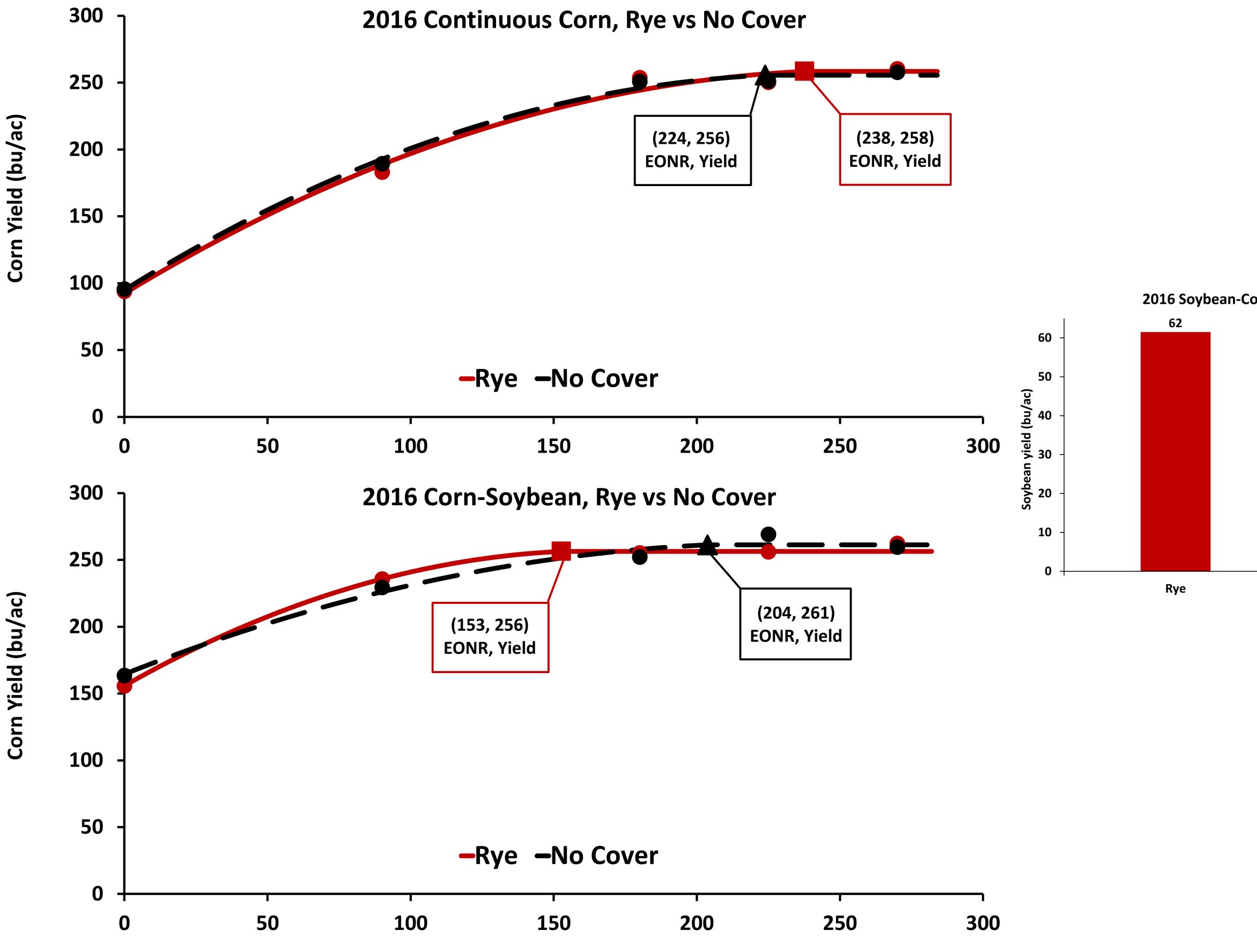
Rosholt Farm Research Update: Nitrogen Management for Corn Production and Water Quality

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Rosholt Farm Field Day 17 Aug. 2017, Westport, MN

