A LOOK AT CRP LAND: RETURNING TO COTTON PRODUCTION

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Abstract

Producers need options for tillage production systems to use when Conservation Reserve Program (CRP) contracts expire. A study was conducted on the Brown Loam soils on North Misssissippi to evaluate production practices for cotton on land in sod managed similar to those in CRP. Tillage practices used for the trials were 1) Fall Hipped and rehipped the next spring; 2) Spring hipped and rehipped two weeks later; 3)Conventional tillage [disk, chisel, disk, hipped]; 4) No-till; 5)No-till+cultivate at four and eight weeks after planting. There was a 12% reduction in plant population for the plots that were planted no-till versus those that had at least one spring tillage. Plant were shorter and canopy closure later for the no-till planted plots. Weed population was higher at the end of the growing season for the no-till planted plots versus the plots that had a least one spring tillage.Residue levels were below 30% at planting for all the plots that had at least one spring tillage.

Introduction

Can former Conservation Reserve Program (CRP) land be successfully returned to row crop production? Which cultural practices will be accepted by National Resource Cconservation Service (NRCS) on former CRP land to meet conservation compliance? These are questions to which producers need answers as CRP contracts expire. Even though, over the past 5 years 7corn and soybean grown on hill lands similar to those in CRP acreage have been profitable. Cropping history has shown land similar to many CRP acreage generally is low in productivity when planted to corn or soybeans.

In the past two years cotton prices have increased to levels which makes cotton a logical choice if CRP land is to return to row crop production. The soils are ideal in texture and structure for cotton production and the climate more conducive to cotton production than either corn or soybeans. A study was started in the fall of 1992 on Brown Loam Soils to evaluate tillage practice for CRP land returning to cotton production, with particular emphasis on the first year out of the reserve program.

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Materials and Methods

Three sites treated in the similar manner as CRP land prior to the beginning of this study, were selected for the tillage trials. Tillage trials were conducted on site 1 in 1993; on site 2 in 1994; and on site 3 in 1995 to test the effects cultural practices have on cotton production after an extended period of time in sod.

Experimental design was a randomized complete block with five replications. Tillage treatments were: (1) fall hipped and rehipped the next spring; (2) no-till; (3) conventional tillage [disk-chisel, disk, hip]; (4) no-till planted with two cultivations in season; (5) spring hipped and rehipped after first hipping.

Roundup (2 lb ai/acre) was applied as a burn down treatment over the entire study site in the fall before any tillage practice was performed. A second Roundup application was made in the following spring on the no-till planted plots (Trt. 2 and 4). Dual (0.5 lb ai/acre) and Cotoran (0.75 lb ai/acre) were applied preemergence broadcast immediately after planting on all plots. The cotton was planted on April 29, 1993, for site 1; and on May 11, 1994 for site 2; and May 10, 1995 for site 3. Measurements of plant height, canopy cover, residue cover, and percentage weeds were made during the growing season for all sites. Cultivations were made using a no-till cultivator about 4 and 8 weeks after planting on treatments 3 and 4. An early post-directed spray was made using MSMA (1.5 lb ai/acre) and Cotoran (0.75 lb ai/acre). A layby treatment was made using Bladex (0.5 lb ai/acre) plus 1% surfactant (v/v).

Insecticide treatments were started in early June with a pinhead square boll weevil application and continued throughout the growing season as needed according to scouting reports made by personnel on the station. Cotton plots were defoliated in the fall when 60% of the bolls were opened. Harvest was made using a one-row cotton picker modified to harvest plots. After harvest the stalks were shredded with a rotary cutter. Residue counts were made after harvest using a transect line.

Results and Discussion

Fall hipped beds were inconsistent in shape and structure from year to year, mainly due to soil moisture at the time of hipping. In 1992 on site 1, the sod rolled during the fall hipping producing beds that were inverted sod rolls. These beds were rough and cloddy with large air pockets within the beds. A rehipping of the beds in the spring failed to improve the internal structure of the beds leaving rough and cloddy beds in which to plant. Fall hipping on site 2 in 1993 produced beds with better structure than on site 1 in 1992. After rehipping site 2 in the spring of 1994, the beds were less than ideal, yet, could be planted using a no-till planter. Fall hipping on site 3 in 1994 also produced beds

that had fair structure and suitable for planting after a spring rehipping in 1995. Even though not measured, field moisture was higher in the fall of 1992 during the hipping than the fall of 1993 or 1994 which could have attributed to the sod rolling during fall hipping.

Spring tillage operations consisting of hipping and conventional tillage practices which produced firm seedbeds. Soils of the Brown Loam will change in physical structure over the winter months depending on rainfall and amount of freezing and thawing that takes place. It is possible for traffic pans to disappear, bulk density to change and the soil to improve in tilth from the period of October to April. This could be the reason why spring tillage operations were accomplished with greater ease than the fall tillage.

