Jamie L. Whitten Plant Materials Center

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Cover Crop C-factors for Cotton Tillage Systems

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INTRODUCTION

Producers, because of economic situations, will demand short-term benefits for any additional cultural practices. Cover crops may meet this requirement depending upon the producer's viewpoint. Establishing and chemically killing a cover crop is expensive, especially if the cover crop is a legume. However, less N fertilizer following legumes, reduced soil loss, soil moisture conservation, and improved water quality are some advantages of cover crops. Increases in soil organic matter may not be realized because of the hot temperatures experienced in the mid-South. If soil organic matter level needs to be increased, it is best to try some type of conservation tillage in a crop rotation. From a study conducted at the Jamie L. Whitten Plant Materials Center, data were collected from four cover crops (crimson clover, hairy vetch, wheat, and native weeds) in no-till and conventionally tilled cotton and used to calculate C-factors for each system.

METHODS

Following stalk shredding in the fall, cover crops were no-till drilled at a seeding rate of 20, 30, and 120 pounds per acre for crimson clover, hairy vetch, and wheat, respectively. Phosphorus and potassium were applied at this time according to soil analyses. Wheat received an additional 25 pounds N per acre at planting. Native weeds were comprised of wild garlic, henbit, and chickweed. Canopy cover ratings were taken from February to April and 28-day intervals. Dry matter yields were determined in mid-April. Cover crops were either chemically killed in the no-till plots or disked once in the conventionally tilled plots three weeks before planting cotton. After planting cotton, weeds and insects were controlled using the usual pesticides. Nitrogen rates for cotton following crimson clover, hairy vetch, wheat, and native weeds were 50, 40, 80, and 80 pounds per acre, respectively. Conventionally tilled cotton was cultivated once at lay-by. Due to a sudden drop in temperature following a warm establishment period, crimson clover was freeze killed during the last year of this experiment.

SUMMARY

Cotton harvesting usually occurs from late September until mid-November which is during optimum planting dates for cover crops. With the late planting dates it is essential to obtain quick plant growth before cold weather develops. During record low temperatures in

December 1989, plant growth and survival were greatly reduced. In 1990, temperatures after cover crop emergence were above normal until dropping suddenly in late December. Crimson clover plants were freeze killed due to a lack of preconditioning. Therefore, crimson clover data were not included for the canopy cover and DM yield analyses.

After emergence, plant height and width of wheat were greater than the legumes (data not presented). This trend continued until late March when hairy vetch started its maximum growth period (Table 1). In 1991, native cover produced more canopy cover than the planted cover crops on three of the four dates. In fields where stands of cool season weeds could be maintained, native cover would not only reduce soil erosion but also eliminate establishment costs as compared to a planted cover crop. Canopy cover was not influenced by tillage systems on any date.

Table 1. Cover crop canopy cover, by dates, 1989-1991.

	Canopy Cover									
	1989				1990		1991			
	9 Feb	13 Mar	28 Mar	11 Apr	30 Mar	13 Apr	7 Feb	27 Feb	21Mar	15 Apr
Cover crop					%					
Crimson clover	80	70	90	100	23	28	--	--	--	--
Hairy vetch	60	60	90	100	47	85	6	13	41	95
Wheat	93	78	83	94	52	77	25	25	48	52
Cool season weeds	17	25	58	74	48	59	87	88	90	96
Tillage										
Conventional	63	58	79	92	39	61	34	39	61	85
No-till	61	58	81	92	44	66	41	43	63	85
LSD(0.05) Cover crop	14	6	10	10	NS	20	9	10	10	4
Tillage	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS: Not significant.

Significantly higher DM yields were produced by wheat during two of the three years (Table 2). Low yields reflected the amount of damage resulting from the record cold weather of December 1989 and excessive rainfall in 1991. Although yields from crimson clover and native cover in 1990 were extremely low, it has been shown in other studies that 55 pounds of residue per acre can greatly reduce furrow erosion. In this study crimson clover was planted after cotton harvest, however it can be overseeded before cotton defoliation.

In 1989 and 1991, cotton planting date was later than recommended due to wet weather. However, NT cotton generally produced a higher yield, significantly higher in 1989, than CT cotton during these two years (Table 3). During both years, NT plots were ready to be planted earlier than CT plots. When periods of dry weather occurred during boll development in all years, we noticed that CT cotton tended to show more and earlier signs of wilting than NT cotton, probably due to lower soil moisture levels in the CT plots. Cover crops did not affect seedcotton yields.

Table 2. Cover crop dry matter yield and seedcotton yield, 1989-1991.

	DM yield			Seedcotton yield		
	1989	1990	1991	1989	1990	1991
Cover crop				lb/acre		
Crimson clover	2150	149	---	1538	2767	---
Hairy vetch	2008	917	1547	1556	3022	2041
Wheat	3303	1960	1475	1715	2746	2093
Cool season weeds	1386	374	1424	1741	2491	1950
Tillage						
Conventional	2029	821	1629	1370	2828	1872
No-till	2393	880	1335	1905	2685	2185
LSD(0.05) Cover crop	1233	543	NS	NS	NS	NS
Tillage	NS	NS	NS	291	NS	NS

C-values for the Revised Universal Soil Loss Equation were calculated for each cover crop-tillage system using the three year average of canopy cover (two year average for crimson clover), tillage implements, and operational dates.

C-values ranged from .065 for NT cotton with wheat to 0.327 for CT cotton with native cover (Table 3). With cover crop and cotton residues remaining on the soil surface, C-values for NT cotton were approximately one-third of those for CT cotton.

Table 3. C-values for cotton cover crop-tillage systems.

Cover crop-tillage system	C-value
1. Disk 2x April 15, chisel April 30, harrow & plant May 1, cultivate 1x. Shred stalks and no-till drill crimson clover Nov. 2.	.215
2. Same as #1 except plant hairy vetch	.221
3. Same as #1 except plant wheat	.191
4. Same as #1 except native winter cover	.327
5. Burndown April 15; no-till plant May 1, no cultivation. Shred stalks and no-till drill crimson clover Nov. 2.	.080
6. Same as #5 except plant hairy vetch	.071
7. Same as #5 except plant wheat	.065
8. Same as #5 except native winter cover	.099

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