UNIVERSITY OF MINNESOTA Driven to Discoversm



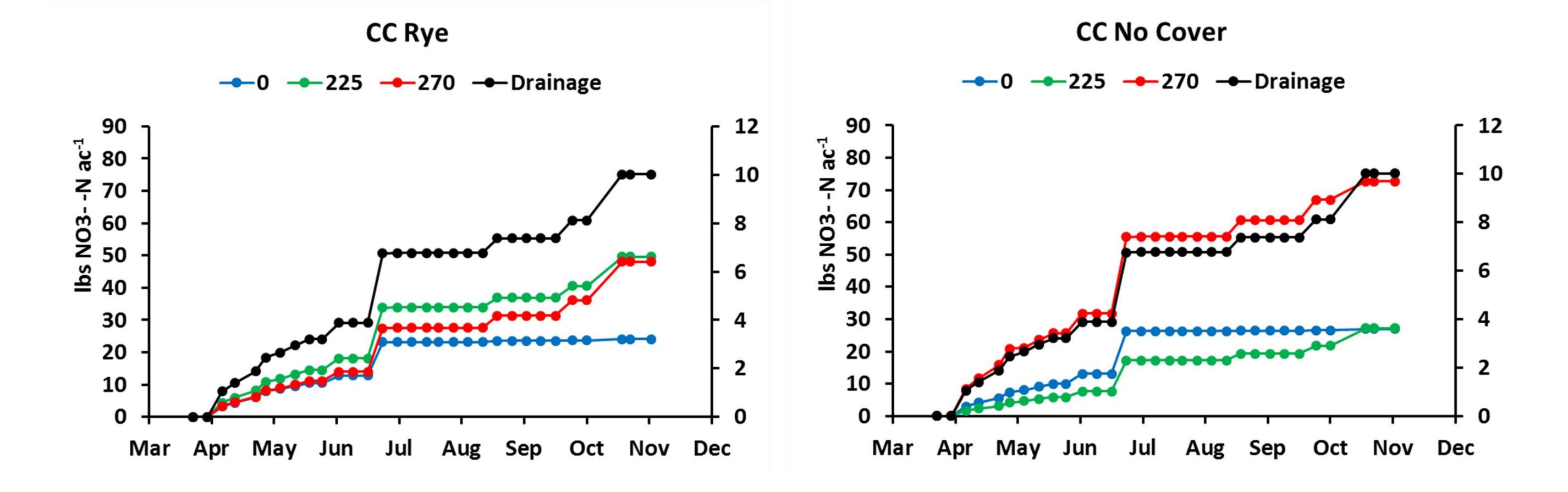


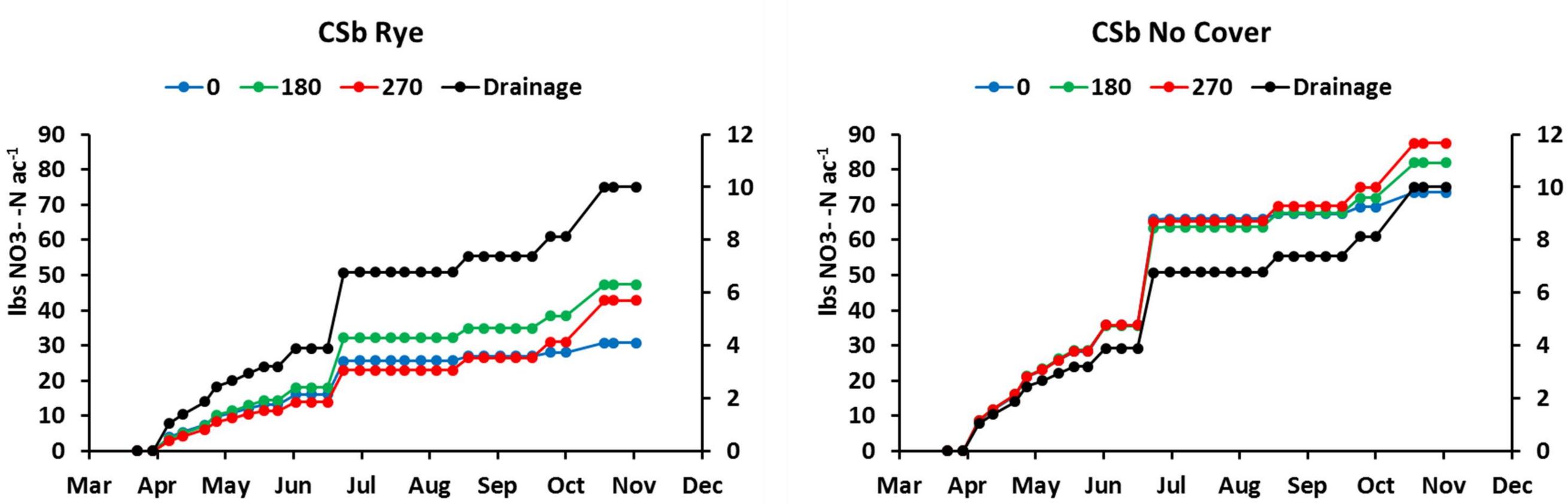
N Rate (lbs N/ac)

