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THREE YEARS EXPERIENCE WITH LIMITED SEEDBED/CHEMICAL TILLAGE COTTON PRODUCTION IN MISSISSIPPI, 1999-2001

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Abstract

Observations from 21 producers indicate that a limited seedbed/chemical tillage system of production may be superior to the standard method of cotton production.

Introduction

Researchers in the Department of Agricultural Economics, Mississippi State University, in cooperation with scientists at other locations and other agencies began investigating alternative systems of cotton production during the 1999 production season [Parvin and Cooke 1999]. Initial research efforts focused on no-till cotton production [Parvin and Cooke 2000] and ultra-narrow row cotton production systems [Parvin, Cooke, and Molin].

Past cotton research [Spurgeon] in Mississippi has consistently shown that much of Mississippi's cotton soils respond to deep tillage (especially subsoiling). Surveys designed to measure differences in no-till and ultra-narrow production systems indicated an emerging system of production which the authors labeled "limited seedbed/chemical tillage" (LS/CT). These systems combine deep tillage and no-till systems of production. They are uniquely efficient in a cotton/corn rotation since the deep tillage can be completed in the fall after corn harvest.

Limited Seedbed/Chemical Tillage

LS/CT systems are built around chemical cultivation after emergence and maintenance of old seedbeds. In these systems, down the row deep tillage tends to replace subsoiling at a 45-degree angle to the row. These systems may or may not employ genetically modified varieties and preplant herbicides. Like UNRC, no-till, and skip-row systems, this approach reduces labor and items correlated with labor, such as tractors, towed equipment, fuel, and repairs.

To date, most LS/CT systems surveyed have involved para-tilling down the row. On most farms, para-till tools are smaller (row width) than the planter. In such cases, rehipping prior to planting is a common practice. However, some producers have larger para-till tools, such as 8-row 40 inch and 12-row 30 inch, which deep till, hip, and often roll in a single pass or trip over the field.

Methodology

During the 2000 and 2001 production season, detailed information on every trip across the field was taken from commercial operations that employed LS/CT cotton production techniques on all or a significant part of their acreage. Sample size was 11 in 2000 and ten in 2001. Actual yields were recorded. The information was utilized to construct per acre budget tables for each of the operations by employing the Mississippi State Budget Generator [Laughlin and Spurlock]. Readers interested in the details of every "trip-over-the-field" for each producer are directed to the annual publications [Parvin, et al 2001; Parvin, Cooke, and Martin].

The Department of Agricultural Economics, Mississippi State University, releases estimates of the per acre cost of producing cotton on an annual basis. The department's standard cotton budget labeled "Solid cotton, sandy soil, 8R-40" usual practices, Delta Area" for the 2000 season [Parvin, et al 1999] and 2001 season [Parvin, et al 2000] was employed to compare net returns above total specified expenses for the standard method of production and the LS/CT operations. Cotton lint was priced at $0.61 per pound in 2000 and $0.58 in 2001. The price of seed is fixed at $0.05 per pound.

2000 Results

Variety
The standard budget employs a conventional cotton variety. Three of the 11 growers sampled employed conventional varieties. One grower utilized a Bt variety and seven growers used stacked gene varieties or BtRR varieties [Parvin, et al 2001].

Insect Control Costs
The standard budget indicates a seed cost of $9.40 per acre, no seed technology fee, and an insecticide material cost per acre of $91.13 for a total of $100.53 per acre. The average for the 11 growers was $23.27 less or $77.26.

Yield
The standard budget reflects a yield of 825 pounds of lint per acre. Six of the 11 growers experienced yields which were less than the standard, but on average the LS/CT growers out-yielded the standard by 85 pounds of lint per acre. Of the 11 growers sampled, the highest yield was 1,240 and the lowest yield was 679 pounds of lint per acre.

Fertilizer Cost
The cost of fertilizer is estimated at $36.96 for the standard and ranged from $8.39 to $37.50 for the 11 growers sampled. The sample averaged $24.21 or 34.5% less than the standard.

Herbicide Cost
The lowest herbicide cost observed for the 11 growers sampled was $28.79 and the highest was $91.86. The 11 growers averaged $44.47 compared to the standard of $35.27. Six of the 11 growers experienced herbicide costs less than the standard.

Operator Labor Cost
These costs are related to the number of trips over the field, performance rates associated with the tools employed, and whether or not the cotton is scrapped or harvested twice. Four of the 11 growers sampled did scrap cotton in the year 2000. The sample averaged $14.73 compared to the standard estimate of $17.07, a reduction of 13.7%.

Fuel Cost
Seven of the 11 growers sampled experienced fuel costs less than the standard. The sample averaged $8.83 compared to the standard estimate of $9.79 (an improvement in per acre fuel cost of 9.8 percent).

