

Justification

- Cover crops are valuable in corn silage-based rotations to provide ground cover after harvest and to reduce N leaching after fall manure application.
- There may be positive long-term effects of using cover crops in these systems; such as greater soil N supply (measured as potentially mineralizable N (PMN)).
- However, previous research (Sharifi 2013) has shown PMN exhibits seasonal variation; as both the soil and manure will change in-terms of potential N supply.
- In our current study, we are examining the effect of rye as a cover (chemically terminated) or a forage (harvested) crop will have on the system by measuring the PMN from soils collected throughout the growing season.

Objectives

- To examine the effect cover cropping has on the soil by measuring the PMN from soils collected throughout two growing seasons using a 7day anaerobic method and 40-wk aerobic method.
- To compare plant N uptake and PMN results on a non-fertilized soil to evaluate seasonal soil N supply.

Materials and Methods

Location – Arlington Agricultural Research Station, WI System - continuous corn silage with fall manure application to all treatments [Manure Rate: 115,000 L ha⁻¹ surface applied 10/6/2014 and 93,400 L ha⁻¹ incorporated 9/15/15.] No tillage in all treatments. Soil - Plano silt loam
No additional mineral N (besides starter fertilizer) added.
Planting Date – 5/8/ 2015; 5/22/2015 (in RF plots) and 5/5/2016

