

RESIDUE MANAGEMENT, TILLAGE, AND NITROGEN RATE RESPONSE IN CONTINUOUS CORN 2014 Project Report to NREC, February 2015

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This research has been underway since 2006 at the Crop Sciences Research & Education Centers at DeKalb, Monmouth, Urbana, and Perry. The objective is to evaluate long-term (10 years or longer) effects of residue removal and tillage, and to see how these affect response to N rate in corn grown continuously. While the future market for corn residue as a biofuel feedstock remains uncertain, we are able through this project to evaluate effects on both yields and on soil properties.

2014 Results

The project went well at all four sites in 2014, with the exception of DeKalb, where for three years running there has been little or no response to N rate. Yields at that site averaged 97, 134, and 99 bu/acre in 2012, 2013, and 2014, respectively, with few responses to treatments in any year, though tilled plots yielded 26 bushels more than no-till in 2012. We plan to try applying the 60 lb N base rate over the entire area of the trial in 2015 to see if lack of N early in the season in cool soils has restricted N uptake and crop/root growth to produce large yield penalties. This site has a mixed record of production, with yields most years lower than those at other sites.

The response to residue removal, tillage, and N rate in 2014 are shown for Monmouth in Figure 1. Residue removal, tillage, and N rate effects were all significant, as were residue x tillage and residue x N rate effects. Averaged across N rates, tillage increased yields by more than 20 bushels over no-till where full residue remained on the field, while removing some or all of the residue brought the yield difference due to tillage down to only 3 or 4 bushels. The N response at this site was similar in 2014 to that in previous years, with maximum yields at about 180 lb N per acre, except for the no-removal no-till treatment, which often is not maximized even at the maximum (240-lb) N rate.

Responses to treatment were very similar at Urbana in 2014 to those at Monmouth (Figure 2). The same effects were significant with the exception of the residue x tillage interaction. Tilled plots yielded 8 bushels more than no-till at Urbana, and removing all of the residue increased yields by 11 bushels. Most residue and tillage treatment combinations responded similarly to N rate; the exception was no removal and no-till, which as usual responded to a higher N rate than did the other treatments. Compared to Monmouth, this treatment yielded about the same as the other treatments at the highest N rate.

Even though yield levels were very good at Perry, the response to residue removal and tillage was quite different than at the other two sites; at the highest N rate, treatments with no-till and partial or no residue removal actually yielded more than those with tillage or residue removal. This is not the first time we have seen such a response at Perry. It was somewhat dry there in August, and we think that removing residue and tilling can have a negative effect on soil water storage there, in some cases reducing yields. The slight drop in yield from 180 to 240 lb of N for the treatments with tillage and residue removal might be expected when water limits yields.

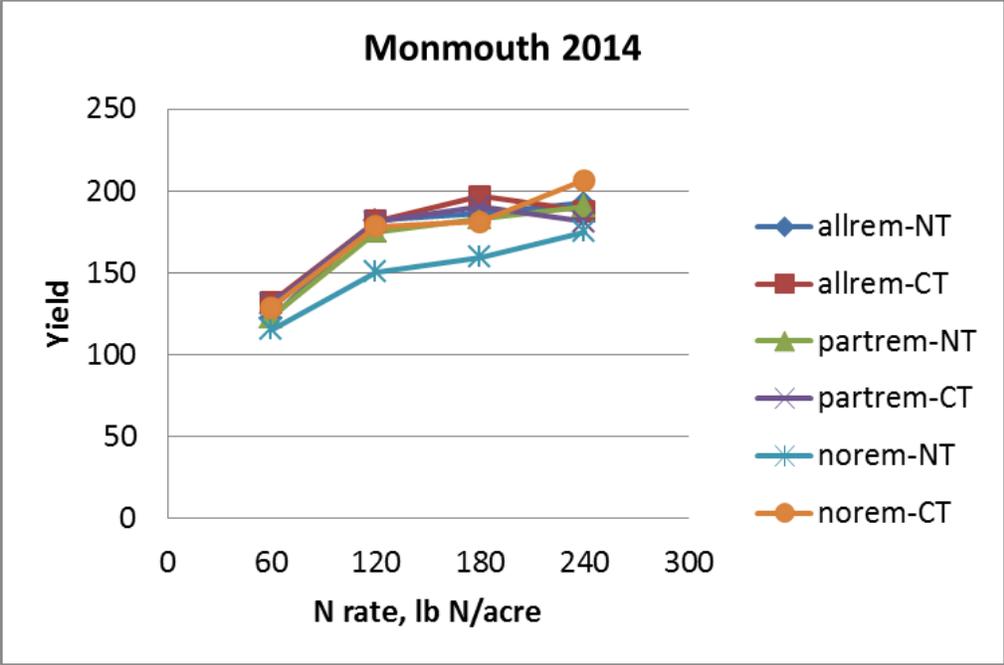


Figure 1. Response of continuous corn (continuous since 2005) to residue removal (all, part, or none) and tillage (CT = tilled; NT = no-till) and N rate at Monmouth in 2014.

