In-Situ Soil Nitrogen Mineralization in Response to Nitrogen Management for Corn and Soybean in Poorly Drained Soils With and Without Tile-Drainage

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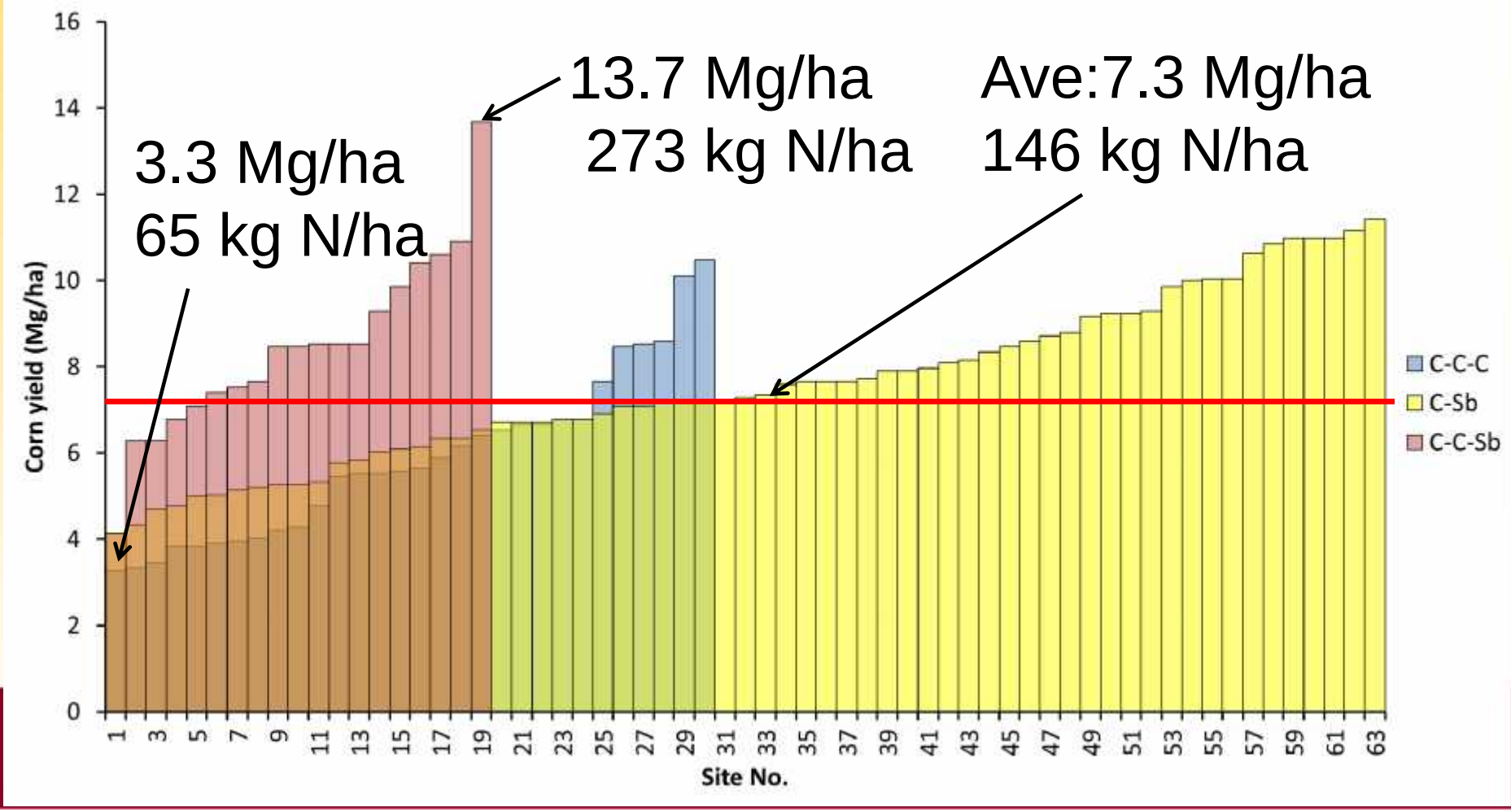
How Much Yield Can We Get Through Mineralization in MN?
Percent of Corn Yield at EONR Obtained from the 0-N Check 53% C-C, 71% C-S