Average plant population trended to be 12% higher (Table 1) for the treatments (1,3 and 5) which were tilled at least once during the spring compared to the treatments (2 and 4) which were planted no-till. Yet, the average population for all treatments were within the ideal population range of 35,000 50,000 plants per acre (McCarty, et. al) 1990, due to a high planting rate.

Plant growth and development, as measured by height and canopy coverage, in the no-till plantings lagged behind the plots that received at least one spring tillage operation until about mid-season (Table 2). However, after mid-bloom the height differential between plots having spring tillage and no-till planting was not evident, but canopy coverage over the row was evident for the plots that had no spring tillage.

Weed population was higher in the no-till (Trt. 2) and no-till+cultivate (Trt. 4) at 15 weeks after emergence than in the plots that had a spring tillage (Trt. 1, 3 and 5) (Table 3). Plots with no spring tillage (Trt. 2 and 4) had shorter plants with less canopy cover at 5 and 10 weeks after planting thereby allowing light to reach the ground, which would enhance weed seed germination resulting in higher weed infestation at the end of the growing season.

Ground cover at 3 weeks after planting was approximately 4 times greater in the no-till planted plots (Trt. 2 and 4) than for the plots that had spring tillage (Table 4). After the first cultivation, 4 weeks after planting, the residue level was reduced drastically by one-half in the no-till plot that was cultivated (Trt. 4) . This would indicate that the sweeping action of the no-till cultivator covered more of the residue and exposed more soil in the cultivation operation than was expected. Residue levels remained above 80% in the no-till plot throughout the growing season. In the treatments that had spring tillage (Trt. 1, 3, and 5) residue levels were below 30% in all treatments at planting. If residue cover is part of the conservation compliance guidelines and tillage is a necessary part of the farming operation, then some other form of tillage practice other than the ones used in this study will be necessary to maintain a 30% residue level.

Seed cotton yields were significant lower for the no-till+cultivate plots each year of the study (Table 5). Cultivation had a negative effect on the no-till yields (Trt.4) and cultivation produced no beneficial effects on plant growth and development that was measured in terms of plant height and canopy cover (Trt. 2 and 4).

Conclusion

The no-till planted plots had a lower plant population but not significant different compared to the plots with at least one spring tillage. However, the populations for the trials were within the recommended range. Plant height and canopy closure were the highest for plots that had at least one spring tillage and the lowest for the plots that had no spring tillage. Yields were significantly lower for the plots that were planted no-till and cultivated at 4 and 8 weeks after planting. Residue as ground cover decreased as number of tillage operations increased. Residue levels were below 30% at planting for all treatments that received at least one spring tillage operation; therefore, if a spring tillage is necessary some type of tillage other than the types used in this study will be needed to maintain a 30% residue cover at planting.

References

1. McCarty, William H., Alan Blaine and John D. Byrd. 1990. Cotton no-till production. Misssissippi Cooperative Extension Publication 1695, May 1990.

Table 1. Average plant population of cotton with different tillage practices at three weeks after emergence.

Tillage practice	Plant population /acre
Preplant Tillage	49,095
No Preplant Tillage	43,700
$LSD_{(0.05)}$	N.S.

Table 2. Average seasonal growth and development in plant height and canopy closure of cotton plants grown using different tillage practices.

	Plant Height				Canopy cover			
	1st sq	1st bl	Late bl	Open boll	1st sq	1st bl	Late bl	Open boll
	----------in----------				----------%----------			
Fall Hipped	14	43	44	42	21	84	75	34
No-Till	13	42	43	43	18	72	65	38
Conventional Till	16	42	42	40	27	81	72	32
No-Till + Cult.	13	39	41	42	16	75	67	27
Spring Hipped	14	38	40	42	19	79	71	27

Table 3. Average seasonal weed percentage in cotton grown using different tillage practices

Tillage Practices	Squaring	First bloom	Late bloom	Open boll
	----------%----------			
Fall Hipped	<1	2	3	4
No-Till	<1	5	11	12
Conventional Till	<1	1	2	2
No-Till + Cultivation	<1	4	10	10
Spring Hipped	<1	2	3	3

Table 4. Average seasonal residue in cotton plots with different tillage practices.

Tillage Practices	Pre-planting	Planting	Squaring	First bloom	Late bloom	Open boll
	----------%----------					
Fall Hipped	18	26	12	11	16	81
No-Till	100	98	60	56	63	92
Conventional Till	38	25	7	5	12	73
No-Till + Cultivation	94	98	27	22	32	72
Spring Hipped	47	24	14	10	17	75

Table 5. Average seed cotton yield of cotton grown using different tillage practices.

Tillage practices	1993	1994	1995	Total
Fall Hipped	1478	1830	1936	1748
No-Till	1462	1561	1936	1653
Conventional Till	1714	1530	1967	1737
No-Till + Cultivation	1252	1403	1792	1452
Spring Hipped	1714	1642	1917	1758
L.S.D. $_{(0.05)}$	245	280	n.s.	