

NO-TILLAGE IN NORTH CAROLINA

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In this report we are presenting somewhat of an overview of our current research and extension activities in North Carolina. Many represent our concerns on which we are placing emphasis.

For a number of years our no-tillage acreage varied from 8 to 10% of the corn, soybean, and grain sorghum acreages. However, most of the soybeans were no-till double cropped after small grain harvest. In the last three years we have witnessed an increased interest in no-tillage and other reduced tillage systems. This has been influenced, in part, by increasing costs of fuel, labor and equipment and by implementation of the Water Quality Act.

We have continued to place emphasis on no-tillage in our corn, soybean, soils, and weed management extension programs. This past year we conducted six training sessions throughout North Carolina in cooperation with Soil Conservation personnel. These sessions were aimed at growers, chemical and equipment dealers, SCS personnel and agricultural extension agents.

This report is divided according to our varied interests: Corn Extension Program, Soils Extension Program, Weed Science Research, and Weed Science Extension.

Corn Extension Program

The emphasis on no-tillage corn in our corn extension program in North Carolina has expanded in the last three years. We are attempting to determine why there has not been more acceptance of no-till corn production. Our approach has been to conduct on-farm tests comparing conventional tillage with no-tillage to demonstrate to farmers these practices side by side and at the same time collect information on these two tillage systems. It also gives us a chance to learn what are some of the problems facing the farmer. Our no-tillage plantings have been into a rye cover crop.

The results from tests conducted on Piedmont clay soils have been quite strongly in favor of no-till planting corn into rye. However, in the sandy Coastal Plain locations our results have been mixed.

Table 1: Corn Yields (Bu/A) in Piedmont Tillage Tests

Tillage Method	COUNTY			
	Caswell	Stokes	Granville	Guilford
Conventional	71	141	58	96
No-till into Rye	94	155	68	99

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Table 2: Corn Yields (Bu/A) in Sandy Coastal Plain Soils Tillage Tests

Tillage Method	COUNTY				
	Johnston	Wilson	Robeson	Chowan	Northampton
Conventional	109	108	153	114	116
No-till into Rye	87	115	122	105	118

We feel that the effect of the rye mulch on moisture infiltration rate is the most important factor contributing to increased yields in the Piedmont locations. Though there is some no-tillage corn in the Piedmont, johnsongrass is a major limiting factor toward expansion of no-tillage production in this area.

In the sandy soils we have become concerned that even though nitrogen has been applied in split applications (a small amount at planting plus the remainder 4 to 6 weeks later), lack of nitrogen may be limiting yields where corn has been no-till planted into a rye cover crop causing some of the yield reductions noted in Table 2. We believe several things could cause this: 1) more nitrogen may be leaching in the no-tillage plots; 2) more denitrification or 3) the nitrogen may become tied up in the rye residue.

In 1980 we are continuing these studies but have expanded them to look more closely at nitrogen rates in conventional versus no-till planting into soybean residue, rye, or vetch. We would like to learn more about our thoughts on the fate of applied nitrogen in the rye residue plots. We also want to evaluate the usefulness of vetch as a cover crop and source of nitrogen especially when overseeded in soybeans. Will this be an economically attractive practice?

Soils Extension Program

In our Soils Extension Program, we have evaluated various tillage methods for corn and soybeans in on-farm tests since 1977. Although the program has emphasized the comparison of in-row subsoiling, chisel plowing and conventional tillage, the following no-tillage treatments have been included: 1) No-tillage planted corn into residue of in-row subsoiled soybean crop as compared with repeated subsoiling and conventional tillage. This was intended to evaluate the possible carryover effect of subsoiling, 2) Same as above with soybeans planted into corn residue, and 3) No-tillage corn into conventionally seeded small grain residue (rye, wheat or oats).

In October, 1979 we reviewed costs of the various tillage methods in a 300-acre operation. This indicated a \$7/A cost savings for no-tillage corn into soybean residue compared with chisel plowing and discing. However, the cost of establishing a rye residue crop for no-tillage corn made this system more expensive than chiseling and discing. This emphasizes the importance of determining the yield and conservation benefits of these two no-tillage methods and special management considerations of them, including nitrogen requirement, weed, nematode and disease management. This comparison is included in several locations in our 1980 program.

Weed Science Research

We have evaluated and helped obtain registration for all the herbicides currently labelled for use in the no-tillage crop production. The only herbicides showing any promise for vegetation kill, other than paraquat or glyphosate, is a combination of acifluorfen and diclofop in soybeans.

Over the years, glyphosate treatments have produced higher yields of no-till corn and soybean compared to paraquat. Better late grass control from glyphosate was found not to be entirely responsible for increased yields, therefore a growth regulator affect was suspected. Growth-chamber and greenhouse studies showed that glyphosate was exuded from the roots of treated plants (such as a cover crop) and could cause stimulatory or inhibitory effects on adjacent plants in the soil, depending on the concentrations of glyphosate applied to the treated plants. In field experiments the increased yields of glyphosate treated plots made glyphosate more economical to use than paraquat where green cover was present at planting.

Several successions of weed complexes have been noted in continuous no-till plots in a high organic soil but no predominant species. Corn yield in continuous no-till plots has decreased by about 20% over a four-year period.

Our first attempt in 1978 to grow no-till flue-cured tobacco was not too successful. No-till tobacco in 1979, planted into a good stand of rye on ridged rows, yielded the same as conventional planted tobacco. The grade index, a measure of quality, was much higher for the no-till tobacco as compared to conventional, especially for the earlier primings. Weed control, except for nutsedge, was satisfactory with paraquat or glyphosate applied prior to transplanting and diphenamid or napropamide applied over-top after transplanting. This method offers the potential for soil erosion control, moisture conservation, less sand damage to small seedlings and less sand on the tobacco leaves. Work in 1980 has expanded to four locations.

In preliminary studies in 1979, corn stands and yields and soil insects were correlated with time of killing the small grain cover crop. Corn yielded 107 Bu/A when the small grain cover crop was killed 5 weeks before planting compared to 61 Bu/A when the cover crop was killed at planting. Wireworm damage at planting was five times higher at one location, but four times less at the other location when the cover was killed early compared to at planting. There appeared to be no appreciable difference in foliar insect feeders among treatments. Studies will be continued for at least two more years before definite conclusions can be drawn on the influence of these factors on no-till corn.

Weed Science Extension

Our primary objective through our on-farm testing program has been to demonstrate herbicide programs for no-tillage corn and soybeans. We have also found greater corn and soybean yields where glyphosate was used to control the small grain cover crop rather than paraquat. The use of oryzalin in standing wheat or barley for no-till doublecropped soybeans has been a successful practice providing linuron or metribuzin is also applied at planting. We have initiated three tests this year to evaluate johnsongrass control programs in conventional vs no-tillage planted corn. Glyphosate was applied in the fall to certain plots and glyphosate applied in row wick applicators will be used during the growing season.