

WEED CONTROL WITH "LOW" AND "NORMAL" INPUT PRACTICES IN NO-TILL AND CONVENTIONAL-TILL COTTON.

H. R. Hurst¹

Producers are always interested in producing a crop at the lowest cost while maintaining or increasing net returns. Input practices for weed control in cotton can often account for 15 to 20% of the total dollars spent. Increased interest is being shown in the adoption of reduced tillage practices by Mississippi Delta cotton farmers. This study was initiated to evaluate the long-term effects of reducing input practices for weed control with both no-till and conventional-till systems.

METHODS

The study was conducted on a silt loam soil site (28% sand, 56% silt, 16% clay, 5.9 pH, 0.8% organic matter) at the Delta Research and Extension Center at Stoneville, MS, during 1990-1993. No irrigation was used. Four treatments were used; a "low" and "normal" combination of mechanical and/or chemical weed control practices for no-till or conventional-till cotton. Mechanical practices are listed in Table 1 and herbicide applications are listed in Tables 2 and 3. Generally, it was the objective to apply herbicides on a 20-inch-wide band on the row with the "low" treatment in conventional-till and reduce the application rate by 21 to 33% from "normal." The conventional-till "normal" herbicide treatment was applied on a 20-inch-wide band also (except PPI Treflan + Zorial) at the recommended rate. Mechanical seedbed preparation and in-season cultivation with the "low" conventional-till treatment used 1 or 2 fewer operations per year when compared with the "normal" treatment. The no-till herbicide treatments were applied broadcast. The "low" herbicide treatment rates with no-till were 21 to 33% less than the "normal" (recommended) rate. All herbicides were applied with tractor-mounted spray equipment in a broadcast volume of 20 gallons per acre (except Roundup in 10 gallons per acre). A four-row boom sprayer was used for over-the-top applications and directed applications were made using a four-row Dickey cultivator with spray shields. Individual plots were four, 40-inch-wide rows 40 feet long.

¹Mississippi Agricultural & Forestry Expt. Sta., Delta Research & Extension Cen., Stoneville. MS.

Treatments were established on the same area each year. The experimental design was a randomized complete block with four replications.

Johnsongrass counts were determined in mid-July of 1992 and 1993 from an area 20 inches by 40 feet centered on an inside row in no-till plots and from an area 12 inches by 40 feet centered on an inside row in conventional-till plots. Visual control estimates, where 0% = no control and 100% = complete control, were made during the winter and summer months for evaluation of weed response. Cotton stand was determined by counting the number of plants on an inside row in each plot and is presented in plants per acre in thousands. Seed-cotton yield was determined by mechanically harvesting the two center rows of each plot one time each fall. 'DES 119' cotton seed were planted on April 24, 1990; April 26, 1991; April 30, 1992; and May 6, 1993. The no-till area had to be replanted on May 7, 1990 and May 13, 1991 due to less than adequate stand. After replanting, the final 1991 stand was very good but was too low in 1990 for maximum yield with the "low" input treatments.

RESULTS

Cotton stand was not different between any treatment in 1991 or 1993 (Table 4). In 1992, the "normal" input conventional system stand was greater than the other systems but the stand with all systems was large enough for maximum yield without irrigation. In 1990, only the stands with the "normal" conventional-till and no-till systems were sufficient for maximum yield. The stands with the "low" conventional-till and no-till systems were only about 75% of that desired. This was due to early season weed competition, mainly broadleaves.

Seed cotton yield in 1990 with "low" and "normal" no-till was lower than "normal" conventional-till (Table 5). "Low" conventional-till yield was higher than "low" no-till. Yield was very good in 1991 with all treatments. The "normal" conventional-till yield was greater than the "low" no-till with the others intermediate. In 1992 and

1993, yield with the "normal" conventional-till system was greater than the "low" conventional-till. In 1992, yield with this system was greater than the "low" no-till system, however this was not true in 1993. The very low yield in 1992 with the "low" input conventional-till system was caused by a very large population of horseweed which was not controlled at planting. Broadleaf weed control was very poor during the entire summer (Tables 8, 9). In 1993, yield with the "low" conventional-till treatment was less than with the "normal" conventional-till [Table 5]. This was largely due to the lack of johnsongrass control in mid-and late-season (Table 10). Seed cotton yield with both input treatments in no-till was intermediate.

CONCLUSION

During 1990-1993, in this area where weed problems abounded, it was difficult to produce high yields without using weed control input practices that are considered to be "normal" (those currently recommended). Reducing herbicide rates on no-till cotton was not as detrimental as reducing herbicide rates and using reduced tillage for conventional-till cotton.

