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ECONOMIC COMPARISON OF CORN-COTTON AND SOYBEAN-COTTON ROTATIONS TO CONTINUOUS COTTON FOR CONTROL OF RENIFORM NEMATODE

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Abstract

It is estimated that 45-50 percent of Georgia's cotton acreage is infested with at least one species of potentially damaging nematodes. Nematodes are present and increasing in many soil locations. Faced with yield losses due to nematodes, cotton producers have decision alternatives. The producer may choose to alternate plantings annually with a non-host crop, continue to produce continuous cotton but with the aid of a nematicide, or use cover crops that will reduce nematode pressure. An objective of this study was to compare economic returns of alternative rates of aldicarb and crop rotations to continuous cotton. Study results show that in continuous cotton, increase use of aldicarb resulted in higher yield and net return. Corn-cotton and soybean-cotton rotations while resulting in lower nematode pressure and higher yields, produced lower net returns than the 2 best continuous cotton treatments. In the 2 years of the 4-year study in which corn was grown, yield was a respectable 171.5 bushels per acre. A corn yield of only 5-10 bushels per acre higher would have resulted in net returns equivalent to the best continuous cotton treatments. This may be achievable for some producers. Soybeans-cotton does not appear to be a profitable alternative to continuous cotton.

Introduction

Georgia cotton acreage has expanded from approximately 375,000 acres planted in the late 1980's and early 1990's to an average of 1.456 million acres from 1998-2001. Acreage of other crops (corn, soybeans, and to a lesser extent peanuts) has declined due to change in government programs or lack of competitive profitability to cotton.

It is estimated that 45-50 percent of Georgia's cotton acreage is infested with at least one species of potentially damaging nematodes (Brown, et. al.). Nematodes are present and increasing in many soil locations. This situation is compounded by the decline in acres of crops that could serve as non-host crops in a rotation with cotton. The exact number is unknown, but much of the state's cotton in grown continually in the same fields year after year. In this situation, nematodes can cause significant yield loss in cotton.

Faced with yield losses due to nematodes, cotton producers have decision alternatives. The producer may choose to (a) alternate plantings annually with a non-host crop, (b) continue to produce continuous cotton but with the aid of a nematicide, or (c) use cover crops that will reduce nematode pressure. There are no commercially available nematode-resistant cotton cultivars at present.

The objectives of this study were: (1) to determine and compare the effects of corn and reniform nematode resistant soybean on nematode population and cotton yield in a rotation with cotton, (2) compare alternative rates of aldicarb and the effect on nematode population and yield of continuous cotton, and (3) compare economic returns of corn-cotton and soybean-cotton rotations to continuous cotton.

Materials and Methods

The research was conducted on 2 farms in Jefferson County, Georgia over 4 years on sites with reniform nematode infestations. Tests were conducted on one farm in 1998-1999 and a second, different farm within the county in 2000-2001. On both sites, cotton had been planted the year before the test began.

The research consisted of 6 treatments of crop rotation - aldicarb combinations (Table 1). Each treatment was replicated 6 times. There were 4 cotton-cotton treatments each with varying amounts and timing of aldicarb application. The corn-cotton and soybean-cotton rotations received 5 pounds of aldicarb per acre in-furrow at planting in the year that cotton was produced.

The Net Return Above Variable Cost (RAVC = Crop Income - Variable Cost) was calculated for each of the 6 treatments each year of the study. Variable Cost included all cash operating expenses such as seed, fertilizer and lime, chemicals, custom application, scouting, irrigation application, machinery and equipment fuel and repairs, labor, operating interest, net ginning and warehousing (cotton), and drying (corn). These costs were taken from University of Georgia crop enterprise budget estimates (Givan, et. al.) and other similar economic analysis (Wigley, et. al.). These costs were adjusted for the amount and cost of aldicarb in the treatment and for yield.

Crop income was calculated as the average yield of the 6 replications for the treatment times the average price received by Georgia farmers for the crop (USDA-GASS 2001 and 2002, USDA 2002). All prices exclude loan deficiency payments (POP's or LDP's) if applicable and all other government payments. Cotton fiber quality data was not available and not considered. Ginning and warehousing costs for cotton were the net cost after cottonseed value based on 1.45 pounds of seed per pound of lint at the average price received by Georgia farmers for cottonseed for that year.

Results

Over the 4 years of the study (2 years each at 2 locations), cotton following corn yielded 1,131 pounds per acre. Cotton following soybeans yielded 1,114 pounds per acre. This compares to 973 pounds per acre for the highest yielding continuous cotton treatment (Figure 1). Among the 4 continuous cotton treatments, cotton with only 3.5 lbs/acre of aldicarb resulted in the lowest yield. Adding additional aldicarb improved yield in continuous cotton by 32 to 107 pounds per acre (Figure 1).

Among the 6 treatments, the highest net return (RAVC) was given by treatments 2 and 3 (Table 2). Continuous cotton with 5 pounds per acre of aldicarb in-furrow (treatment 2) resulted in an average RAVC of $71.76 per acre followed by continuous cotton with 10 pounds of aldicarb per acre in split applications (treatment 3) at $70.04 per acre.

The second (at side-dress) application of aldicarb in treatment 3 greatly reduced late season nematode populations compared to treatments 2 and 4. This may have been the reason for the improved yield in treatment 3. Treatment 3, however, did not result in RAVC significantly different than treatment 2.

In continuous cotton, increase use of aldicarb resulted in higher yield and net return. Corn-cotton and soybean-cotton rotations while resulting in lower nematode pressure and higher yields, produced lower net returns than the 2 best continuous cotton treatments. In the 2 years of the 4-year study in which corn was grown, yield was a respectable 171.5 bushels per acre. A corn yield of only 5-10 bushels per acre higher would have resulted in net returns equivalent to the best continuous cotton treatments. This may be achievable for some producers.