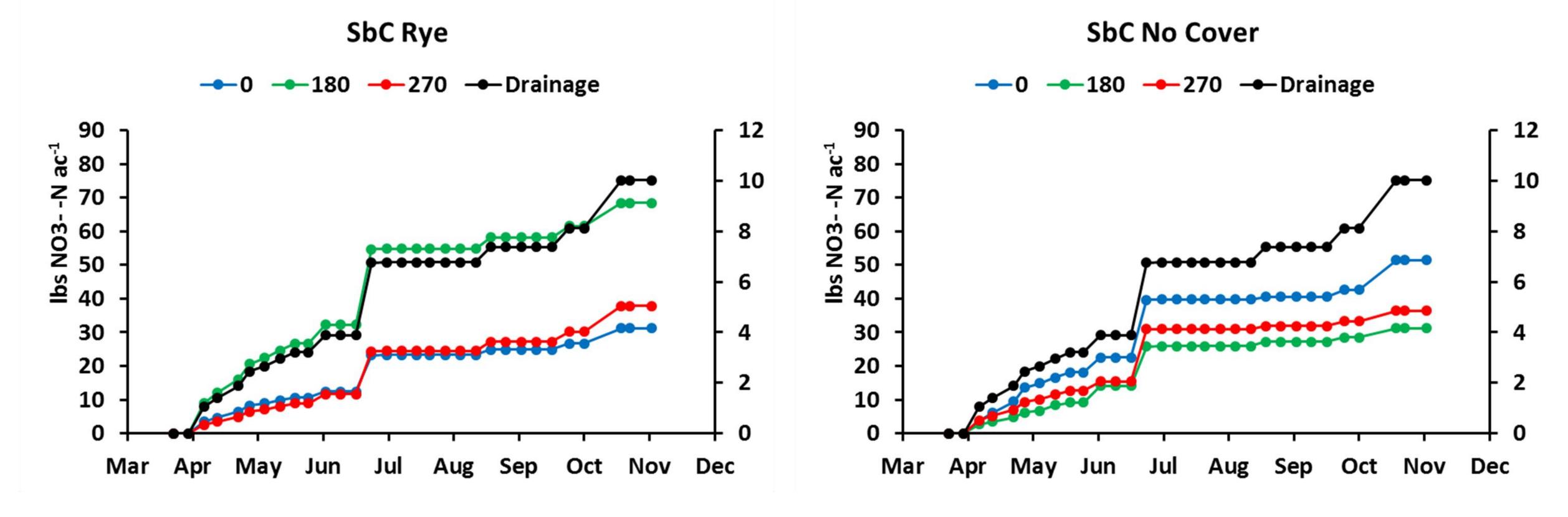
2016 Soybean-Corn, Rye vs No Cover



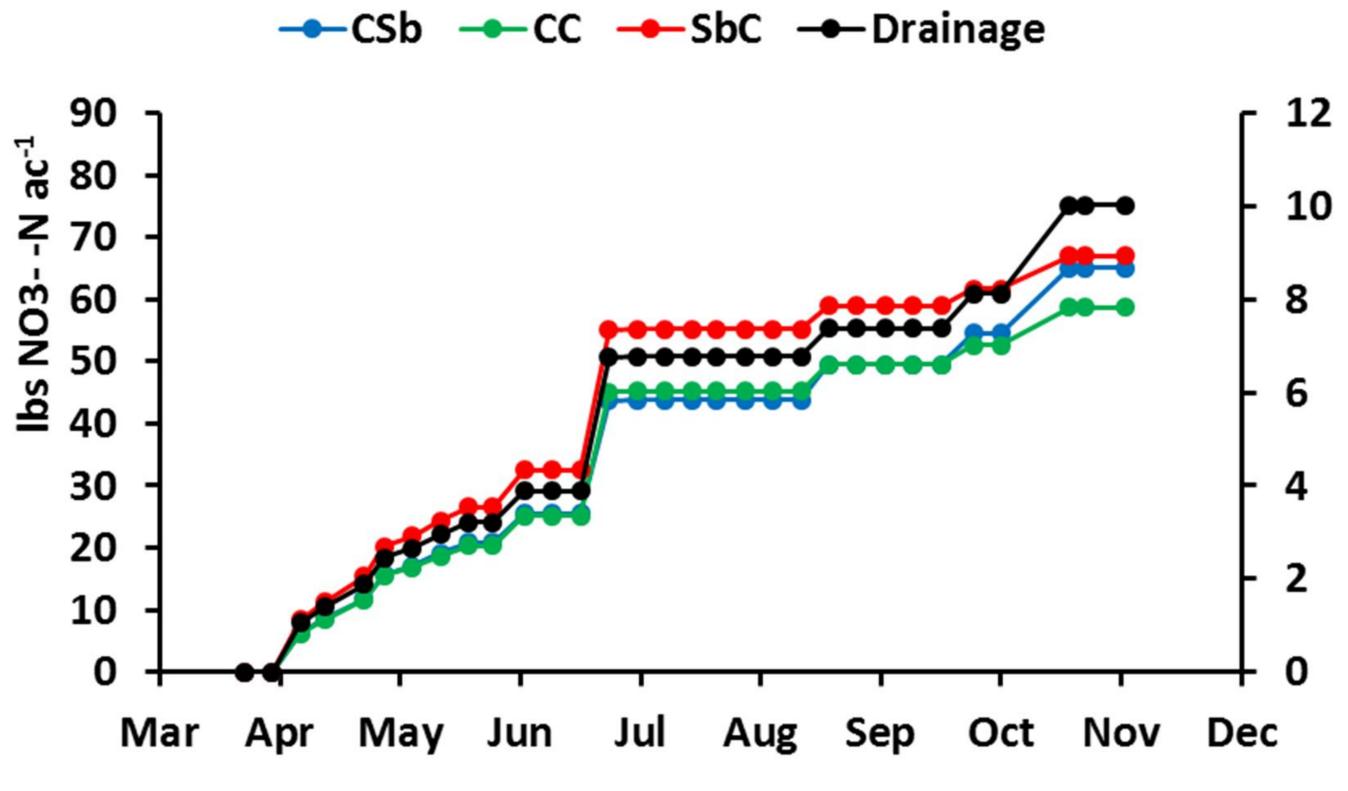
No Cover





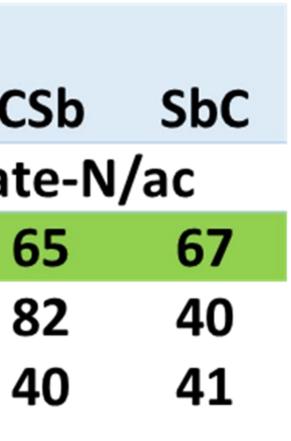


Kura



May-Jun Drainage 28%

| May-Jun Lo | bad | |
|-------------|-------|--------|
| 29% rye | | |
| 33% no cov | ver | |