Table 1. Mechanical operations with conventional tillage.

Operation	Input	
	Low	Normal
	-----1990-----	
Subsoil	--	--
Disk	4/20	4/20
Hip	12/1/89, 4/20	12/1/89, 4/20
Bed conditioner	--	--
Cultivate	5/17, 5/30, 6/8, 6/20	5/17.5/30, 6/8, 6/20
	-----1991-----	
Subsoil	--	11/1/90
Disk	3/11	3/11, 3/13 (2X)*
Hip	11/7/90, 3/13	11/7/90, 3/13
Bed conditioner	4/25	4/25
Cultivate	5/31, 6/12, 6/20	5/31, 6/12, 6/20, 6/28
	-----1992-----	
Subsoil	--	10/10/91
Disk	--	--
Hip	11/13/91	11/13/91, 3/27,
Bed conditioner	4/29	3/17, 3/27, 4/29
Cultivate	5/12, 6/1, 6/22	5/12, 6/1, 6/22, 7/2
	-----1993-----	
Subsoil	--	11/9/92
Disk	11/16/92	11/16/92
Hip	2/1	2/1
Bed conditioner	3/10	3/10, 4/14
Cultivate	5/31, 6/30	5/31, 6/30

* Two times.

Table 2. Herbicide applications with conventional tillage (band-applied).

Herbicide	Date applied				Broadcast rate (lb ai/Acre)	
	1990	1991	1992	1993	Low	Normal
Treflan + Zorial'	3/21	3/13	3/27	4/14	--	0.75 + 0.75
Cotoran + Zorial	4/24	4/26	4/30	5/6	1.0 + 1.0	1.5 + 0.75
Fusilade (OT)	--	--	--	7/2	0.15	--
Caparol (DIR)	--	5/31	--	--	0.375	0.5
Caparol + Bueno (DIR)	6/11	--	6/2	5/31	0.375 + 1.5	0.5 + 2.0
Bladex + Bueno (DIR)	6/21	6/12	--	--	0.45 + 1.5	0.6 + 2.0
Karmex (DIR)	7/6	7/1	7/9	7/9	--	1.0

* Broadcast.

Table 3. Herbicide applications with no tillage (broadcast applied).

Herbicide	Date applied				Broadcast rate (lb ai/Acre)	
	1990	1991	1992	1993	Low	Normal
Gramoxone		--	4/30	4/22	0.5	0.94
Gramoxone + Karmex	2/14	--	--	--	0.5	0.94 + 0.5
Gramoxone + Bladex	--	4/23	--	4/22	--	0.94 + 1.0
Roundup D-Pak	--	2/28	3/2	2/22	0.5	0.67
Cotoran + Zorial	4/24	4/26	4/30	5/6	1.0 + 1.0	1.5' + 1.5
Fusilade (OT)	5/8	5/16	5/19	5/14, 7/2	0.15	0.188
Caparol (DIR)	--	5/31	--	--	0.375	0.5
Caparol + Bueno (DIR)	6/11	--	6/2	5/31	0.375 + 1.5	0.5 + 2.0
Bladex + Bueno (DIR)	6/21	6/12	--	--	0.45 + 1.5	0.6 + 2.0
Staple (OT)	--	--	6/22	5/14, 7/2	0.05	0.05
Karmex (DIR)	7/6	7/1	7/9	7/9	--	1.0

*Roundup 0.5 lb/A added in 90.

Table 4. Effect of weed control inputs on cotton stand.

Tillage	Input level	Plants/Acre*			
		1990	1991	1992	1993
		------(1,000's)-----			
Conv.	Low	21.5 b	48.1 a	30.5 b	36.9 a
Conv.	Normal	34.4 a	50.6 a	46.3 a	48.4 a
None	Low	21.2 b	51.2 a	33.2 b	44.4 a
None	Normal	29.4 ab	54.2 a	33.2 b	47.2 a

* Values within the same column with the same letter are not different according to DMRT (P = 0.05).

Table 5. Effect of weed control inputs on yield.

Tillage	Input level	Seed cotton*			
		1990	1991	1992	1993
		------(lb/A)-----			
Conv.	Low	2107 ab	3825 ab	1086 c	1397 b
Conv.	Normal	2491 a	3961 a	3295 a	2555 a
None	Low	817 c	2669 b	2044 b	2177 ab
None	Normal	1568 b	2937 ab	2527 ab	2269 ab

* Values within the same column with the same letter are not different according to DMRT (P = 0.05).