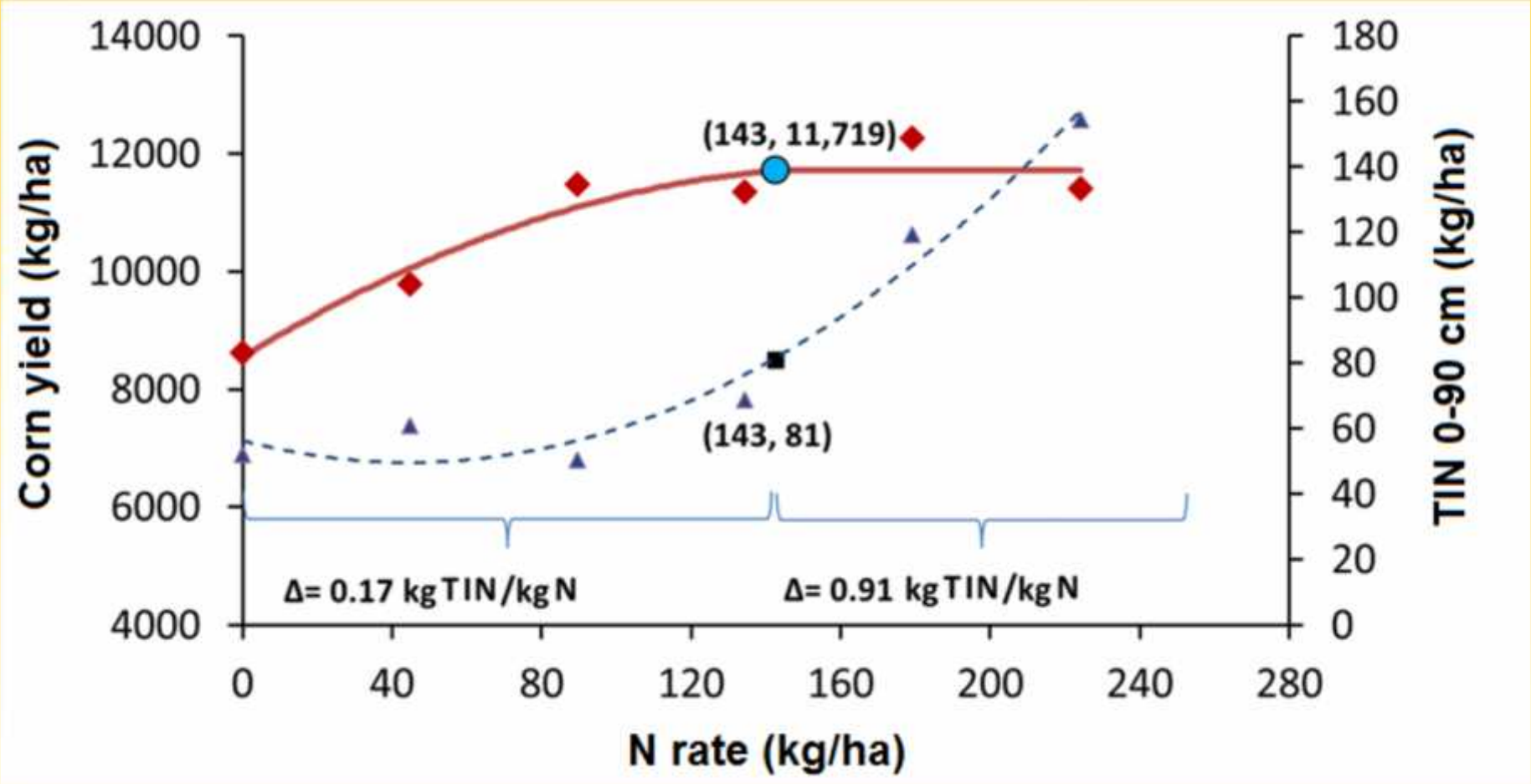


After 4 Years of Constant Management in a Sandy Loam with 4.6% SOM

N rate	Corn-Corn	Corn-Soybean	Soybean-Corn
kg ha^{-1}	mg NO_3^--N L^{-1}		
0	8.8d	19.7d	10.6c
135	28.2c	42.9c	10.9c
180	37.2b	46.6bc	15.6b
225	42.7ab	55.8a	25.0a
270	44.3a	53.6ab	15.8b
Mean	32.2	43.7	15.6

N rate	Corn-Corn	Corn-Soybean	Soybean-Corn
kg ha^{-1}	kg NO_3^--N ha^{-1}		
0	21b	50c	26
135	64ab	84b	25
180	83a	92ab	39
225	93a	113a	62
270	100a	112a	41
Mean	72A	91A	38B

