No-Till Production in North Carolina

No-till is no longer in the experimental stage. In 1980 there were approximately 300,000 acres of conservation tillage in North Carolina, based on an SCS survey. Potentially, there are approximately four million acres of corn and soybean land that could be no-tilled. What are the keys that will lead us toward more no-till? Why should North Carolina farmers consider this alternative?

Management is the keystone to a sound no-till program. Like any new production technique, you need to understand the basic principles. No-till is not immediately adaptable to all farming situations. Past management plays an important role.

If the soil pH or fertility status is very low, this correction must be made. If troublesome weeds, such as common bermuda or johnsongrass, are present in the field, these must be brought under control. If traffic pans are present, they should be corrected. Planting equipment must be modified or new equipment purchased to fit no-till needs. Spray equipment may need to be modified.

These plus other considerations need to be accounted for, but all can be overcome with the current state of technology and management. Briefly, our experience has been that through management all these deficiencies can be overcome. If a farmer can grow 150 bushels of corn with conventional tillage, he can equal or surpass this yield with no-till production.

Why change to no-till? There are five basic reasons: (1) to control erosion, (2) to conserve moisture, (3) to save time, (4) to intensify land use, and (5) to increase profits.

Soil Erosion Control

Soil erosion is the dominant soil conservation problem and water quality problem on thousands of acres of land in North Carolina. We have two basic types of erosion-wind and water. No-till crop production offers a viable solution to both problems.

Wind erosion not only transports soil particles laden with surface applied fertilizer and chemicals, but also causes physical damages to plant seedlings from the abrasive effect of the blowing particles. Adequate surface mulch of no-till production will eliminate this problem.

The more serious problem of erosion in North Carolina is water erosion. This problem is most severe on the steeper slopes, but is also a costly problem on the more gently sloping Coastal Plain soils. According to a 1977 survey conducted by the SCS, USDA, 64 percent of the total erosion in North Carolina occurs on cropland. Even though only an average of 7.5 tons per acre per year is eroded from cropland, the large acreage of cropland make a signficiant total contribution'. When topsoil is lost, farmers are losing their productive base.

In 1979 Langdale reported that at current production in the Southern Piedmont, each centimeter of soil eroded from Class II land cost the producer about 147 kilograms of corn (grain) per hectare (5.9 bu/A for 1" of soil loss). This means that for every inch of topsoil lost with corn at $3.00/bu., the loss will be $17.70/A potential production. Therefore, for every ton of soil lost, the loss over a 50-year period will be approximately $160.00.

Work by Frye[3] at the University of Kentucky shows that over a wide range of observation using different winter cover crops on eroded versus uneroded Maury soil there was a 14 percent increase in yield over a three-year period on the non-eroded soils. Erosion also causes important nutrient losses, approximately $3 to $5 per ton per year. As the soil particles are transported by water not only do the soil particles carry a nutrient load, but the water many times transports fertilizers and chemicals in the solution. As the clayey textured subsoils are exposed, power and fuel costs increase as well as nutrient requirements to satisfy the lime and phosphate needs.

Based on comparison of different conservation systems on the rate of erosion reported by the SCS, USDA ,[4] soybeans grown on a 4 percent slope, contour farming with terraces yields 8 tons/A/yr. soil loss, while no-till farming on contour soybeans in wheat stubble yields 3 tons/A&r. soil loss. Clearly no-till crop production reduces erosion, thereby reducing sediment transport and consequently enhancing water quality.

To Conserve Moisture

Moisture conservation is another positive benefit from no-till over conventional tillage. Loss of soil moisture through runoff and evaporation will reduce the amount of plant-available water and consequently limit crop yields. Work done by Langdale, et a1.,[5] over a four-year period showed that runoff was reduced 47 percent with no-till practices compared to conventional practices and erosion was reduced 98 percent. Crop residues soften the impact of rainfall and reduce surface sealing that can limit infiltration.

Ten years of research by Beale, et al. [6] at Clemson has shown that no-till corn in winter cover mulch averaged 3.11 inches less water runoff per year and 2.38 tons/A less soil erosion per year. Beale reported that yields were equal to or greater than that of the

conventional unmulched corn. Clearly, as more water is forced into the soil profile and less is evaporated from the surface because of the mulch cover effect, more water is available in the root zone for plant use.