In the 2 years of the 4-year study in which soybeans were grown, yield averaged only 27.5 bushels per acre. A soybean yield of approximately 40 bushels per acre would be needed to provide net returns equivalent to the best continuous cotton treatments.

Summary and Conclusions

Growing cotton continually on soils with nematode infestations can result in lower yield and reduced profitability. Nematodes can be reduced through crop rotation or "managed" with nematicide treatments and/or increased rates of aldicarb. It is thought that much if not most of Georgia's cotton is grown continuously for at least 2-3 years without rotation. Nematodes are estimated in to be in 45-50% of the state's cotton fields.

This research shows that cotton yields can be improved through rotation and/or use of additional aldicarb. A corn-cotton rotation appears to be a profitable alternative to continuous cotton if cotton yields are high enough. Soybeans do not appear to be a feasible rotation crop.

Crop rotation is best analyzed over a long period of time. This is because the economics is impacted by weather (which crops have a good year when they are grown) and prices (which crops enjoyed better prices over the period compared to other crops). This study did not consider peanuts as a rotation crop with corn. Changes afforded by the new 2002 farm bill may offer new opportunities for peanuts on some cotton farms.

Acknowledgment

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Table 1. Summary of crop rotation/aldicarb treatment combinations.

		Aldicarb	
Treatment	**Rotation**	**In Furrow (lbs/acre)**	**Side-dress (lbs/acre)**
1	Cotton-Cotton	3.5	
2	Cotton-Cotton	5.0	
3	Cotton-Cotton	5.0	5.0
4	Cotton-Cotton	7.0	
5	Corn-Cotton	5.0	
6	Soybeans-Cotton	5.0	

Table 2. Yield and per acre net returns above variable cost (RAVC) for cotton rotations, 1998-2001.

	Aldicarb [1]						
Treatment	**IF**	**SD**	**Rotation [2]**	**Avg Yield [3]**	**Avg Price [4]**	**Variable Cost**	**RAVC**
1	3.5		Ct-Ct-Ct-Ct	866	48.13	$370.53	$46.28
2	5.0		Ct-Ct-Ct-Ct	940	48.01	$379.53	$71.76
3	5.0	5.0	Ct-Ct-Ct-Ct	973	48.25	$399.43	$70.04
4	7.0		Ct-Ct-Ct-Ct	898	48.09	$382.86	$48.99
5	5.0		Cr-Ct-Cr-Ct	171.5/1,131	2.21/39.69	$300.46/$406.22	$60.62
6	5.0		Sb-Ct-Sb-Ct	27.5/1,114	4.95/39.99	$154.91/$404.90	$10.91

1/ On cotton. Pounds per acre applied in-furrow at planting (IF) and side-dress (SD).
2/ Ct = cotton, Cr = corn, and Sb = soybeans. Years 1998-1999-2000-2001.
3/ For Treatments 5 and 6, yield is 2 year average yield for corn/cotton and soybean/cotton, respectively.
4/ Weighted average price. Cotton price is cents per lb. Corn and soybean price is dollars per bushel.

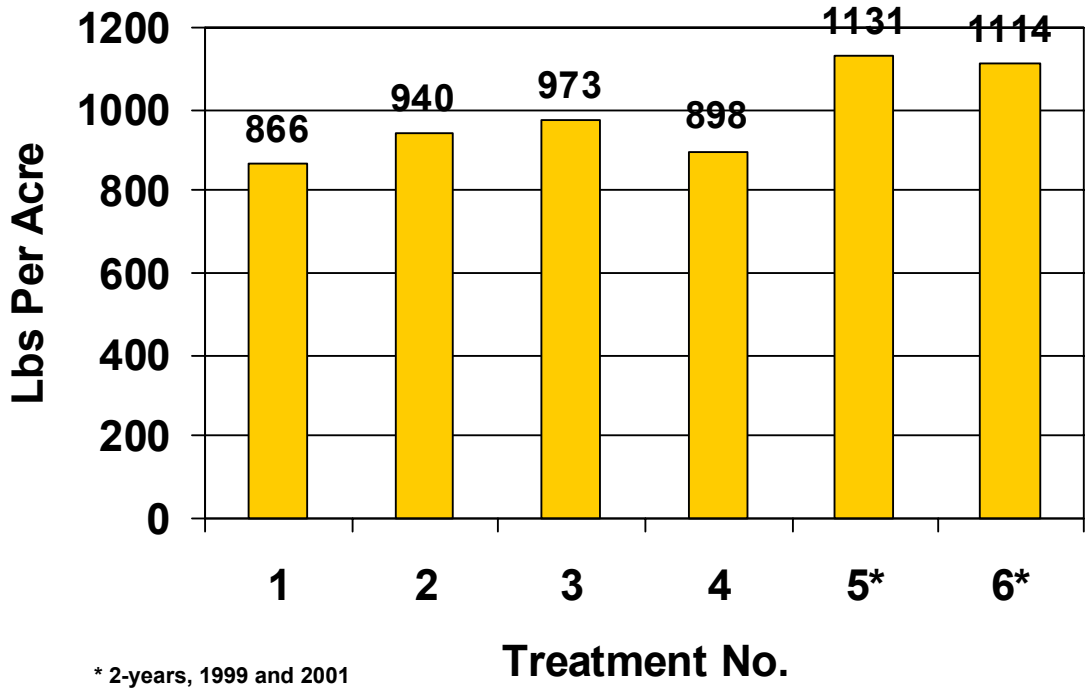

Figure 1. Average Cotton Yield Per Acre, By Treatment.