Direct Expenses
Ten of the 11 growers sampled experienced direct expenses less than the standard. On average, direct expenses were $62.43 lower ($396.90 versus $459.33) for the sample than for the standard (an improvement of 13.6 percent).

Fixed Expenses
Estimated fixed expenses for the sample ranged from a low of $56.59 to a high of $96.90 per acre. The average for the 11 growers sampled was $4.71 less than the standard.

Net Returns
Net returns (returns above specified expenses or returns above direct expenses plus fixed expenses) for the sample ranged from a low of $11.92 to a high of $391.35 per acre compared to $37.05 for the standard. Ten of the growers sampled outperformed the standard. On average, the 11 growers sampled experienced estimated net returns of $163.72, or $126.67 more than the standard.

2001 Results

Variety
The standard budget utilized a conventional variety. Nine of the ten growers sampled employed BtRR varieties.

Insect Control Cost
The standard indicates $98.85 per acre versus an average of $71.72 per acre for the sample.

Yield
The sampled averaged 902 pounds of lint per acre. An improvement of 77 pounds per acre or 9.3% more than the standard.

Fertilizer Cost
The lowest fertilizer cost observed for the 12 growers was $28.95 and the highest was $79.00. The sample averaged $47.59 compared to the standard of $50.18.

Herbicide Cost
The sample ranged from $11.18 to $56.61 with an average of $28.61. The average is $7.16 or 20.0% less than the standard.

Operator Labor Cost
The sample was 40.6% more efficient than the standard.

Fuel Cost
On average, the sample improved fuel use by 36.1%.

Direct Expenses
All of the 12 growers experienced direct expenses less than the standard. On average, they were $110.18 or 22.7% below the standard (Table 2).

Fixed Expenses
Average fixed expenses for the sample were 28.2% less than the standard.

Net Returns
The estimated net returns for the standard was a negative $27.10. One net return for the sample was negative, the maximum was $293.28, and the average was $184.62 per acre more than the sample.

Limitations

2000 and 2001 were years with below average insect control costs. The standard budget reflects average insect control costs. The sample of 11 plus 10 or 21 LS/CT growers is small and may not accurately represent the potential population of LS/CT producers.

Conclusions

Reasonable individuals can argue about how much of the difference in net returns is due to differences in soil type, variety, insect pressure, weed populations, and production system. However, these limited observations indicate that the LS/CT system of production may be superior to the standard system of production.

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Table 1. Yield (pound of lint per acre), variety type, selected cost items, by tillage system, Mississippi, 2001

Tillage System	Yield lb/acre	Variety	Seed + Tech.	Fert.	Herb.	Insect.	Op. Labor	Fuel	Repair + Maint.
				----------		dollars	----------		
Standard LS/CT	825	Conv.	9.70	50.18	35.77	89.15	16.94	19.24	36.84
01	940	BtRR	52.68	79.00	11.18	19.82	11.38	12.52	27.25
02	835	BtRR	52.68	79.00	25.19	13.79	8.73	9.47	24.40
03	1100	Conv.	8.73	56.08	56.61	12.58	9.56	9.44	24.73
04	905	BtRR	53.30	40.93	28.07	19.14	8.62	19.99	29.17
05	932	BtRR	51.45	33.30	25.68	0.00	9.38	10.04	24.43
06	606	BtRR	48.99	28.95	23.35	16.17	11.71	13.19	28.25
07	1033	BtRR	53.30	39.08	29.88	47.87	11.58	12.94	27.63
08	747	BtRR	54.53	52.49	31.70	37.84	12.37	17.60	29.14
09	1060	BtRR	49.61	34.68	31.10	68.45	7.77	7.77	17.81
10	864	BtRR	52.07	32.37	23.35	4.22	9.51	10.03	24.79
Average	902	-----	47.73	47.59	28.61	23.99	10.06	12.30	25.76

Table 2. Yield (pound of lint per acre), variety type, direct and fixed costs and net returns (dollars per acre) by tillage system, Mississippi, 2001.

Tillage System	Yield lb/acre	Variety	Direct Expenses	Fixed Expenses	Net Returns
			----------	dollars	----------
Standard LS/CT	825	Conv.	485.63	83.91	-27.10
01	940	BtRR	401.94	60.21	155.88
02	835	BtRR	368.12	53.02	127.84
03	1100	Conv.	376.63	53.32	293.28
04	905	BtRR	390.05	78.88	126.10
05	932	BtRR	320.42	53.80	238.58
06	606	BtRR	307.79	62.26	28.37
07	1033	BtRR	412.91	61.83	204.44
08	747	BtRR	430.72	84.38	-23.95
09	1060	BtRR	431.11	40.06	225.76
10	864	BtRR	314.79	54.34	198.93
Average	902	-----	375.45	60.21	157.52