ECONOMICS OF CONSERVATION TILLAGE PRACTICES

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Abstract

Because of extreme climate differences between the southeastern Cotton Belt region of the United States and south Texas, farmers are reluctant to adopt conservation tillage systems developed in the southeast United States. With a greater knowledge of the benefits and risks of conservation tillage practices under a subtropical, semi-arid environment, producers can make better decision regarding tillage practices. The objectives of this study were to 1) compare the effects of conventional moldboard tillage and conservation tillage on cotton yields and production costs; and 2) provide farmers with guidelines for implementing conservation tillage. Cotton lint yield and production economics as affected by tillage in a semi-arid subtropical environment was examined. Six producer fields were split and one-half of each was farmed using conventional tillage practices and one-half of each field was farmed using conservation tillage practices. Seeding rate, fertilizer, irrigation, insect management, and other production factors were the same for both tillage systems. Cotton average lint yields in the conservation tillage fields were 137 pounds greater than in the conventional tillage fields. Four of the sites had higher yields of up to 39% more lint in the conservation tillage fields, one site was equal and one site had a 3% lower yield with the conservation tillage. Production costs averaged $55/acre less in the conservation tillage fields and net returns averaged $129/acre more with conservation tillage compared with the conventional tillage methods. Results of this one year study apply to cotton following grain sorghum. Conservation tillage cotton can be produced with lower input costs and have equal or greater economic returns than the conventional moldboard plow tillage system.

Introduction

Conservation tillage is being adopted for grain sorghum and corn production practices in South Texas. An obstacle to cotton production with conservation tillage has been the lack of information available to producers on relative yield data and economics of using conservation tillage for South Texas compared with conventional tillage. Previously many producers used the moldboard plow and disk tillage system to destroy crop residue from the previous crop and to prepare a seedbed for the next crop. The moldboard plow was the most common method used to destroy post-harvest cotton stalks which can serve as food source for boll weevil populations which overwinter in South Texas. Conservation tillage production practices leaves most of the previous crop residue on the soil surface to provide a mulch for the soil, increase water infiltration rates into the soil, and decrease wind and water erosion. Even with these apparent benefits of using conservation tillage many producers are reluctant to adopt these practices due to lack of knowledge of the risks and economic benefits of using conservation tillage for cotton production. The objectives of this study were to 1) compare the effects of conventional tillage and conservation tillage in conservation tillage cotton yields and production costs; and 2) provide farmers with guidelines for implementing conservation tillage.

Materials and Methods

Cotton lint yield and production economics as affected by tillage in a semi-arid subtropical environment were examined. Six cotton producer fields were split and one-half of each was farmed using conventional tillage practices and one-half of each field was farmed using conservation tillage practices. Field size was from 18 to 30 acres. The previous crop from all fields was grain sorghum. Following harvest of the grain sorghum in June the crop was terminated with an over the top application of glyphosate (Roundup) or shredded, allowing grain sorghum regrowth to occur and then applying glyphosate to the actively growing grain sorghum. A pre-plant burndown application of glyphosate was applied prior to planting cotton in the spring for each conservation tillage field. Three of the producers used a sweep to define a larger water furrow between crop rows prior to planting and three did no tillage on the conservation tillage. Four of the fields which were conventional tillage had the following tillage treatment: shred the grain sorghum residue, heavy tandem disc, moldboard plow, tandem disc at least twice, form beds, and shape beds. Additional cultivation of crop beds were made from 2 to 4 times to control weeds during the fall, winter, and prior to planting the cotton in the early spring. Two of the conventional tillage fields used a deep chisel instead of a moldboard plow but all other field operations were the same. Seeding rate, fertilizer, irrigation and other production factors were the same for both tillage systems.