Optimum N Rate and Residual N

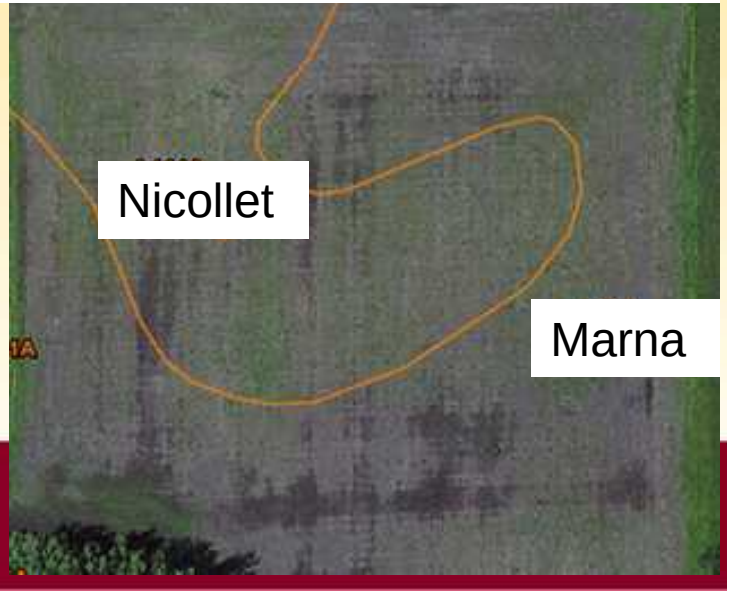


Control drainage structure

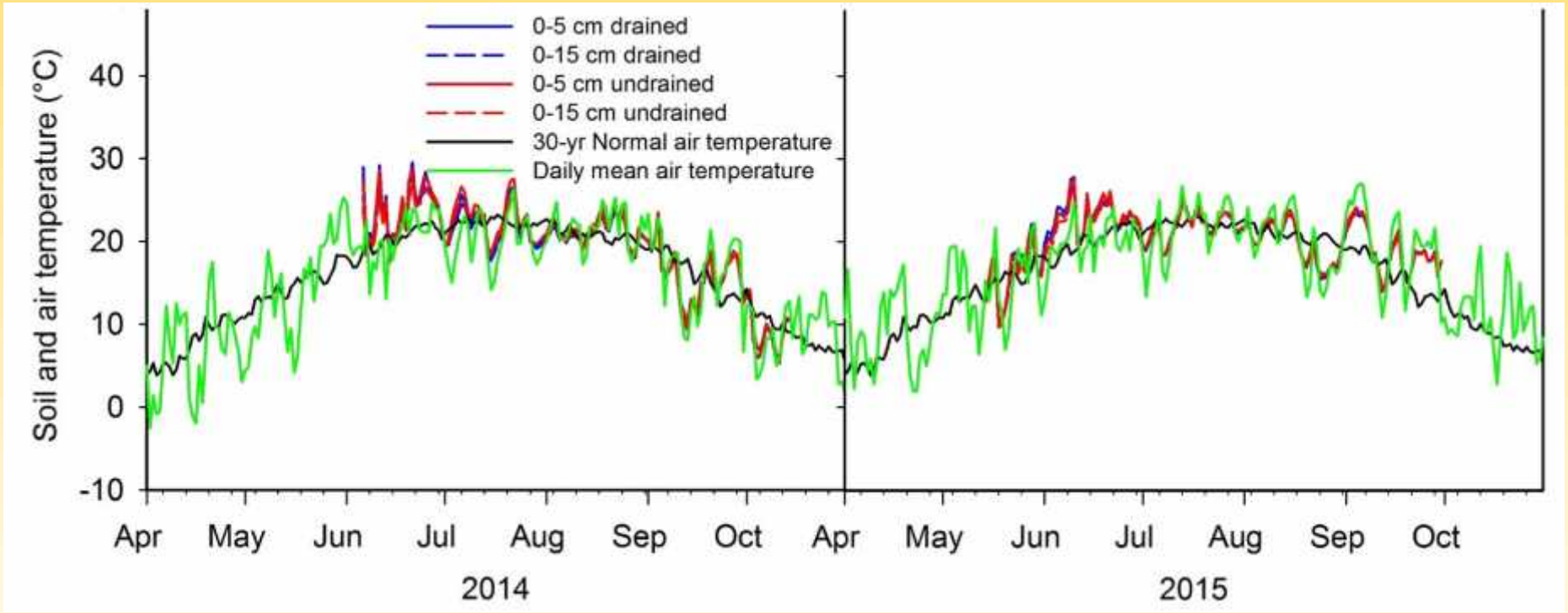
In undrained soil:

- 19% greater TOC (41 vs 35 Mg/ha)
- 18% greater TN (2.9 vs 2.4 Mg/ha)