| 32% Kura | | |
| Cumulative | | |
| season-long | CC | CSb |
| | lb ni | trate- |
| Kura | 59 | 65 |
| NoCover | 42 | 82 |
| Rye | 41 | 40 |
| | | |







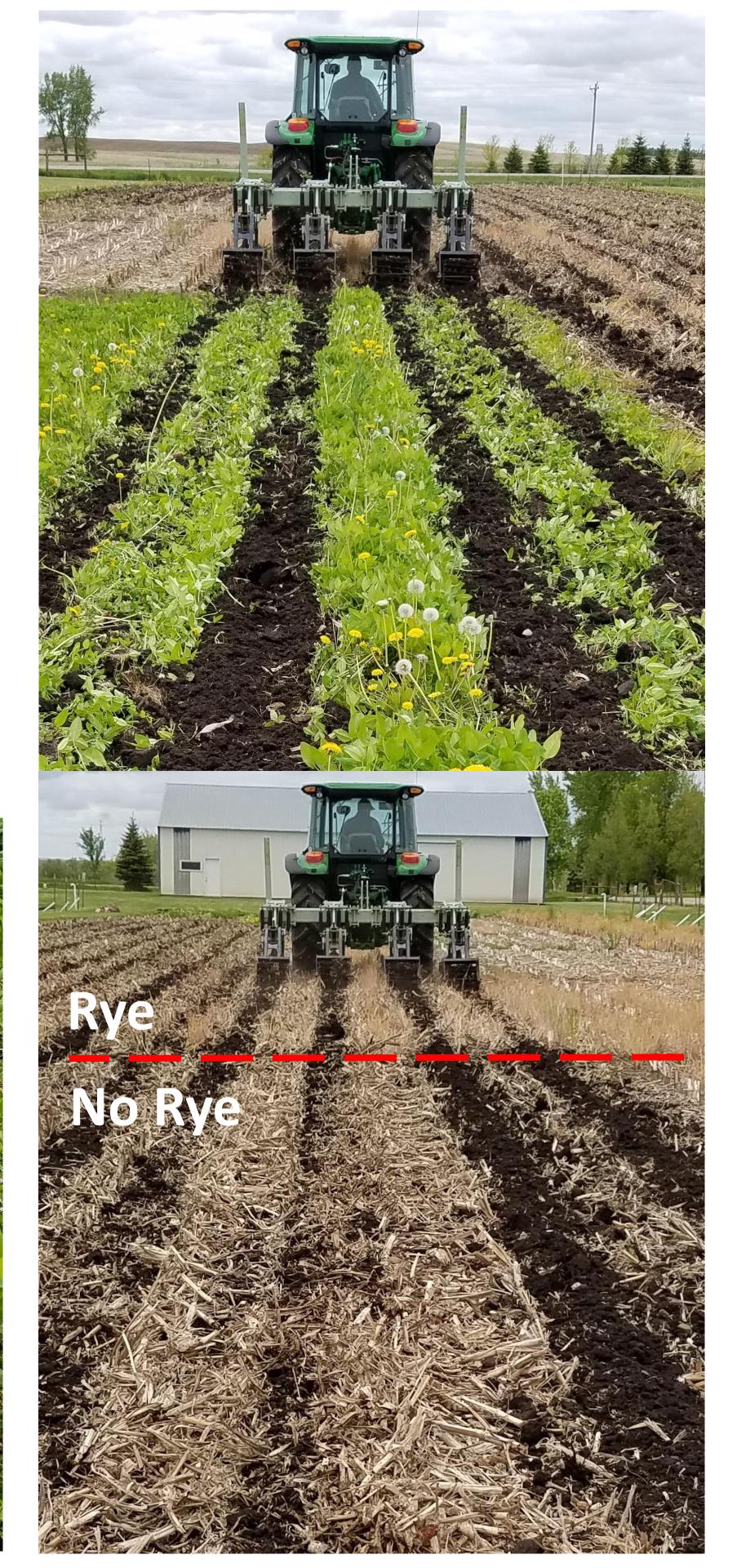
Top Left to Right: Varying CC spring Rye establishment, CSB Rye establishment, Strip tillage of kura (1tRIPr)

