Conservation Tillage Activities and Research

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The University of Massachusetts and the Massachusetts Association of Conservation Districts (MACD) with financial support from the Massachusetts Division of Energy Resources initiated a conservation tillage program in 1993. Three no-tillage corn planters and three no-tillage forage seeders were purchased for rental to farmers on daily basis. The program introduced firsthand 115 Massachusetts farmers to the practices of no-tillage and minimum tillage planting of field corn and forage crops. During the one and a half growing seasons of the project, over 800 acres of field corn were planted using the no-till planters, and over 500 acres of forage crops were planted using the no-till seeders.

Many farmers are finding it necessary to become more familiar with conservation tillage methods for field corn and forage crop establishment. For many USDA cost-sharing incentive programs, highly erodible land must have at least 30% coverage of the soil surface with crop residues after planting. These residues prevent topsoil erosion and also reduces the potential for groundwater pollution from runoff containing nutrients or pesticide residues. More important to a farmer's bottom line is that top soil maintenance (which includes fall cover cropping) helps to improve crop yields through better soil fertility and soil quality. Listed below are some of the advantages and disadvantages that farmers are likely to encounter when switching over to conservation tillage methods.

Table 1. Advantages and Disadvantages of No-Tillage Practices.

ADVANTAGES	DISADVANTAGES
Reduces topsoil loss	Requires special planters
Reduces runoff pollution	Requires attention to planting depth
Reduces energy use by 75%	Loss of manure ammonium nitrogen
Requires 80% less field time	Insecticide may be required
Improves soil quality	Requires burndown herbicide
Best for well-drained soils	Soils warm slower in Spring

Conservation tillage requires that farmers adapt their practices of weed and insect control. In conventional tillage, most insect control is performed by plowing and harrowing the soil, disturbing the insect larvae which have over-wintered in the fields. In no-till field corn, the soil is largely undisturbed and the larvae, if present in the soil, will continue to grow and may eventually feed on the young corn plants. If the larvae population exceeds the economic threshold for the particular pest, then appropriate chemical or BT control measures are needed.

Weed control in no-till may require switching to a winter-killing cover crop (oat) or else the use of a burndown herbicide. The weeds and cover crop need to be growing actively in order to attain a good kill. This can cause problems for fall seedings because some of the perennial weeds species are not growing actively in the late summer-fall. Winter

annual weed species such as horseweed or shepardspurse can become a problem in the spring following a fall seeding.

Tillage Experiments at the University of Massachusetts

Experiments investigating the differences between tillage systems have been on-going at the University since 1981. Most of the yield differences over the years have been small and not more than about three tons per acre of 70% moisture silage (Table 2). Average silage yields for the tillage treatments were relatively equal except during years marked by significantly less rainfall such as in 1993. Rainfall May through August in 1993 was 8.6 inches compared to a norm of 15.5 inches. In 1993 the no-tillage yield far exceeded the conventional tillage yield.

Table 2. Silage yield of four tillage systems

Tillage Method	Average 1981-86	1993
	tons/acre 70% moisture	
MB Plow-Disk	24.5	17.4
Disk-Disk	24.7	--
Chisel-Disk	23.3	--
No-Till	23.4	27.0

Conventional tillage using the moldboard plow and disk harrow gives good consistent results in most soils in Massachusetts. While the results from the river bottom soil in the Connecticut River Valley may not represent most soil conditions in other regions of Massachusetts, it is clear that many farmers have a tendency to overwork soils with repeated secondary tillage. Field studies at other Massachusetts sites by us and others have also shown that conservation tillage is a viable alternative to the intense conventional tillage that sometimes abuses the soil resource and possibly contributes to excessive soil erosion.

In 1994, a 16 acre tillage experiment at the University of Massachusetts Dairy Farm was initiated to study the effect of subsoiling in combination with three different tillage systems. The experiment was planted on May 13th; six weeks after the date of planting, the differences between the subsoiling and no-subsoiling were not significant; however, there were large early-season differences between no-tillage, minimum tillage, and conventional tillage treatments. A full report will be available after the corn harvest.