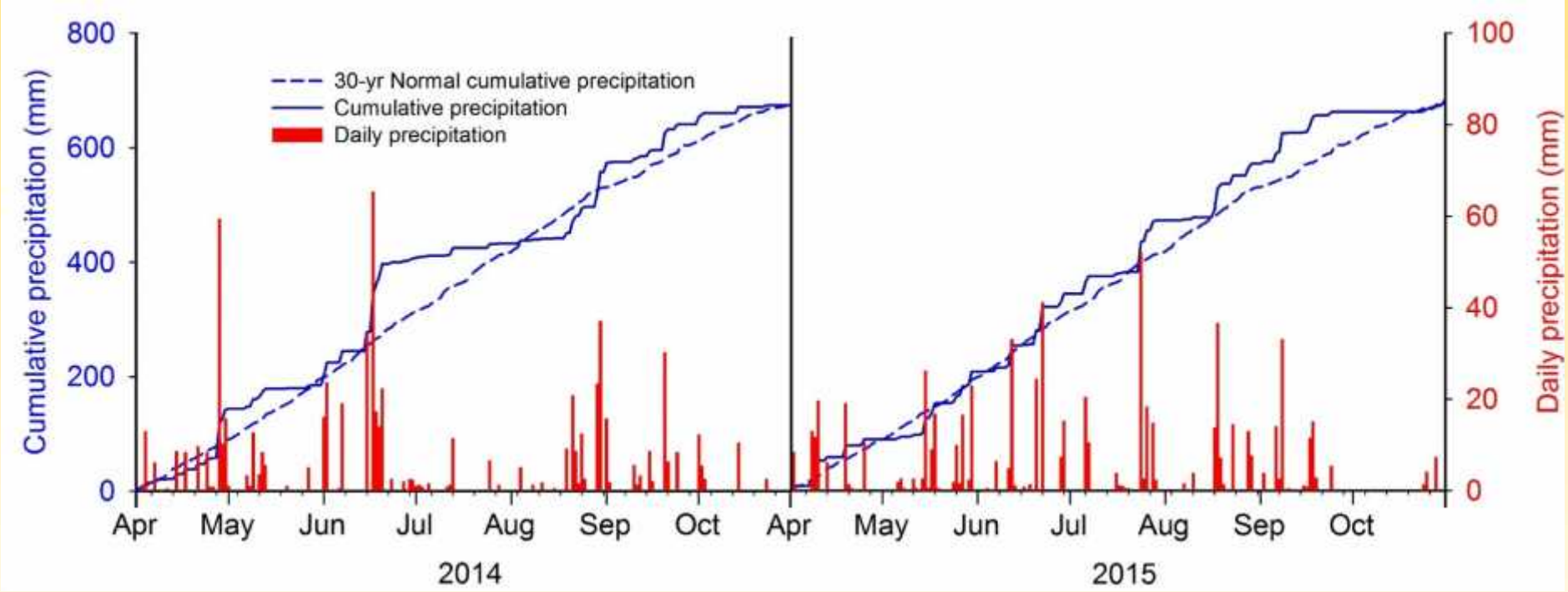
Silty clay loam; 5.3% OM



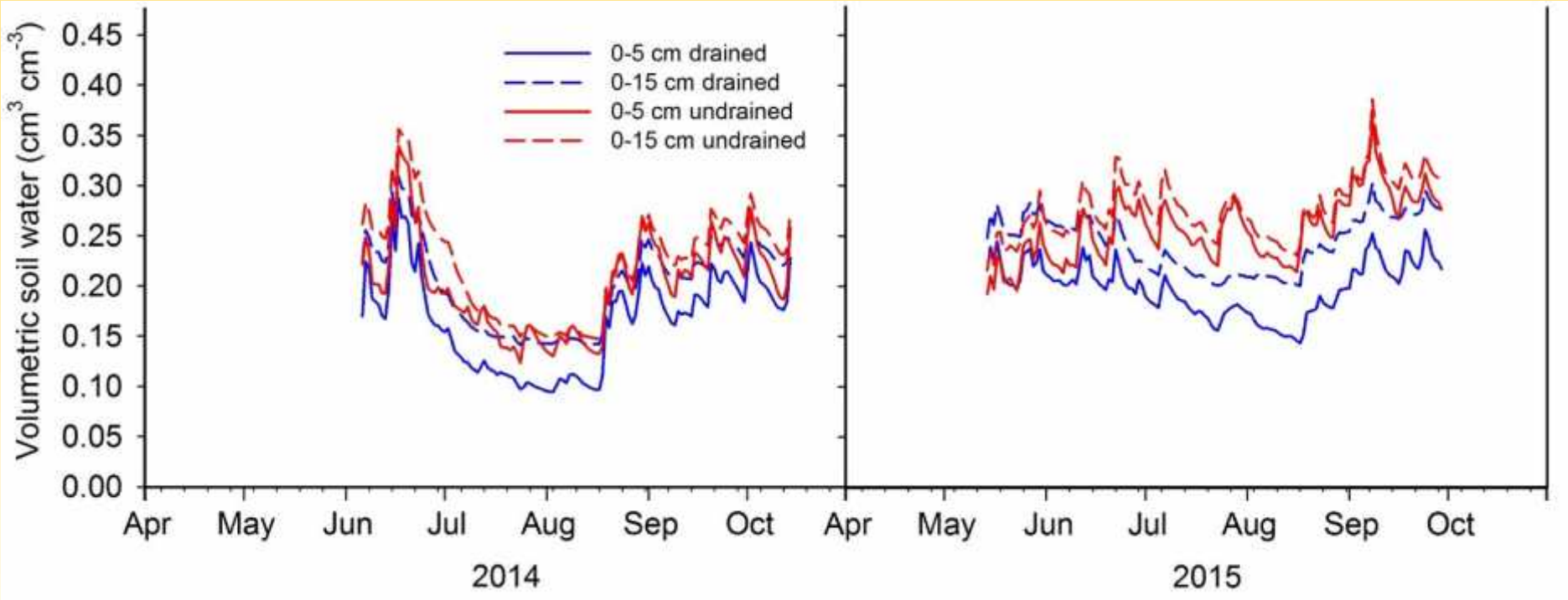
Soil and Air Temperature at 0-5 and 0-15 cm Soil Depth



