NO-TILL: IT WORKS ON THE FARM

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INTRODUCTION

The Sam Worley farm, in Maury County, Tennessee, is situated at the extreme western edge of the Nashville Basin in small creek valleys between outlying ridges of the Highland Rim. The open land is mostly of the Dellrose-Mimosa-Armour soil association, with gentle to moderately steep slopes (2–25%) and highly dissected topography. Field size is generally under fifteen acres, often with several soil types in a given field. Much of the farm suffered considerable erosion in the nineteenth and early twentieth centuries, particularly the Mimosa soils (about 1/3 of the cropland), and surface texture ranges from heavy silt loam to silty clay loam with or without chert. Except in small creek bottom areas, soils are well to excessively drained.

During the 1950's and 1960's, much of the marginal cropland was in permanent pasture and hay crops, with the remainder in a two-year barley-grain sorghum-wheat rotation. A small amount of corn silage was grown.

In the 1970s, a two-year wheat-soybeans-corn rotation became more advantageous economically, and some additional land was acquired. In order to implement this new rotation and increase crop acreage, a no-till planter was purchased in 1975. Since 1977, all of the corn and soybeans on the farm have been planted no-till. Wheat is conventionally drilled after a light disking of cornstalks.

EFFICIENT CROPPING AND CONSERVATION

The primary purpose behind the switch to no-till on the Worley farm was conservation. On steep, irregular slopes modern machinery and contour terraces were incompatible, and only no-till seemed to offer hope of reducing soil erosion to acceptable levels while utilizing the soils reasonably efficiently and intensively. This commitment to both intensive use and conservation requires a drastic change in philosophy: no longer do we consider tillage as a normal practice, but as an obstacle to the natural soil-forming process.

The greatest advantage of this long-term commitment to no-till lies in the cumulative nature of the benefits to the soil. In fields which have been under continuous no-till cropping for several years, soil organic matter has continued to increase over time, with concommitant changes in soil physical condition. Surface and subsurface structure has become stronger, infiltration and permeability have improved; and in some cases internal drainage seems to have improved. Particularly in the cases of some small areas of Egam and Dunning soils (somewhat poorly-drained bottoms), the load bearing capacity of the soil when wet has increased. All of these changes have occurred slowly but seem to be continuing after eight years of no-till cropping.

Neil Worley farms with his father, Sam, and his brother, Stephen, near Hampshire, Tennessee.

When deep tillage is eliminated as an option and even light disking strictly limited, other features in the cropping program must take up the slack in weed and disease control. Experience has shown, however, that combinations of certain crop rotations (or even specific varieties) and herbicide programs can control almost any problem, usually far better than was originally expected. Extension's recommendations have been useful starting points, but considerable experimentation has been necessary to find a suitable prescription for some fields and improvements are still being made.

CROP RESULTS

All of the soil conservation benefits of no-till, even the virtual elimination of erosion, would not bring about its adoption if crops could not be economically produced. On the Worley farm, however, no-till crop yields have been quite satisfactory. Before and after figures are not available, since the crop rotation was changed at about the same time as the planting system, but the current four-year average yield is 101 bu./A of corn and 30.3 bu./A of double-cropped soybeans, on soils which should be expected to yield 70 bu. of corn and 28 bu. of full-season soybeans, according to Bell, et al.[1]. Only wheat yields do not seem to have been improved by the no-till rotation, disease problems having held the four-year average to 34 bu/A

Not only have row crop yields been satisfactory, but lower labor and machinery costs have allowed the total cost of producing a crop to be lower with no-till than with conventional tillage. It has been possible to expand cropped acreage to Class III and IV land and, indeed, the greatest improvement in yield has been on what were considered the poorest soils - eroded, clayey, or poorly drained.

PRACTICAL OBSERVATIONS

I have mentioned only the benefits to the soil, but the list of benefits we have derived from no-till cropping is extensive: timely planting with less fuel and labor, tripled crop acreage with same tractor power, less lodging of corn, etc. After eight years, we would not even consider going back to plowing.

To make no-till work, it is essential to plan ahead: take a unified, whole-system approach, keep fertility high, be aware of potential weed problems early, keep up with new technology. It is particularly vital to scout for and spot treat johnsongrass at levels far below the conventional tillage economic threshhold. Of course, these same factors are well utilized by many in conventional tillage systems, but only no-till develops the full long-term potential of our sloping and fertile soils.

[1] F. F. Bell, G. J. Buntley and Paul Denton. Yield Estimates for the Major Crops Grown on the Soils of Middle and East Tennessee, Univ. of Tenn. Ex~. Sta. Bu. 604, July 1981.