Bottom Left to Right:

Development difference on July 14th, strip tillage of rye and no rye treatments



CSB Kura 180 lbs N/ac CSB Kura 0 lbs N/ac Plot 805 Plot 805



Rye in SbC Sept 16 Rye in CC Sept 16

Kura with oat companion crop June 16

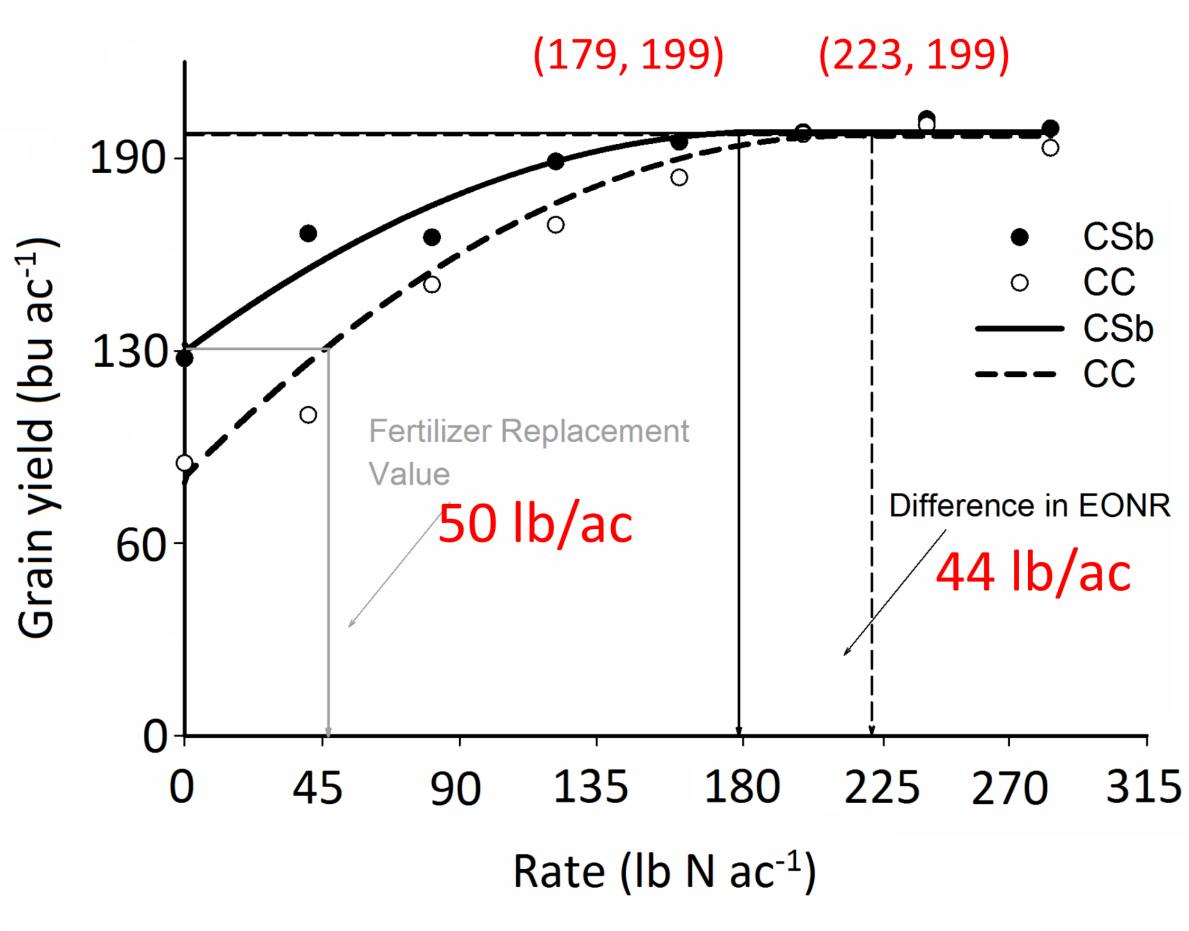
Kura Sept 16



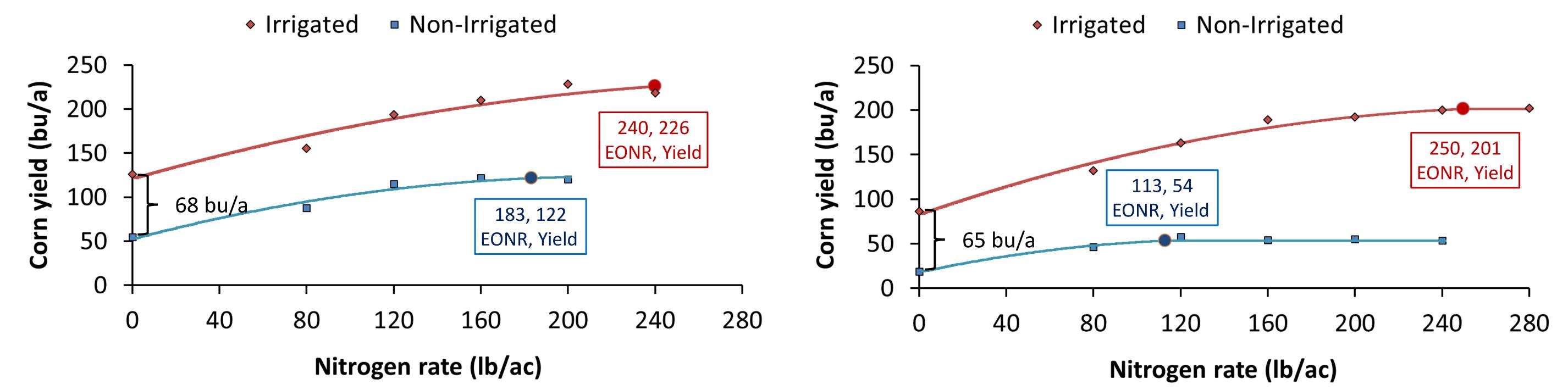
Kura Establishment







2015



| Table 1. Guidelines for use of N fertilizer for corn after corn grown on irrigated sandy soils. | | | | |
|--|-----------|------------------|--|--|
| N price/Crop | MRTN | Acceptable range | | |
| value ratio | lb N/acre | | | |
| 0.05 | 233 | 214 – 252 | | |
| 0.10 | 209 | 192 – 225 | | |
| 0.15 | 191 | 177 – 206 | | |
| 0.20 | 177 | 164 - 190 | | |



UNIVERSITY OF MINNESOTA EXTENSION

AG-NM-1501 (2015)

Fertilizing Corn Grown on Irrigated Sandy Soils

John A. Lamb, Nutrient Management Specialist Carl J. Rosen, Nutrient Management Specialist Phyllis M. Bongard, Educational Content Develop Daniel E. Kaiser, Nutrient Management Specialist Fabian G. Fernandez, Nutrient Management Specialis

Most irrigated corn grown in Minnesota is on soils derived from sand and gravel outwash deposits. Sub-soils are sandy while the surface soil's textures can range from sand to silty clay loam. With irrigation, these soils are very productive but nutrient application is necessary to get the most economical production from them. These soils also require high levels of management to control nutrient loss and related environmental degradation and profitability concerns.