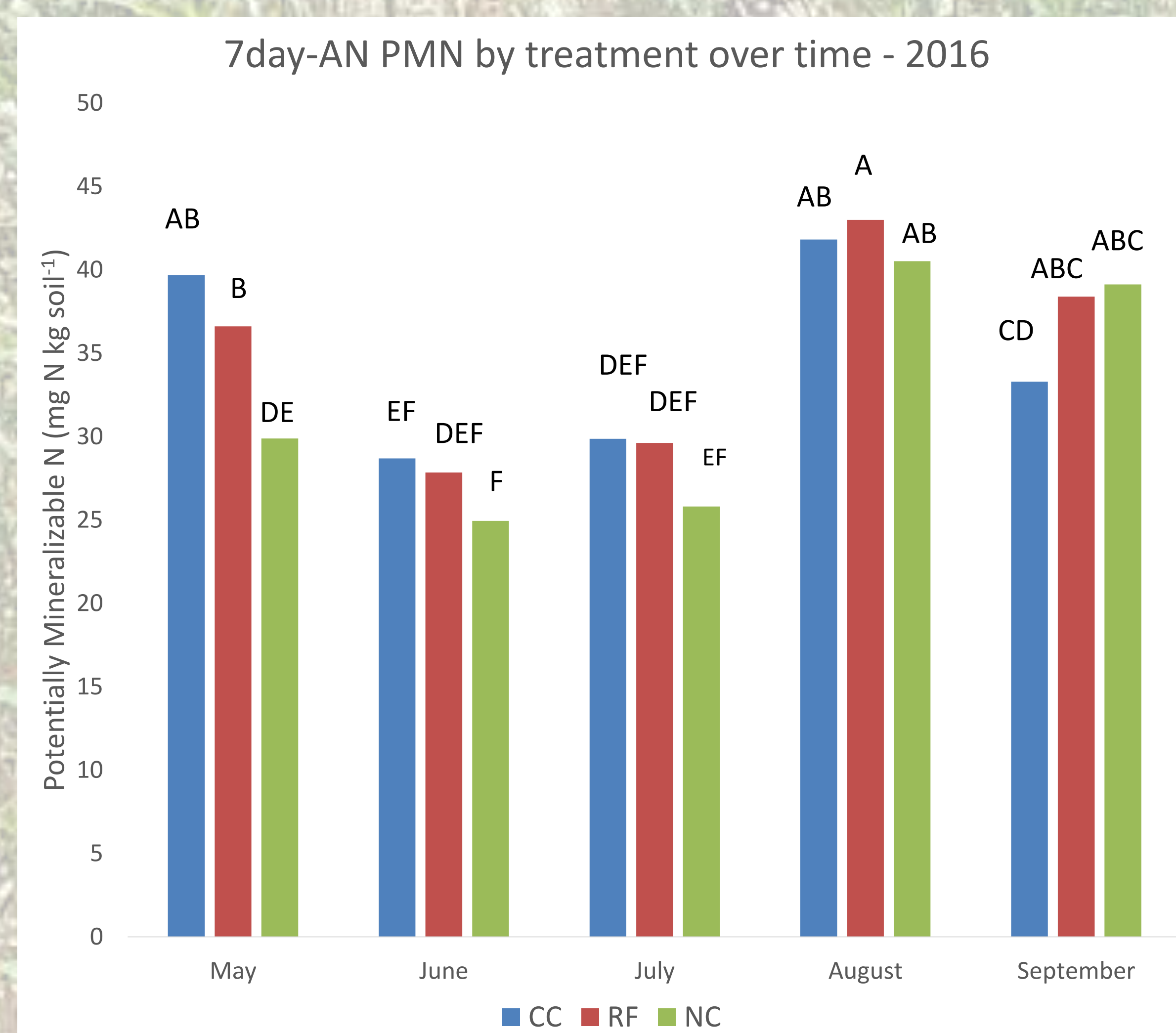
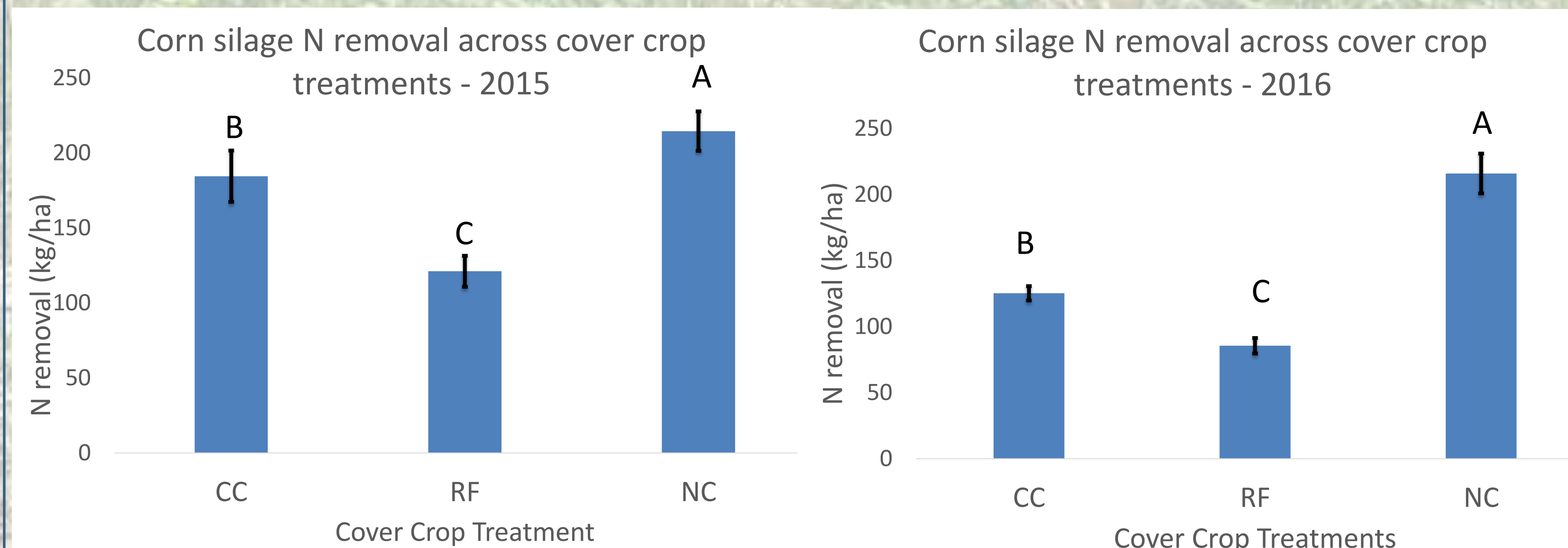
Harvest Date – 9/15/2015 and 9/12/2016

