INFLUENCE OF CROP ROTATION AND TILLAGE SYSTEMS ON CORN AND SOYBEAN YIELDS

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Conservation tillage is a system of managing crop residue on the soil surface with minimum or no tillage. With the development of effective chemical weed control and suitable planting equipment, use of conservation tillage systems has increased considerably in Alabama. Several minimum and no-tillage systems have been developed that produce corn yields equal to or higher than those obtained with conventional tillage. However, additional information is needed on conservation tillage systems for soybeans or soybeans in rotation with corn.

A recent study by the Alabama Agricultural Experiment Station showed that soybean yields were increased by conservation tillage practices and crop rotation. Conventional tillage systems were compared to minimum and no-tillage systems on soybeans, corn, and wheat on a Hartsells fine sandy loam soil on the Sand Mountain Substation at Crossville, from 1981 to 1983.

The minimum tillage treatment consisted of planting corn and soybeans over 8- to 9-in. deep chisel slots; the no-tillage treatments were planted with a double-disk opener planter directly into the untilled soil surface. Row spacing was 36 in. Cropping sequences were continuous soybeans; continuous corn; corn-soybeans; and corn-wheat for grain-soybeans. Wheat was on all plots as a winter cover, including those plots not used for grain crop. The wheat was killed on the winter cover plots 10 days before planting corn or soybeans.

Continuous soybean yields were increased 16%with the no-till and in-row chiseling tillage systems over conventional tillage in 1981 and 1982, and 52 and 34%by the no-tillage and in-row chiseling tillage, respectively in 1983. The 3-year average yield of soybeans in 2-year rotation with corn, across all the tillage systems, was 23%higher than under continuous soybeans (Table 1).

This reduction of soybean yield under continuous soybeans may be caused by a soybean cyst nematode (SCN) population found in September, 1983 (Table 2). SCN counts were lower in plots where soybeans were rotated with corn than in continuous soybeans, except with conventional tillage. The nematode numbers were further reduced in a double-cropped system with wheat for grain. It is speculated that the reduced time the land was cropped to soybeans is the reason for this reduction in nematode count.

Corn yields in 1983 were 14%higher when rotated with soybeans than when corn was grown continuously, and 8%higher for the 3-year average across all tillage (Table 1). Yields in 1983 were 10% lower on conventional tillage than other tillage systems when averaged

[1]Cooperator, USDA - in part Summer Highlights article.

across all cropping systems, and 7% lower for a 3–year average. SCN were not found in plots where continuous corn was grown. The conventional tillage had higher SCN counts than other tillage treatments. The stunt nematode count under corn was not affected by rotation with soybeans.

The results of this study show that soybean yields were increased by conservation tillage practices and crop rotation. Further, the results suggest that cultivating soybeans exclusively will result in the buildup of soybean cyst nematodes, and cultivating corn exclusively will result in the buildup of stunt nematodes in corn. This may be a factor contributing to lower yields of these crops.

Table 1. Effect of tillage systems and cropping sequence on yields of corn and soybeans, 1981-1983.

Cropping sequence[1]	Per acre yield by treatment: Conventional	Chisel under row	No-tillage	Avg.
	Bu.	Bu.	Bu.	Bu.
3-year average soybean yield				
Soybean continuous	20.8	27.3	31.8	26.6
Soybean–corn	31.0	32.9	33.8	32.6
Corn–wheat for grain–soybean	33.9	31.2	27.5	30.9
Av.	28.6	30.5	31.0	
3-year average corn yield				
Corn continuous	117	110	108	111
Corn–soybean	111	127	118	118
Corn–wheat for grain–soybean	114	127	122	121
Av.	114	121	116	
2-year average wheat yield				
Wheat	32.6	31.1	28.7	30.8

[1] Wheat was on all plots as a winter cover, including those plots not used for grain crop.

Table 2. Effect of tillage systems and cropping sequence on soybean cyst nematode counts found in September, 1983 after 3 years of cropping.

Cropping sequence[1]	Count per 50 cc soil			
	Conven-tional	Chisel under row	No-till-age	Av.
	Soybean cyst larvae and cyst counts under soybeans			
soybean continuous	460	806	498	598
Soybean–corn	1090	143	21	418
Corn–wheat for grain–soybean	246	13	2	95
Av.	598	321	189	--
	Soybean cyst larvae and cyst counts under corn			
Corn continuous	1	1	1	1
Corn–soybean	100	23	4	42
Corn–wheat for grain–soybean	54	39	3	31
Av.	51	21	2	--

[1] Wheat was on all plots as a winter cover including those plots not used for grain crop.