Brian L. Barber, Director, Soil Testing Laboratory

NITROGEN BEST MANAGEMENT PRACTICES

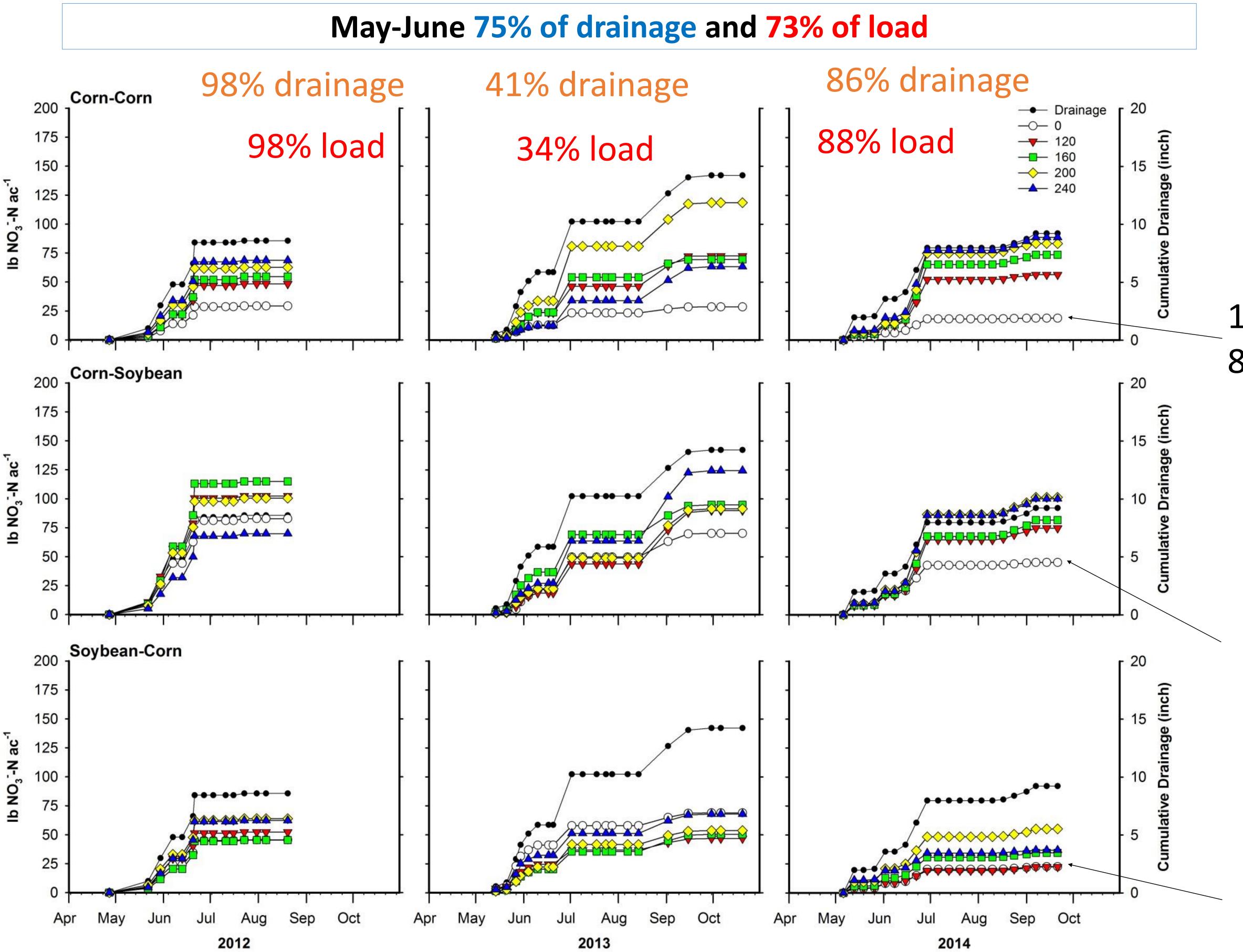
Currently, the use of best management practices (BMPs) for nitrogen (N) is voluntary. Corn growers on irrigated sandy soils should implement BMPs to optimize N use efficiency, profit, and protect against increased losses of nitrate-N to groundwater aquifers. The focus of this publication is to present recent findings for N fertilizer use, especially related to rate of application and time of application. For more detailed discussion on time of application, selection

of N source, placement of fertilizer N, and decisions regarding the use of nitrification inhibitors please see Extension publications listed under Related Publications. **Rate of N Application**

Because of environmental risks and profitability concerns, N is the most

important nutrient input for irrigated corn The corn fertilizer guidelines established in 2006 were based on the use of the Maximum Return To Nitrogen (MRTN) concept. This concept incorporates the productivity of the soil the cost of N fertilizer, the price received for corn, and the grower's attitude towards risk associated with insufficient N for the crop and risk of environmental degradation.

When the MRTN concept was developed, there was relatively little current information for corn N response on irrigated sandy soils. A decision was made to use data from highly productive fine-textured soils for the irrigated sandy soils until an adequate amount of data was collected under irrigation. Here we discuss N rates based on field research conducted since 2007 on irrigated sandy soils. The corn market and fertilizer costs do affect the economic optimum N rate. To account for this, the ratio of the price of N fertilizer per pound to the value of a bushel of corn is used in the N rate decision. An example calculation of the price/value ratio is if N fertilizer costs \$0.50 per lb N or \$830 per ton of anhydrous ammonia, and corn is valued at \$5.00 per bushel, the ratio would be 0.50/5.00 = 0.10Once the soil productivity, in this case irrigated sandy soils, and price/value ratio have been determined, a producer's attitude towards risk must be factored into the

