# Tillage System N Application Timings On Heavy Clay Soils In The Golden Horseshoe Region

## (Interim Report)

### Purpose:

To evaluate the timing of nitrogen application timings for conventional and stiptill systems. On heavy textured soils many producers apply nitrogen very early in the spring in anticipation of planting a corn crop. They often use urea which lies on top until rain or tillage work it in which can be considerable time after application. This N is susceptible to loss via denitrification on fine textured soils. Furthermore, often if a wet spring follows the N application, the producer is unable to plant corn in a timely manner and elects to switch his planting intention to soybean. This leaves applied commercial fertilizer N in a system where it is not required since the soybean crop will supply its own N via fixation.

If a side dress N application system will work in strip till systems, it has considerable potential to reduce costs and environmental losses associated with applying N that will not be required if corn is not planted.

### Methods:

Three sites were selected in the Ancaster to Binbrook region of the Golden Horseshoe SCIA region. Two of the cooperators chosen have fully adopted the strip till system on their farms and the third was willing to allow the UofG-OMAFRA Cropping Systems Team to conduct the trial with the Teams equipment.

All sites were in soybeans during 2004. Trials were laid out with 2-3 replicates on field scale plots and the strip tillage and fall tillage component of the conventional system were conducted in December. In the spring of 2005, the plots of the two tillage systems were planted with starter N fertilizer only. Following the planting operation the conventional tillage plots were fertilized with 3 rates of 28% N targeting ~ 45, 90 and 135 lbs N/ac (50,100, 150 kg N/ha) in addition to a plot that received only starter N. At the same time a single treatment of striptill received a 1x rate of the At Planting N application. In late June, the striptill plots of the trials received a Side Dress application of the same N rate treatments that was applied to the conventional plots earlier. A single conventional plot which had not received N had a 1x application of Side Dress N applied. All N treatments at both application timings used the same skip row N applicator to ensure that rates applied were the same for each rate regardless of date.

The sites were otherwise maintained with normal farm practices. Assessments included planting date, number of tillage passes for conventional system, berm temperatures, crop stand, harvest yield and grain moisture.

At all sites the corn was planted with Notill competent planters which is necessary for satisfactory planting in strip till systems since it must perform the seedbed tillage operation while the crop is being planted. Conventional planters are not sufficient for planting Striptill plots.

| Table 1. Site And Treatment Profiles | | | | |
|---|---|---|---|---|
| **Site** | **Soil** | **Drainage** | **Treatments** | **Planting Dates** |
| Binbrook | Clay | Poor, Unimproved | 1. Fall and Spring Striptill<br>2. Fall Soil Saver, Spg Disc + Cultivate | 13-May-05 |
| Ancaster | Loam | Moderate | 1. Fall Striptill<br>2. Fall Soil Saver + Spg Cultivate | 11-May-05 |
| Jerseyville | Loam | Good | 1. Fall Striptill<br>2. Fall Soil Saver + Spg Cultivate | 10-May-05 |

## Results:

Harvest data was the main assessment for these trials. The data is presented in the tables below.

In table 2 the results are presented for the combined analysis of the three sites. The starter only plots for both tillage treatments resulted in statistically the same yields. This was also true for the 0.5x N rates. For some reason the 1.0x N rate plots were significantly better in the at planting conventionally tilled plot then the side dressed striptill plot but the 1.5x rate category did not differ between tillage systems.

The bridge treatments of conventional side dress vs. striptill at planting N application were statistically the same as the conventional at planting and striptill side dress treatments.

| Table 2. 2005 GHSCIA Tillage Planting Timeliness Comparison Across Sites | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Site | Soil Type | Tillage System | N Appln Timing | N Rate Category | Total N Rate (lb/ac) | Yield (bu/ac) | Stat Diff | Total N Rate (lb/ac) | Yield (t/ha) | CV |
| All Sites | various | Conv | At Plant | 0 | - | 142 | cd | - | 8.9 | 6.53 |
| All Sites | various | Conv. | At Plant | 0.5 | - | 155 | ab | - | 9.7 | |
| All Sites | various | Conv. | At Plant | 1 | - | 162 | a | - | 10.2 | |
| All Sites | various | Conv. | At Plant | 1.5 | - | 162 | a | - | 10.2 | |
| All Sites | various | Conv. | Side Dress | 1 | - | 158 | ab | - | 9.9 | |
| All Sites | various | Striptill | Side Dress | 0 | - | 137 | d | - | 8.6 | |
| All Sites | various | Striptill | Side Dress | 0.5 | - | 151 | bc | - | 9.5 | |
| All Sites | various | Striptill | Side Dress | 1 | - | 151 | bc | - | 9.5 | |
| All Sites | various | Striptill | Side Dress | 1.5 | - | 154 | ab | - | 9.7 | |
| All Sites | various | Striptill | At Plant | 1 | - | 146 | cd | - | 9.2 | |
| Treatments within the same location are not statisitically different if followed by the same letters at the 10% level. | | | | | | | | | | |

## Summary:

Although the conventional tillage system with either N application timing appeared to be better then strip till and side dressing, the differences were not great in yield and when economic analysis is imposed, the striptill is likely to be more profitable.

The results demonstrated that especially with the firm ground present between corn rows in a striptill system, side dress applications can be beneficial. Using a side dress system for N application will ensure that N is applied into a crop that requires it; placement of N is much more accurate then with traditional preplant broadcast applications. Banded N is more concentrated in the row and therefore less susceptible to weather effects in terms of leaching or denitrification. For fine textured soils which are more susceptible to denitrification and losses of $N_2O$ to the atmosphere, a side dress application system for N is likely more economical and environmentally sound.

## Next Steps:

A third year of this study needs to be completed since the results from the first year were impacted by weather and other effects. The fall of 2005 in the Wentworth region was extremely wet and we were unable to establish the fall tillage treatments. The plan is to conduct the trials again starting with establishment in the fall of 2006 and completing the field studies in the fall of 2007.

An economic and environmental impact analysis will be completed. Based on the similar yields achieved by the Conventional and Striptill systems, these further analysis will likely show that there is greater potential for profit from the Stiptill system over the Conventional system and that side dress application of N is a viable alternative to broadcast early season applications. . As well, the environmental impact with Striptill is likely to prove less because of reduced fuel use, less soil disturbance, better N use efficiency among other factors.

## Acknowledgements:

Funding for this project was provided through the Greenhouse Gas Mitigation Program for Agriculture supported by Agriculture and Agri-Food Canada and administered nationally by the Soil Conservation Council of Canada. In Ontario this program is delivered by OSCIA in partnership with IFAO, OMAFRA and the University of Guelph.

We would like to thank the project cooperators for their important contribution.

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