Conservation Tillage and Corn Production

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Conservation tillage is any type of tillage operation which maintains at least 30% coverage of the soil surface with crop residues. These residues will prevent topsoil erosion and may improve the soil fertility. However, the most tangible savings to farmers is in a much lower fuel bill and much reduced time for land preparation prior to planting. Reducing the number of field operations on a per acre basis can result in dramatic fuel savings from 50-75% (Table 1) without reducing yields. Likewise, the reduced number of passes over a field under conservation tillage saves the farmer valuable time (Table 2), lessens soil compaction and lengthens the growing season which can result in a higher corn yields. For example, a 50 acre corn field under a conventional moldboard plow system would require approximately 46 hours (6 days) to plant; the same 50 acre corn field under a reduced tillage system (disking twice) would take 27 hours (3 days), and a no-till system would only require 13 hours (1.5 days) to complete the planting.

Table 1. Diesel fuel requirements for various tillage systems.*

	Diesel Fuel Consumption (gal/ac.)				
Tillage System	Moldboard Plow	Chisel Plow	Disk Disk	Disk	No-Till
Operation					
Moldboard	2.25	-	-	-	-
Chisel	-	1.05	-	-	-
Disk	0.74	0.74	0.74	0.74	-
Disk	0.74	0.74	0.74	-	-
Plant	0.52	0.52	0.52	0.52	0.60
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Total	3.25	3.05	2.00	1.26	0.60

* adapted from Iowa St. U., Extension Agricultural Engineering

More than 100 farmers were surveyed to determine tillage and nutrient management practices. Information on nutrient management is presented elsewhere in this report. Of these crop/livestock farmers nearly 80% use conventional, moldboard plow with disking before planting. About 25% practice some form of reduced tillage and a few use no-till (Figure 1). This suggests considerable saving could be made in terms of fuel and labor. Farmers who need to conserve nitrogen from manure need to incorporate the manure within 12 to 24 hours for maximum benefit hence these farmers should consider reducing tillage rather than strict no-till without manure incorporation.

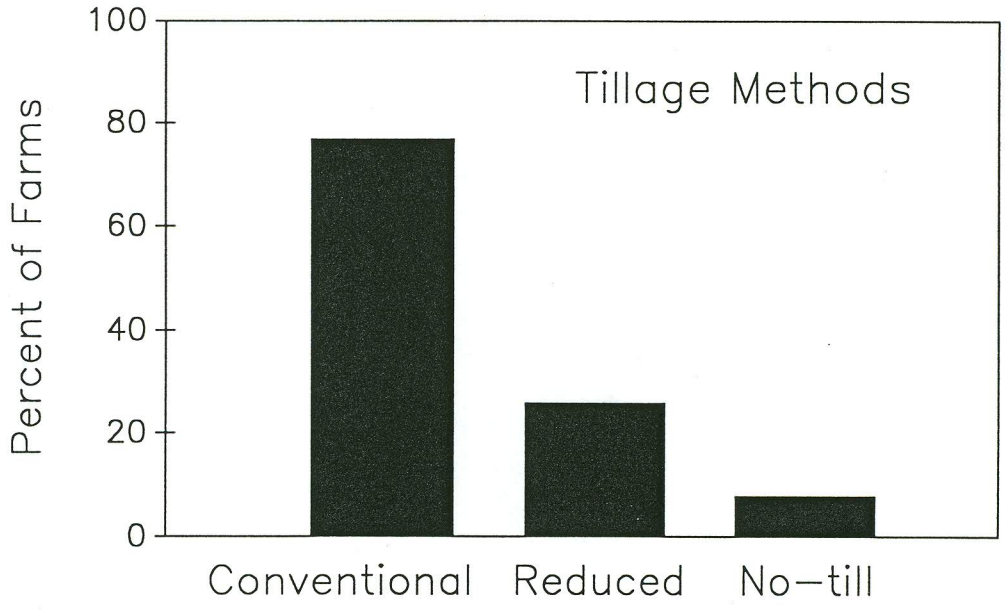

Figure 1. Tillage methods use by crop/livestock farmers in Massachusetts.

Table 2. Labor requirements for various tillage systems.*

	Labor (hr/ac.)				
Tillage System	Moldboard Plow	Chisel Plow	Disk Disk	Disk	No-Till
Operation					
Moldboard	0.38	-	-	-	-
Chisel	-	0.21	-	-	-
Disk	0.16	0.16	0.16	0.16	-
Disk	0.16	0.16	0.16	-	-
Plant	0.21	0.21	0.21	0.21	0.25
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Total	0.91	0.74	0.53	0.37	0.25

* adapted from Iowa St. U., Extension Agricultural Engineering

During the six growing seasons 1981 to 1986, tillage research at the University of Massachusetts Research Farm in South Deerfield experienced several variations of 'typical' New England weather. The summer precipitation, May through August, for 1981, 1982, 1983, 1984, 1985 and 1986 was 12.4", 18.7", 12.6", 19.5", 16.9" and

18.6" respectively. The 30 year norm for May through August is 15.2" with an even distribution of more than 3.5" each month. Rainfall these six years was not typical with some months receiving more and others less rainfall than is shown by the norm. In 1984, for instance, more than 60% of the rainfall came in late May, just after most corn had been planted in the Connecticut River Valley.

Mostly the yield differences have been small and not more than about three tons per acre of 70% moisture silage (Table 3). Yields were consistently high for the moldboard plow-disk treatment compared to other tillage treatments. The yields in these experiments were quite variable as a result of uneven stand establishment rather than a reduction in later plant growth. No-till plots in 1984 had more variation in stand establishment than moldboard plow-disk plots. The variable stands were probably related to the heavy rains between planting and emergence.

Table 3. Influence of four tillage systems on yield of corn silage.

Tillage	1981	1982	1983	1984	1985	1986
			----- tons/acre 70% moisture -----			
MB Plow-Disk	25.9	20.5	25.1	28.9	24.3	22.5
Disk-Disk	25.7	19.7	23.6	28.1	26.6	24.8
Chisel-Disk*	25.2	18.6	24.2	26.9	23.4	21.5
No-Till	25.5	17.9	23.8	25.9	25.6	21.8

*Tillage in 1981 was 2 passes of a plain disk harrow; years 1982-86 a chisel plow and notched harrow was used as in all other disk passes.

Conventional tillage using the moldboard plow and disk harrow gives good consistent results in most soils in Massachusetts. While these 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.

If done correctly with a good planter and with proper attention given to planting and weed control, no-till and other reduced tillage systems should yield about the same as conventional moldboard plow-disk systems.