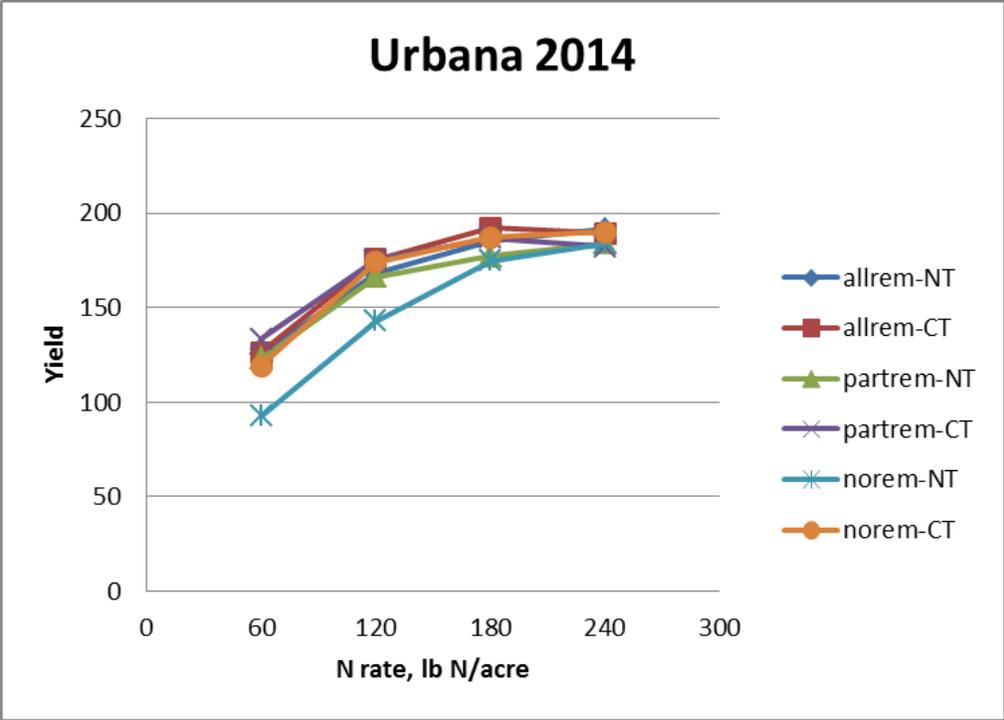


Figure 2. Response of continuous corn (continuous since 2005) to residue removal (all, part, or none) and tillage (CT = tilled; NT = no-till) and N rate at Urbana in 2014.

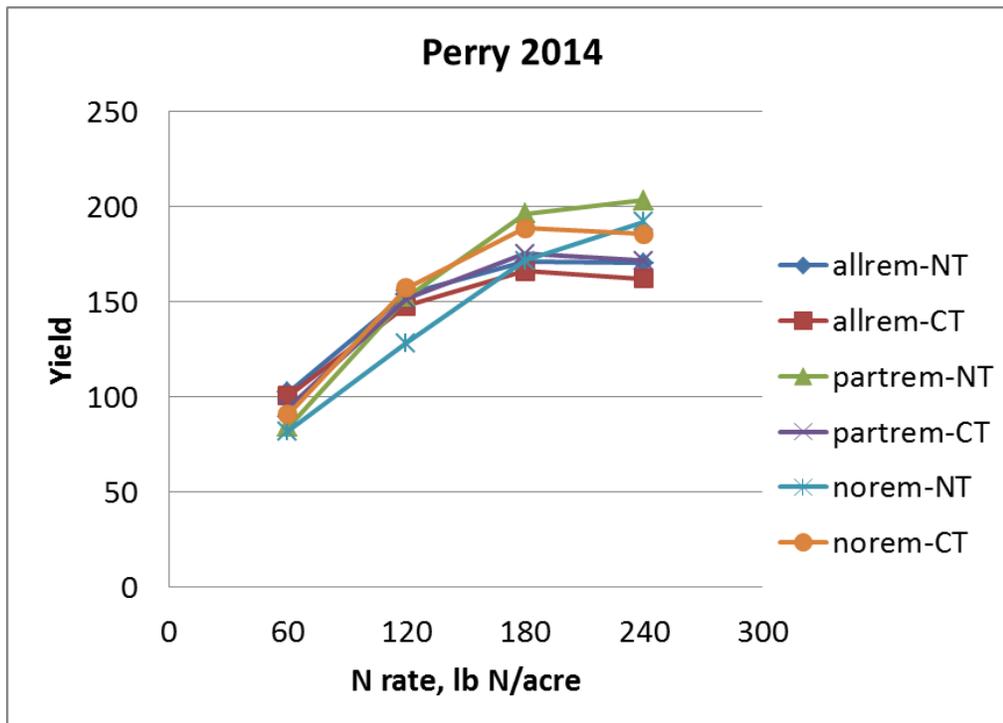


Figure 3. Response of continuous corn (continuous since 2005) to residue removal (all, part, or none) and tillage (CT = tilled; NT = no-till) and N rate at Orr Center (Perry) in 2014.

Outreach

Data from this trial have proven to be valuable, though with the decrease in interest in harvesting corn stover the interest is waning somewhat. This project became part of the DOE regional biomass project, and a manuscript was published from that project that included our data. Additional manuscripts have been submitted, and the data continue to be used in Extension programs.

Budget

| Category | 2014 Budget | Spent in 2014 | Remaining | 2015 request |
|-------------------------|----------------|------------------|-----------|-----------------|
| Materials and Supplies | 500 | - | 500 | 500 |
| Transportation Services | 1,500 | - | 1,500 | 1,500 |
| Services | 4,000 | 2,011 | 1,990 | 8,000 |
| Indirect Costs Pool | 4,235 | 3,957 | 278 | 4,694 |
| Academic Salary | 22,500 | 21,021 | 1,479 | 23,175 |
| Assistant Salary | - | 6,396 | (6,396) | 0 |
| Benefit Costs | 9,662 | 6,225 | 3,437 | 9,071 |
| Totals | 42,398 | 39,610 | 2,787 | 46,940 |

The use of some salary funds for a (research) assistant occurred because the academic professional paid on these funds was a (lower-paid) graduate research assistant before being hired.

The larger amount for services in 2015 is for analysis of samples to be taken from all plots in the fall of 2015, after treatments have been in place for 10 years.