Time Saving

Time is another positive consideration related to no-till crop production. First, no-till crop production will save the farmers one-half to 1½ hours per acre in total production time. Because there is less heavy tillage, smaller, more fuel efficient tractors may be used and thereby reduce machine cost. Second, no-till offers an opportunity for timeliness of operation. Because this type of system does not require land preparation other than broadcast fertilization, one trip over does the job of planting, land preparation, weed control, and insect control. At the end of each work day the crop is planted and ready to grow.

This is important in a multicrop system (i.e., no-till corn - conventional wheat - no-till soybeans) in that it allows very timely planting of the soybeans. The area of small grain acreage that is harvested in the afternoon is planted to soybeans the next morning prior to the small grain being ready to cut in the afternoon. This system adds one to two weeks or even more critical growing time for the soybeans.

More Intensive Land Use

No-till allows for more intensive land use. Soils that do not have the potential to produce good crop yields with conventional tillage cannot be expected to produce any better yields under no-till systems. There are many thousands of acres of land that have good yield potentials; however, they are subject to severe erosion under conventional tillage. With no-till it is possible to grow high-value row crops and still hold erosion levels to well within the permissible soil loss limits. Areas where row crops could only be grown with strip farming and terraces can now be planted no-till and eliminate these more expensive time consuming practices.

Not only does no-till allow more intensive use of the more rolling land; it allows more opportunities for double cropping. There are many opportunities for cropping combinations where using no-till allows timeliness of operation to maximize yields and provides nearly year-round ground cover. Some examples are:

(1) No-till corn - conventional wheat - no-till soybeans = 3 crops in 2 years.

(2) No-till corn (silage) - conventional wheat silage - no-till corn silage - conventional wheat silage = maximum TDN production with full growing season for each crop and 11 months of ground cover.

(3) Alfalfa for 3 to 4 years - no-till corn followed by reseeding in the fall = breaks the cycle for one year and utilizes N from alfalfa.

(4) Farmers imagination is the only limitation as far as combinations.

One researcher in the "No Nonsense Guide to No-Till Farming"' said, "After 30 years and about $30 billion of soil conservation work in this country, we stumble onto a system that cannot only eliminate the need for further spending, and not only pay its own way, but will actually yield an immediate return. There aren't many soil conservation efforts that can show such immediate and sizable returns. And the best part is that new land that can be put into production with this system is primarily in the marginal, hilly areas where farm income needs the biggest boost; it will more than double the productive acreages on many small farms."

To Boost Profits

Finally, profit opportunities from no-till and conservation tillage systems have been documented by many university researchers and on-the-farm experiences. Budgets prepared by NCSU Extension specialists in crops and economics show the same returns to land, overhead and management for corn at $121.26 and $121.47 per acre respectively for conventional and no-till systems. Labor is substituted for herbicides, but this does not nearly reflect all the profit picture. Less erosion from the no-till systems equate to multiple cropping systems allowing more intensive machinery use for equipment such as the combine, which is the most expensive single item on the farm. The system also equates to less erosion, less loss of nutrients and chemicals, and higher sustained yields for future generations. Now is the time to switch and insure higher water quality and more effective use of our natural resources.

Literature Cited

1. Executive Summary, Water Quality Management Plan, Division of Environmental Management, Dept. of Natural Resources and Community Development, Raleigh, N. C., June 1979.
2. Langdale, G. W., et. al., 1979, Corn yield reduction on eroded Piedmont soils. J. Soil and Water Cons. 34 (5).
3. Frye, Wilbur W., February 1980, Yield of corn on eroded and uneroded Maury soil. Paper, Southern Assoc. of Agricultural Scientists.
4. Soil Conservation Service, USDA, Benefits/Costs of Soil and Water Conservation Practices for Erosion and Sediment Control, Raleigh, N. C. 27611, June 1980.
5. Langdale, G. W., et. al., 1979, Reduction of Soil Erosion by No-Till System in the Southern Piedmont. ASAE Meeting.
6. Beale, O. W., G. B. Nutt and T. C. Peele, 1955, The Effects of Mulch Tillage on Runoff, Erosion, Soil Properties, and Crop Yields. Soil Sci. Soc. Amer. Proc. 19:244-247.
7. No Nonsense Guide to No-Till Farming, Allis-Chalmers Farm Equipment Division, Milwaukee, Wis. 53201.