Daily and Cumulative Precipitation and 30-yr Normal Cumulative Precipitation

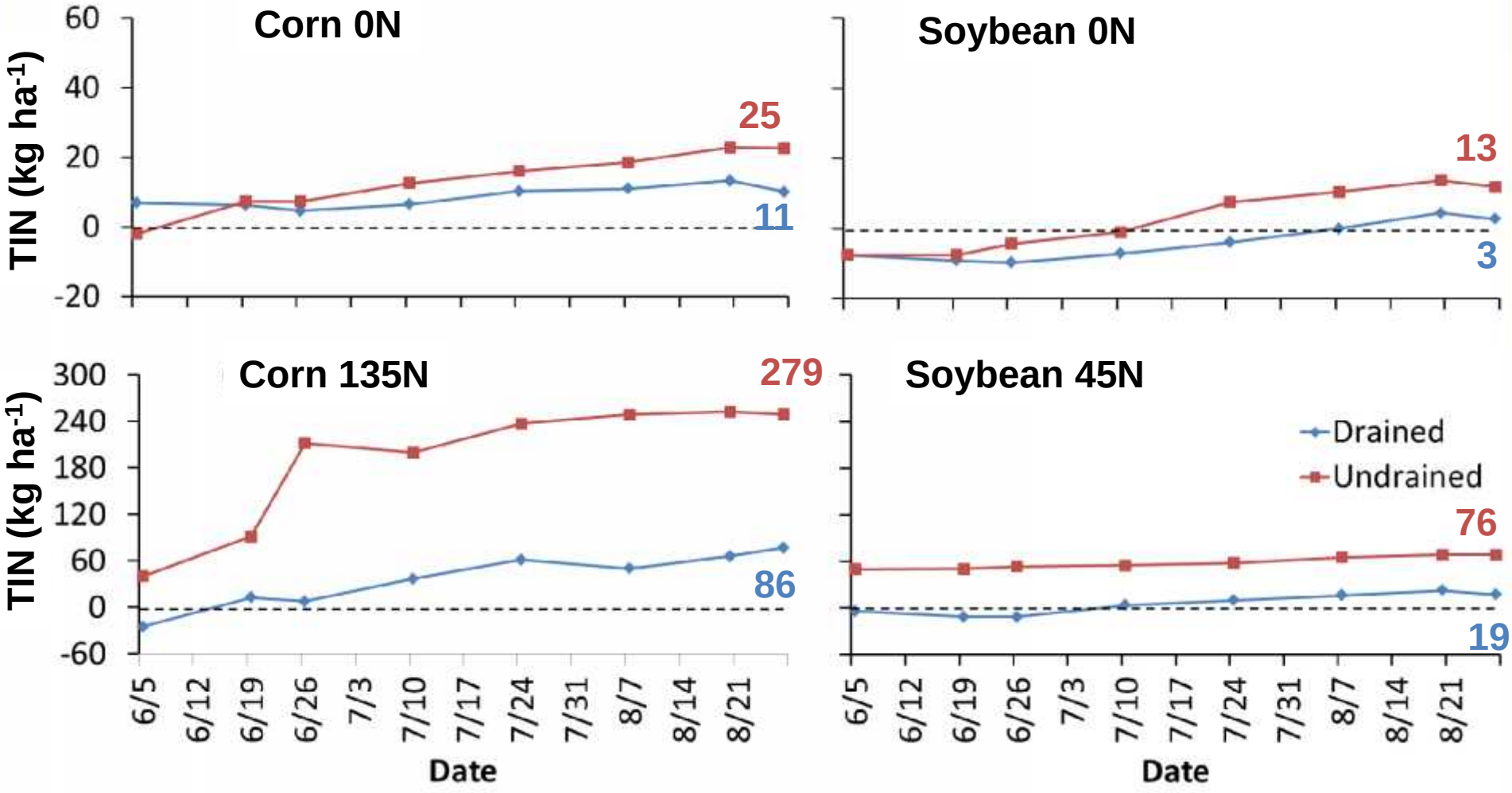


Volumetric Soil Water Content at 0-5 and 0-15 cm Soil Depth for Drained and Undrained Soils