Results and Discussion

Cotton lint yield was calculated by machine harvesting the entire field of each tillage system and weighing the entire volume of lint after ginning from each field conventional and conservation tillage field. Cotton average lint yields (Table 1) in the conservation tillage fields were 137 pounds/acre more than in the conventional tillage fields. Four of the sites had higher yields of up to 39% more lint in

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:666-667 (1998)
National Cotton Council, Memphis TN

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Production costs for cotton up to seedling emergence time averaged $55/acre less in the conservation tillage fields (Table 2) than the conventional moldboard tillage fields. This reduced production costs was primarily a result of fewer trips over the field and using herbicides to manage weeds instead of mechanical tillage. Gross returns for seed, lint and the total gross returns (Tables 3, 4, and 5) averaged $106/acre more with conservation tillage compared with the conventional moldboard tillage methods. The higher gross returns was a result of higher yields on average in the conservation tillage fields when compared with the moldboard plow tillage fields.

Net returns were calculated by subtracting the total production and harvest costs, ginning, bags, ties, receiving and storage costs from the gross returns and an average $85/acre land use fee. No costs were included for interest on money used. The conservation tillage net returns (Table 6) for the six pairs of fields averaged $129/acre more than the conventional moldboard tillage fields. Higher net returns in the conservation tillage fields were a result of lower production costs and greater yields on average when compared with the conventional moldboard tillage fields. Even when yields were about the same or slightly less in the conservation tillage fields the net returns were higher due to reduced production input costs. Results of this one year study indicate that conservation tillage cotton production can be an economical alternative to the conventional moldboard plow and disc tillage systems traditionally used in the Lower Rio Grande Valley of Texas. Long term studies will be continued to show the effects over time of the differences between tillage systems used.

Table 1. Cameron County cotton lint yields in 1997 for six conventional moldboard plow fields compared with six conservation tillage fields located next to each conventional field.

Field Number	Conventional lbs/acre	Conservation Tillage lbs/acre
1	740	966*
2	711	796*
3	600	540
4	505	520
5	720	993*
6	720	1001*
Average	666	803

Table 2. Cameron County cotton production costs per acre from harvest of the previous crop to planting of the cotton crop with seed and pre-emergence herbicide costs included in 1997.

Field Number	Conventional dollars/acre	Conservation Tillage dollars/acre
1	$ 101	$ 53
2	$ 119	$ 41
3	$ 113	$ 41
4	$ 88	$ 39
5	$ 78	$ 45
6	$ 101	$ 53
Average	$ 100	$ 45

Table 3. Cameron County cotton gross seed returns based at $105 per ton in 1997.

Field Number	-------gross seed returns per acre-------	
	Conventional Tillage	Conservation Tillage
1	$ 78	$ 101
2	$ 75	$ 84
3	$ 63	$ 57
4	$ 53	$ 55
5	$ 78	$ 104
6	$ 78	$ 105
Average	$ 71	$ 84

Table 4. 1997 Cameron County Cotton Gross Lint Returns per acre based on $0.68 per pound of lint.

Field Number	---------Gross lint returns per acre---------	
	Conventional	Conservation Tillage
1	$503	$ 657
2	$483	$ 541
3	$408	$ 367
4	$343	$ 354
5	$490	$ 675
6	$490	$ 681
Average	$453	$ 546

Table 5. Cameron County cotton gross seed and lint returns per acre for 1997 based on seed at $105 per ton and lint at $0.68 per lb.

Field Number	Gross Returns --------lint and seed returns/acre----------	
	Conventional	Conservation Tillage
1	$ 581	$758
2	$ 558	$625
3	$ 471	$424
4	$ 396	$409
5	$ 568	$779
6	$ 568	$ 786
Average	$ 524	$630

Table 6. Net returns for conventional moldboard plow system and conservation tillage cotton production system in Cameron County during 1997 using a standard of $85/acre for land usage, $0.23/lb for cotton harvest, ginning, bag, tie, rec.,and storage. .

Field Number	---------- Net Returns/acre----------		
	Conventional	Conservation Tillage	Difference
1	$ 225	$ 398	$ 173
2	$ 190	$ 316	$ 126
3	$ 135	$ 174	$ 39
4	$ 107	$ 165	$ 58
5	$ 239	$ 421	$ 182
6	$ 218	$ 418	$ 200
Average	$ 186	$ 315	$129