

NITROGEN FERTILIZER RESPONSES IN CORN TILLAGE SYSTEMS

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Nitrogen fertilizer application to corn is necessary each year because soils do not have good mechanisms to retain nitrogen compounds, these being subject to leaching and/or denitrification processes. Two studies were initiated in 1983 to examine variable nitrogen fertilizer rates under differing tillage systems. At the University Research Farm in South Deerfield, tillage plots established two years previously were used.

Corn silage yields for these plots after three years of the same tillage practices, with three rates of nitrogen broadcast prior to planting, are shown in Table 1. As had been found previously at this site, tillage method had little apparent effect on yield. There was neither a large yield advantage or disadvantage to reduced tillage or no-tillage, compared to

Table 1. Effect of tillage and nitrogen fertilizer on corn silage yield (70% moisture) of an infrequently manured soil.

Nitrogen Fertilizer	No Tillage	Disk-Disk Plant	Chisel-Disk Plant	Moldboard Plow Disk Plant	
lb/acre	—————		ton/acre	—————	
60	18.5	17.8	20.4	18.1	
160	23.8	26.7	24.2	28.5	
260	26.8	24.2	25.7	25.9	
Average	23.0	22.9	23.4	24.2	

conventional moldboard plowing followed by disking. Similar results were found at the second site in Worcester County on the Ken-Ric Farm in Spencer (Table 2). Here no-till and a reduced tillage system of single disking before planting were compared to disk plowing followed by a second disking before planting.

Table 2. Effect of tillage and nitrogen fertilizer on corn silage yield (70% moisture) of a well-manured soil.

Nitrogen Fertilizer	No Tillage	Disk Plant	Disk-Disk Plant
	lb/ac	ton/acre	ton/acre
60	19.7	20.9	20.9
160	21.4	19.2	21.3
260	21.2	23.5	20.9
Average	20.8	21.2	21.0

Nitrogen fertilizer (ammonium nitrate) applied to the tillage plots in South Deerfield increased yield from the 60 lb/acre rate to the 160 lb/acre rate, but with little or no further increase to the higher 260 lb/acre rate. At the Spencer site there was no nitrogen response, the yield from the lowest rate equalling that from the highest rate. The Spencer site being close to the dairy barn, among other reasons has had a long history of heavy manure application prior to this year of experimentation, unlike the South Deerfield site, which had not received manure during the three years of these tillage experiments. Breakdown of organic matter releasing nitrogen was probably a large contributor of nitrogen for the growing corn crop. At both sites there was no statistically significant interaction between tillage system and nitrogen fertilizer application rate.

These results show that farmers can reduce the amount of tillage, even to zero tillage, and still maintain acceptable yields under Massachusetts environmental conditions. In so doing valuable soil may be saved in fields subject to erosion. Additionally, the nitrogen studies have shown farmers should take into account not only present applications of manure, but also give credit to long term applications from previous years.