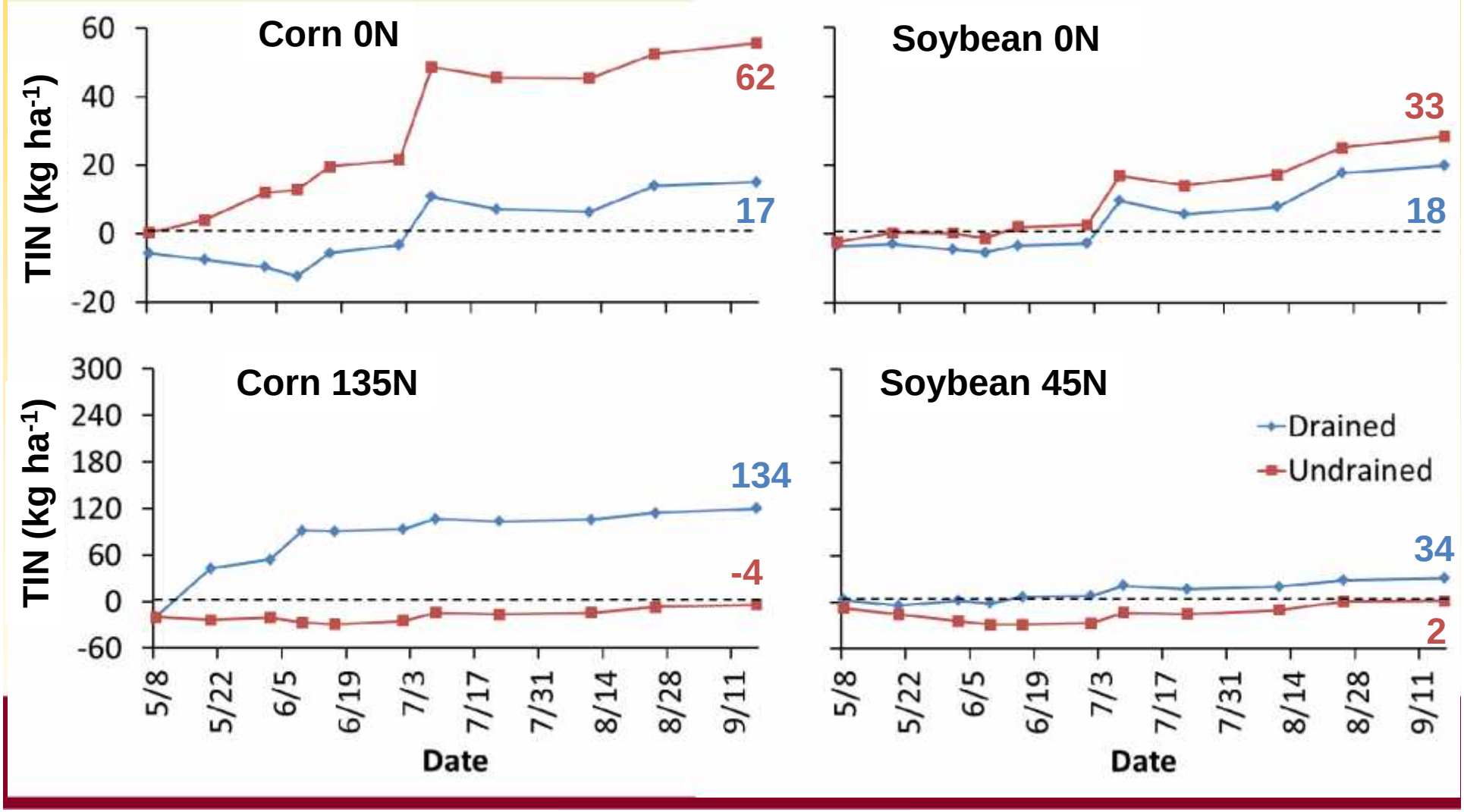
2014

Adding N in D increase Nmin	Yes
Adding N in UD decrease Nmin	No
Soybean less Nmin than corn	Yes
D greater Nmin than UD	No



