Cover Cropping and N Fertilization for No-Tillage Corn Production in Mississippi

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In a recent study of 10 cropping systems in Mississippi, including monocropped soybean, corn, grain sorghum, sunflower, and wheat, and various doublecrop sequences, monocrop corn had the highest net returns (Sanford et al. 1986). All monocrops in this study were planted into prepared seedbeds.

Current acreage of corn in Mississippi is around 210,000 acres and is not projected to increase even though the demand for grain is greater than the supply within the state. Corn yield in Mississippi is primarily limited by lack of rainfall, especialy during grain fill.

The use of no-tillage and cover crops could improve soil moisture conservation, while at the same time reducing soil erosion. Also, if a legume cover crop is included, a considerable quantity of biologically fixed N could be introduced into the system. This system could bring erodible farmland into compliance with the mandates of the 1985 Food Security Act. However, little work has been done in the state on no-tillage corn production. Thus, one of the primary objectives of this study was to determine the response of no-tillage corn to cover cropping and N fertilization.

Methods

The experiment was initiated in fall of 1986 at the Northeast Mississippi Branch Station in Verona, MS on a Prentiss tine sandy loam soil with 2 to 5 percent slope. The site had previously been in bermudagrass sod. The sod was sprayed with 0.2 Ib/acre fluazifop to kill the bermudagrass. The killed sod was then chisel plowed and disked. Hairy vetch and Marshall ryegrass were each broadcast seeded at 30 Ib/acre and then cultipacked. Corn (Pioneer Hybrid 3165) was planted into live cover crops on 15 April 1987 at 26,000 kernels/acre in 30-inch rows using a six-row planter equipped with rippled coulters. After planting, the area was sprayed with 0.5 Ib/acre paraquat, 2.0 lb/acre alachlor, and 2.0 Ib/acre cyanazine to kill existing vegetation and to provide residual weed control. Ammonium nitrate was surface broadcast after planting at rates of 0, 58, 116, and 174 Ib N/acre. The experiment was arranged as a randomized complete block

Results

Estimates of cover crop dry matter yields just prior to planting were 2,200 Ib/acre for hairy vetch and 1,780 lb/acre for ryegrass. Since this was the first year of the study, the cover crops provided the only source of surface residues. Once the cover crops were dessicated, approximately 80 to 90 percent of the soil surface was covered. With ryegrass, we did not get 100 percent kill and some regrowth occurred. Also, the killed ryegrass remained upright thus causing some of the corn to become etiolated.

The effects of cover crops and N fertilizer on corn are shown in Table 1. With ryegrass, the greatest grain yield increase was associated with the first 58 Ib N/acre applied. No significant advantage was observed with rates above 58 lb N/acre. With vetch cover and no N fertilizer, grain yield was about equal to that of the ryegrass cover with 174 lb N/acre, but was not significantly greater than 58 Ib N/acre with ryegrass cover. Fertilizer N did not influence grain yields with vetch cover. The advantage of vetch cover over ryegrass for corresponding N rates was apparent at the 0 and 58 lb N/acre rates, but not at rates higher than this. The only difference in stover yield was that all treatments were greater than the ryegrass cover with no N fertilizer treatment. All treatments produced considerable corn residue which when left on the soil surface should minimize soil erosion by water.

Table 1. Corn grain and stover yields as influenced by cover crop and four rates of fertilizer N.

Fertilizer N rate	Cover treatment	Yield*	
		Grain**	Stover
(lb/acre)		(bu/acre)	(lb/acre)
0	Ryegrass	94	7,300
58	Ryegrass	121	8,800
116	Ryegrass	127	9,600
174	Ryegrass	135	8,800
0	Hairy vetch	140	9,600
58	Hairy vetch	149	9,300
116	Hairy vetch	142	9,700
174	Hairy vetch	153	10,120
LSD (0.05)		20	1,400

*All values are a mean of 16 observations.
**Adjusted to 15.5% moisture.

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In summary, excellent corn grain yields were obtained when no-tillage corn followed a sod crop. With ryegrass, rates above 58 lb N/acre were not advantageous, while with vetch, no response to fertilizer N occurred. The overall lack of response to fertilizer N is apparently related to the high organic matter content of the surface soil which through mineralization probably released considerable N. It would be premature to draw any conclusions with only one growing season of data, but it appears that no-tillage corn has the potential to be a viable cropping alternative in Mississippi especially on land requiring a conservation practice.

Reference

Sanford, J. O., B. R. Eddleman, S. R. Spurlock, and J. E. Hairston. 1986. Evaluating ten cropping alternatives for the Midsouth. Agron. J. 78:875-880.