability to save soil moisture at planting (especially beneficial in a doublecrop situation). This conservation of moisture will increase the chance of the crop obtaining a stand and even producing acceptable height prior to the first irrigation. A no-till cropping system also reduces soil loss from the field and protects the quality of area surface water.

CONCLUSIONS

The SRVP no-till fields were successful in lowering specified operating and ownership cost without losing yield potential. Operating and ownership costs were lower in no-till SRVP fields than in tilled fields. Yields of the no-till fields were slightly higher than those of the conventionally tilled fields. A quicker turn around in planting soybeans after wheat was achieved when planting no-till which can aid in establishing an adequate plant stand.

No-till also offers soybean producers an additional management tool. The use of no-till does allow quicker planting and better use of soil moisture when moisture is limited. Preservation of top soil and surface water are also gained from no-till soybean production.

LITERATURE CITED

Ashlock, L.O., R.A. Klerk, J.D. Beaty and T.E. Windham. 1997. Arkansas Soybean Research Verification Program. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkansas.

Ashlock, L.O., R.A. Klerk, W.L. Mayhew and T.E. Windham. 1996. Arkansas Soybean Research Verification Program. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkansas.

Ashlock, L.O., R.A. Klerk, W.L. Mayhew and T.E. Windham. 1995. Arkansas Soybean Research Verification Program. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkansas.

Ashlock, L.O., R.A. Klerk, W.L. Mayhew and T.E. Windham. 1994. Arkansas Soybean Research Verification Program. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkanss.

Ashlock, L.O., R A. Klerk, W.L. Mayhew and T.E. Windham. 1993. Arkansas Soybean Research Verification Program. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkansas.

Mayhew, W.L., R.A. Klerk, N.V. McKinney and T.E. Windham. 1995. No-till production in the Soybean Research Verification Program. Conservation Technology in Arkansas Agriculture 1993. Research Series 442:25-29.

Spurlock, S.R., and D.H. Laughlin. 1992. Mississippi State budget generator user's guide version 3.0. Agricultural Economics Technical Publication No. 20 Mississippi Agr. and Forestry Exp. Sta., Mississippi State, Mississippi.

Windham, T.E., and C.D. Brown. 1998. Estimating 1998 Production Costs in Arkansas: Soybeans. Extension Technical Bulletins 491-498. Cooperative Extension Serv., Univ. of Arkansas, Little Rock, Arkansas.

Table 1. Number of Soybean Research Verification Program fields under different production systems with no-till and conventional tillage practices. 1993-1997.

	Dryland		Irrigated	
	No-Till	Conventional	No-Till	Conventional
Early Season	3	1	1	0
Full Season	1	15	3	43
Double-crop	7	2	13	13

Table 2 is on the following page.

Table 3. Number of doublecrop irrigated Soybean Research Verification Program fields from 1993 to 1997 with average yield, operating cost, ownership, total cost, net return and net return with 25% land rent charge.

Item	No-Till	Conventionally Tilled
Number of Fields	13	13
Yield (bu/acre)	43.6	41.9
Operating Cost ($/acre)	$115.02	$124.42
Ownership Cost ($/acre)	$ 50.17	$ 51.46
Total Cost ($/acre)	$165.18	$175.88
Net Return ($/acre)	$109.21	$ 87.67
Net Return +25% Land Rent Charge ($/acre)	$ 40.61	$ 21.78

Table 4. Inputs of operating cost for doublecrop irrigated Soybean Research Verification Program fields from 1993-1997.

Item	No-Till	Conventionally Tilled
	----------$/acre----------	
Seed	$16.40	$14.48
Custom Work	$17.14	$13.72
Fertilizer	$ 8.69	$11.53
Seed Treatment	$ 1.33	$ 1.23
Herbicide	$34.21	$31.91
Operating Labor	$ 4.15	$ 7.33
Irrigation Labor	$ 4.24	$ 5.56
Diesel	$12.17	$13.33
Repair and Maintenance	$12.95	$16.27
Interest	$ 3.11	$ 3.58
Total	$114.39	$118.94

Table 2. County, field size, planting date, row spacing, number of cultivations and yields of SRVP fields in doublecrop irrigated production systems. 1993-1997.

No-Till					
County (Year)	Field Size	Plant Date	Row Space	Number of Cultiv.	Yield
	acre		in.		bu/acre
Jefferson (93)	90	6-21	19	1	39.5
Lonoke (93)	50	6-14	19	0	36.6
Prairie (93)	60	6-14	7.5	0	54.6
Jackson (94)	35	6-18	13	0	46.0
Jackson (95)	35	6-24	8	0	41.5
Lonoke (95)	40	6-12	7.5	0	49.1
Pulaski (95)	31	6-8	7	0	37.6
Lonoke (96)	50	6-17	7.5	0	42.0
Poinsett (96)	56	6-24	7.5	0	32.1
Pope (96)	37	6-15	7.5	0	54.0
Pulaski (96)	50	6-14	7.5	0	35.1
Craighead (97)	38	6-25	10	0	46.5
Lee (97)	125	6-23	7.5	0	52.8
Average	54	6-18	9.9	0.1	43.6
Conventional Tillage					
County (Year)	Field Size	Plant Date	Row Space	Number of Cultiv.	Yield
	acre		in.		bu/acre
Arkansas (93)	49	6-30	14	0	41.5
Lincoln (93)	30	6-22	15	2	23.3
Poinsett (93)	135	6-21	30	1	35.2
Randolph (93)	55	6-22	30	2	52.8
Arkansas (94)	53	6-17	30	3	39.3
Jefferson (94)	45	6-19	19	0	35.2
Lincoln (94)	30	6-27	30	1	36.7
Prairie (94)	109	6-25	30	2	52.4
Lincoln (95)	40	6-13	38	3	42.4
St. Francis (95)	130	6-19	7	0	45.8
Cross (96)	53	6-24	15	0	43.2
Independence (96)	34	6-18	15	0	51.6
Arkansas (97)	80	6-24	32	2	45.4
Average	65	6-22	23.5	1.2	41.0