Table 6. Winter Weeds, % Control.*

Date	Weed	No-Till		Conventional	
		Low	Normal	Low	Normal
2/28/90	Eveningprimrose	52.5 b	85.0 a		
	Henbit	91.3 b	99.5 a		
	Horseweed	67.5 b	90.0a		
	Venus Lookingglass	30.0 a	53.8 a		
4/12/90	Eveningprimrose	12.5 b	86.3 a		
	Henbit	92.5 a	98.0 a		
	Horseweed	45.0 b	86.3 a		
	Venus Lookingglass	22.5 a	70.0 a		
3/12/91	Grass	94.5 b	99.5 a	95.0 b	95.0 b
	Broadleaf	81.3 c	90.0 b	95.0 a	95.0 a
3126191	Grass	100.0 a	100.0 a	95.0 b	100.0 a
	Broadleaf	82.5 c	94.8 b	91.3 b	100.0 a
3/4/92	Grass + Broadleaf	63.8 a	75.0 a	53.8 a	80.0 a
3/24/93	Grass	98.0 ab	98.5 a	90.0 c	94.5 bc
	Broadleaf	68.8 c	75.0 bc	92.0 ab	98.5 b
417193	Grass	100.0 a	100.0 a	80.0 b	97.5 a
	Broadleaf	53.8 c	73.8 b	81.3 b	97.8 a

* Values in the same row with the same letter are not different according to DMRT (P = 0.05).

Table 7. Summer Annual Grass, % Control.*

Date	Conventional		No-Till	
	Low	Normal	Low	Normal
6/13/90	90.0 b	98.0 a	80.0 c	96.5 a
7/11/90	91.3 ab	98.0 a	46.3 c	81.3 b
7/30/90	80.0 b	96.5 a	53.8 c	92.5 a
5/28/91	68.8 b	97.3 a	97.3 a	98.0 a
6/19/91	76.3 b	98.0 a	94.5 a	98.0 a
7/15/91	88.3 c	100.0 a	93.3 bc	96.5 ab
6/16/92	81.3 bc	95.8 a	68.8 c	87.5 ab
6/9/93	91.3 c	100.0 a	96.5 b	97.8 b
6/23/93	76.3 b	100.0 a	97.8 a	98.3 a
7/8/93	86.3 b	97.3 a	98.0 a	97.3 a

• Values in the same row with the same letter are not different according to DMRT (P = 0.05).

Table 8. Summer Annual Broadleaf, % Control.*

Date	Conventional		No-Till	
	Low	Normal	Low	Normal
6113/90	87.5 ab	98.0 a	40.0 c	62.5 bc
7111/90	83.3 ab	98.0 a	33.8 c	71.3 b
7/30/90	75.8 ab	97.3 a	35.0 c	61.3 bc
5128191	56.3 b	89.5 a	63.8 ab	63.8 ab
6/19/91	65.0 a	93.5 a	77.5 a	67.5 a
7/15/91	83.8 b	100.0 a	75.0 b	73.3 b
6/16/92	45.0 b	88.8 a	57.5 b	55.0 b
6/9/93	75.0 b	99.0 a	96.3 a	88.3 ab
6/23/93	52.5 a	95.0 a	85.8 a	77.5 a
718193	61.3 b	96.0 a	89.5 a	87.0 a

* Values in the same row with the same letter are not different according to DMRT (P = 0.05).

Table 9. Summer Annual Broadleaf + Grass, % Control.*

Date	Conventional		No-Till	
	Low	Normal	Low	Normal
6/25/90	88.8 a	98.3 a	42.5 b	61.3 b
5120192	50.0 b	95.3 a	26.3 b	48.8 b
7/1/92	33.8 c	94.5 a	66.3 b	61.3 b

* Values in the same row with the same letter are not different according to DMRT (P = 0.05).

Table 10. Johnsongrass, population and % control.

	Population*		Control*					
	7/13/92	7/15/93	6/13/90	6/19/91	7/15/91	3/30/92	5/31/93	7/14/93
	----- (Plants/133.3 ft ²) -----		----- (%) -----					
<u>Conventional</u>								
Low	144.3 a	23.4 a	0 b	15 b	99 a	51 b	100 a	61 b
Normal	21.8 b	9.0 ab	24 ab	0 b	100 a	97 a	100 a	100 a
<u>No-Till</u>								
Low	88.0 ab	0.8 b	61 a	80 a	53 b	91 a	86 b	95 a
Normal	58.5 ab	0.4 b	60 a	87 a	87 a	91 a	91 a	98 a

* Values within the same column with the same **letter** are not different according to DMRT (P = 0.05).