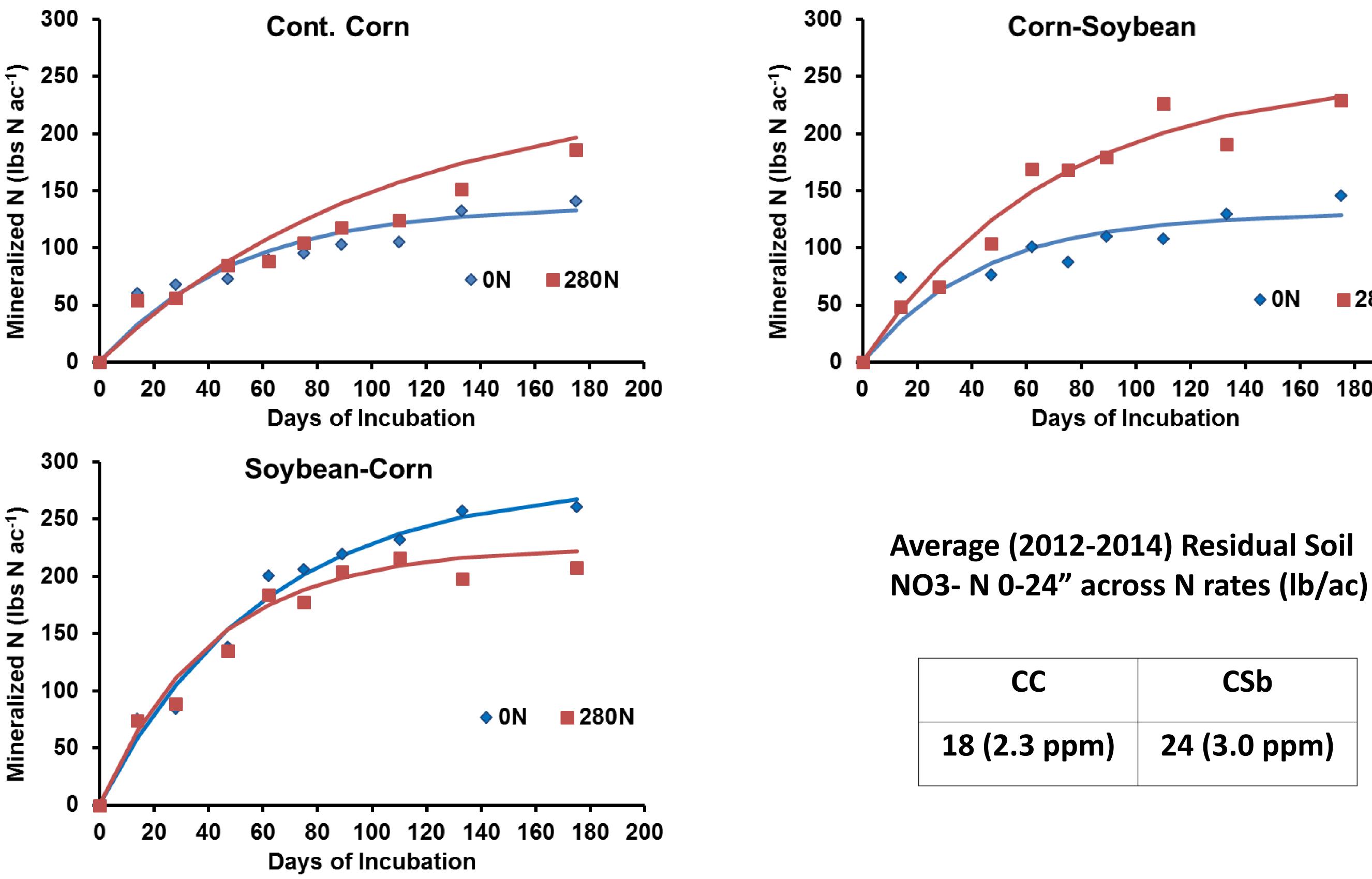


19 lb/a 8.8 ppm

45 lb/a 19.7 ppm

23 lb/a 10.6 ppm

Arvilla sandy loam: 4.6% OM CEC 16.1 meq/100g, (70% sand, 17% silt, 13% Clay), pH 7.1



| CC | (|
|--------------|--------|
| 18 (2.3 ppm) | 24 (3. |

CSb .0 ppm)

180 160 200 140



| | CC | | | CSb | | |
|---------------|---------------------|---------------------|--|---------------------|---------------------|--|
| | N rate | Grain yield | NO ₃ ⁻ -N Leached | N rate | Grain yield | |
| | Ib ac ⁻¹ | bu ac ⁻¹ | Ib ac ⁻¹ | Ib ac ⁻¹ | bu ac ⁻¹ | |
| EONR | 223 | 199 | 77 | 179 | 199 | |
| 20% Reduction | 179 | 191 | 70 | 144 | 194 | |
| 25% Reduction | 167 | 188 | 68 | 135 | 193 | |

20% reduction reduced yield by 4% and NO₃-N leaching by 9%. **25% reduction reduced yield by 6% and NO₃-N leaching by 11%**

| Product | Yield | СС | CSb | SbC | СС | CSb | SbC |
|-----------|------------------------|--------------------------|-------------|---|-------------|--------------|-------------|
| 160 lb/ac | bu ac ⁻¹ | mg NO ₃ N L-1 | | lb NO ₃ ⁻ -N ac ⁻¹ | | | |
| Urea | 198 <mark>a</mark> | 30 a | 44 a | 19 a | 63 a | 95a | 43 a |
| ESN | 190b | 27 a | 42 a | 19 a | 64 a | 85 a | 47 a |
| ESN/Urea | 188b | 28 a | 46 a | 22 a | 60 a | 99 a | 46 a |
| SuperU | 185b | 33 a | 52 a | 21 a | 67 a | 104 a | 52 a |