2015

Adding N in D increase Nmin	Yes
Adding N in UD decrease Nmin	Yes
Soybean less Nmin than corn	Yes
D greater Nmin than UD	Yes for fert. trt only



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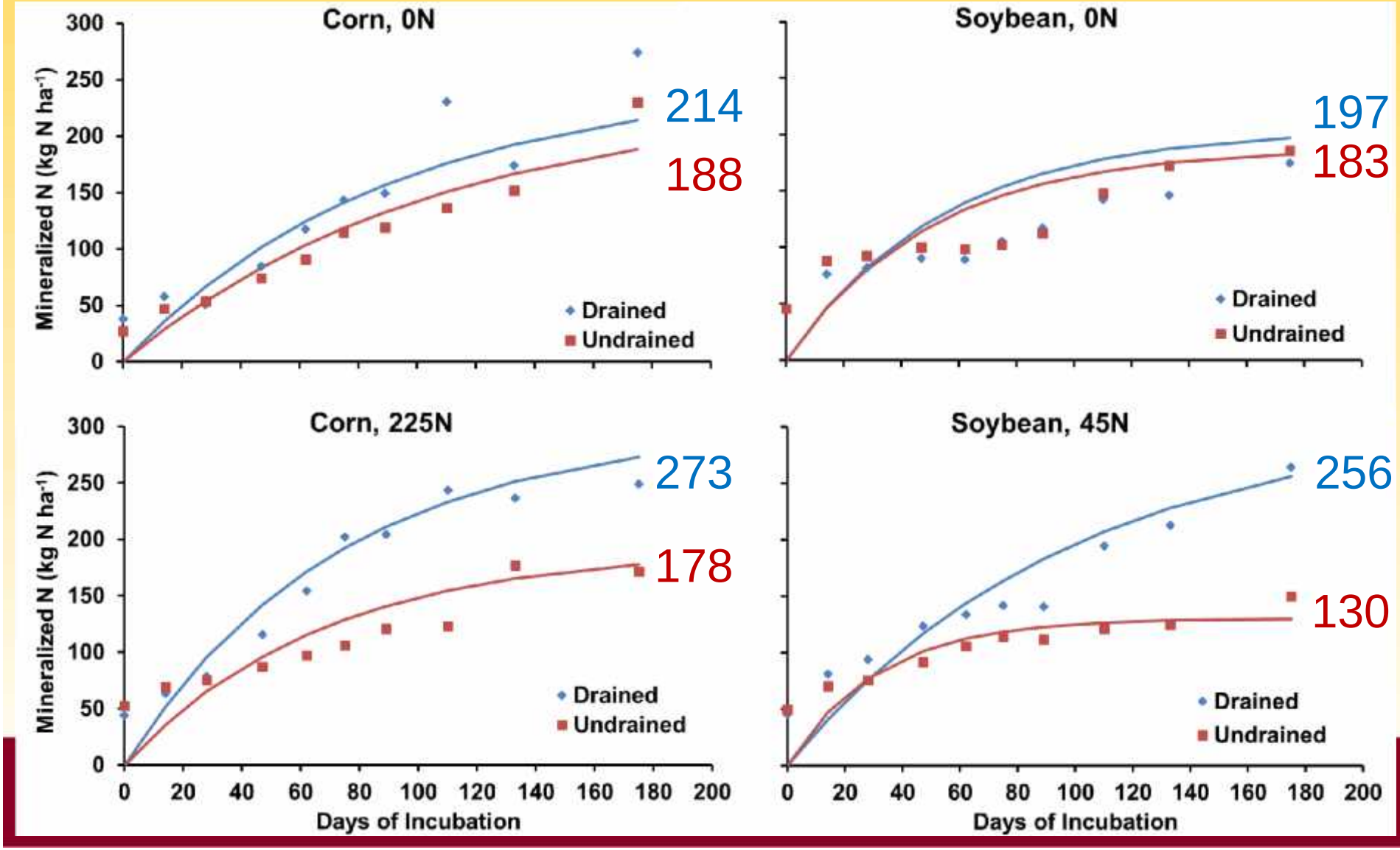
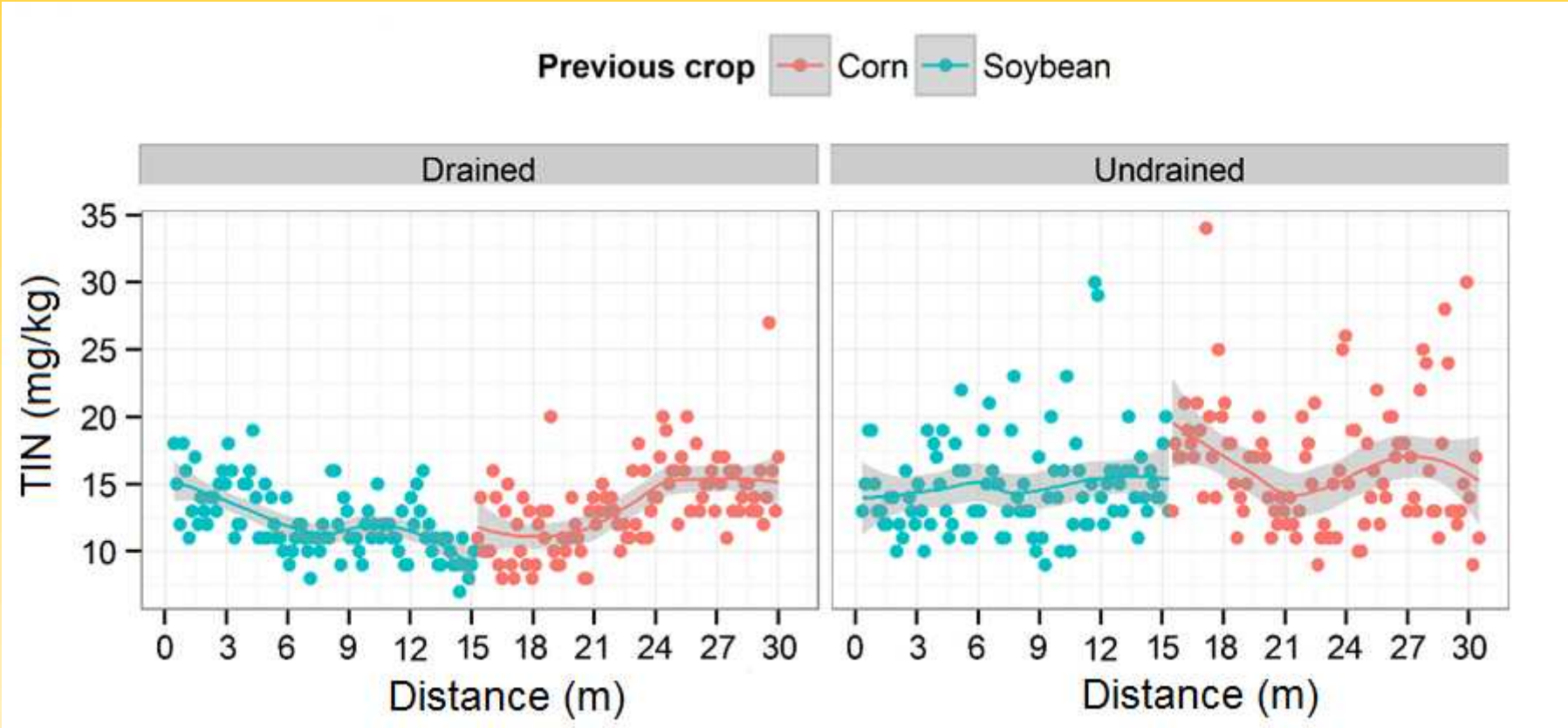


Lab Measurements of Ideal (Potential) May Not Translate Well to Field Conditions

Crop	Drainage	Nitrogen	Lab	2014	2015
			kg ha^{-1}		
Corn	Drained	No	214	11	17
		Fert.	273	86	134
	Undrained	No	188	25	62
		Fert.	178	279	-4
Soybean	Drained	No	197	3	18
		Fert.	256	19	34
	Undrained	No	183	13	33
		Fert.	130	76	2



- 400 samples 0-30 cm deep every 15 cm over a 30 m linear transect
- 180 point samples (0-15, 15-30, 30-60 cm)10-core composite

Overall, 20 samples per hectare are needed to achieve a TIN estimate with 10% error margin at 0.05 significance level

Summary

- There are many challenges and opportunities around N management
- Quantifying soil N mineralization is not an easy endeavor
- Critically important to improve our understanding of the mineralization process to enhance N management


Questions?
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