

# Effects of Cover Crops and Irrigation on Cotton

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## INTRODUCTION

**S**oil scientists generally agree that incorporating cover crops into the soil prior to planting inter-tilled crops such as cotton is a desirable practice. However, there is a scarcity of evidence to determine whether the benefits derived from the practice outweigh the disadvantages. The primary objectives of this study were

1. To measure the effects of winter and summer cover crops on the following cotton crop;
2. To measure the effects of cover crops on soil organic matter and related soil-test properties;
3. To measure the effects of irrigation on cotton grown with and without cover crops.

## PROCEDURES

This study is located on the University of Arkansas Cotton Branch Experiment Station, Marianna, Arkansas, on Loring silt loam. The plots were established in 1985, and cotton was grown on all plots, using normal production practices, to measure soil uniformity. The 1985 cotton yields showed no appreciable differences due to soil variation. Therefore, the following rotations were initiated that fall.

1. Vetch/cotton/vetch
2. Wheat/cotton/wheat
3. Vetch/sudan/vetch/cotton
4. Vetch/sudan/vetch/cotton plus 52-52-52 extra fertilizer applied for Sudan.
5. Cotton.

Each main plot consists of eight 38-in. rows 800 ft long. Each main treatment is replicated four times in a randomized complete block design. Cotton was grown in the plots of treatments 1, 2 and 5 in 1986 without irrigation. Beginning in 1987, each plot in which cotton was grown was split to compare furrow irrigation and non-irrigation. Supplemental nitrogen (N) is applied to individual plots during fruiting and maturation as need is indicated by petiole analyses to nullify any bias resulting from N fixed by the vetch cover crop.

Measurements include:

1. Routine soil tests of samples collected in 6-in. increments 0-36 in. deep;
2. Nine weekly petiole analyses for  $\text{NO}_3\text{-N}$ , P, K and  $\text{SO}_4\text{-S}$  during fruiting and maturation each year;
3. Cotton lint yields.

Only the yields are presented in this report.

## RESULTS

All cover crops were incorporated into the soil as green manure. The effects of N fixation by vetch was evidenced by increased nitrate concentrations in the soil of those plots in which vetch was turned under. It was, therefore, necessary to apply higher rates of N to the non-legume plots in order to equalize available N across rotations. Nitrogen was maintained in the sufficiency range in all plots.

Lint yields are listed in Table 1. There was no yield response to any cover/green manure crop treatment in 1986, 1987 or 1988. In 1989 the vetch-sudan-vetch plus high fertility treatment increased yields compared to cotton alone or cotton following vetch or wheat. Lint yields following vetch-Sudan-vetch were greater than yields following wheat. At this point in the study, there appeared to be a trend for the summer cover crop (sudan) to be more effective than the winter crops (wheat and vetch).

In 1990, the vetch-cotton-vetch rotation and cotton alone produced higher yields than the wheat-cotton-wheat rotation. Adverse weather conditions in May 1990 resulted in below-average yields.

Irrigation increased cotton yield each of the three years in which it was applied.

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Table 1. Cotton lint yields following cover crops, with and without furrow Irrigation, Cotton Branch Station, Marianna, Arkansas, 1986 through 1990.

Rotation <sup>1</sup>	Irrigation <sup>2</sup>	1986		1987		1988		1989		1990	
		Yield	Mean	Yield	Mean	Yield	Mean	Yield	Mean	Yield	Mean
		lb lint/acre <sup>3</sup>									
VCV	yes	---		948		1035		1002		885	
VCV	no	---	675	690	819	745	890	730	866	743	814
WCW	yes	---		925		1013		973		680	
WCW	no	---	649	666	796	812	913	714	843	649	665
VSVC	yes	---		914		---		1027		---	
VSVC	no	---	---	639	777	---		767	897	---	
VSVC(+h.f.)	yes	---		972		---		1057		---	
VSVC(+h.f.)	no	---	---	733	853	---		812	935	---	
C	yes	---		953		1053		1013		850	
C	no	---	629	676	815	800	927	724	869	807	829
LSD(.05)		---	NS	NS	NS	NS	NS	NS	43	NS	52
Irrigated		---	---	---	942	---	1034	---	1014	---	805
Non-irrigated		---	---	---	681	---	786	---	749	---	733
LSD(.05)		---	---	---	25	---	34	---	36	---	56

<sup>1</sup>C = cotton, S = sudan, V = vetch, W = wheat, h.f. = high fertilizer.<sup>2</sup>There was no irrigation in 1986.<sup>3</sup>There were no significant interactions of rotation x irrigation effects.