Experimental Design –

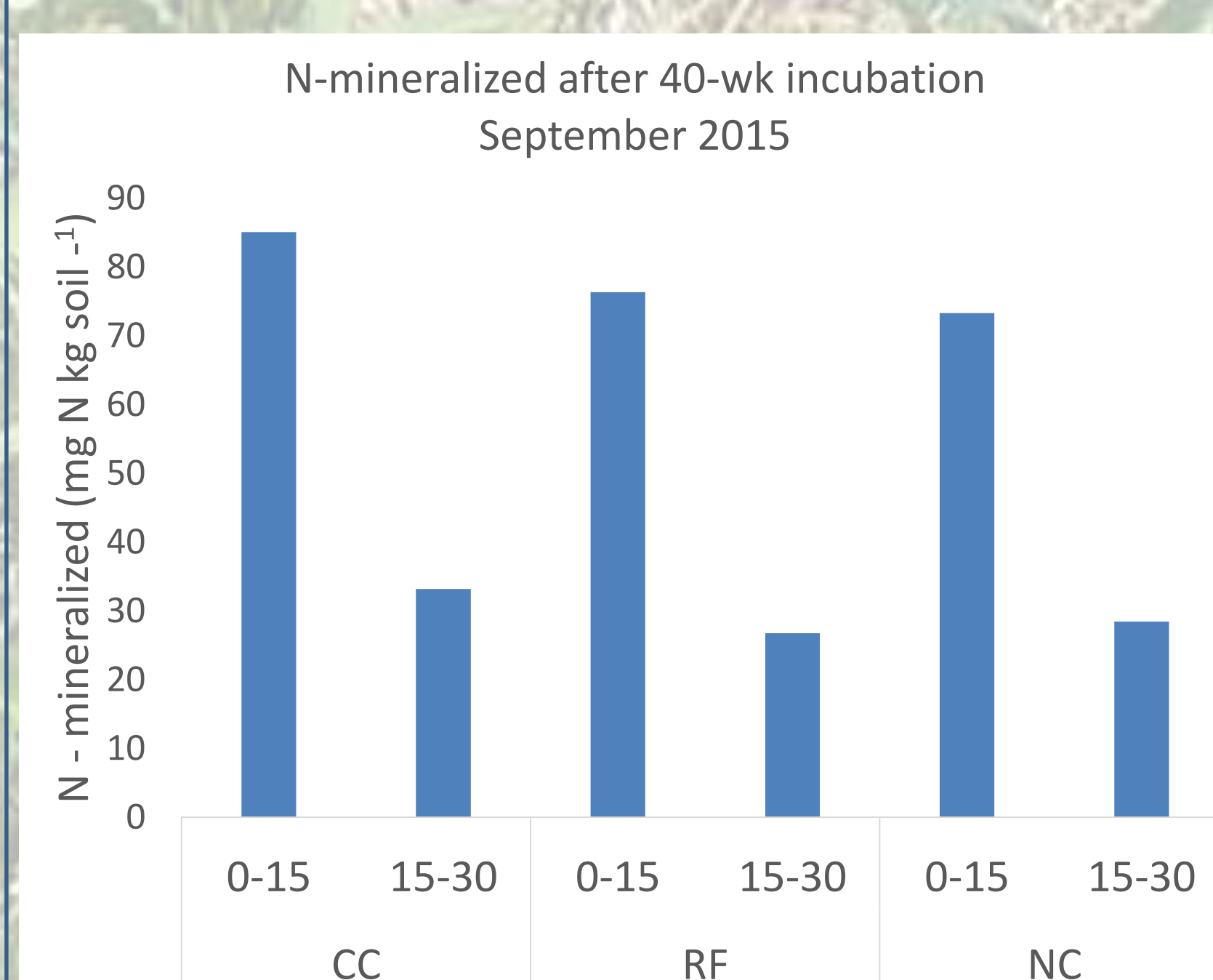
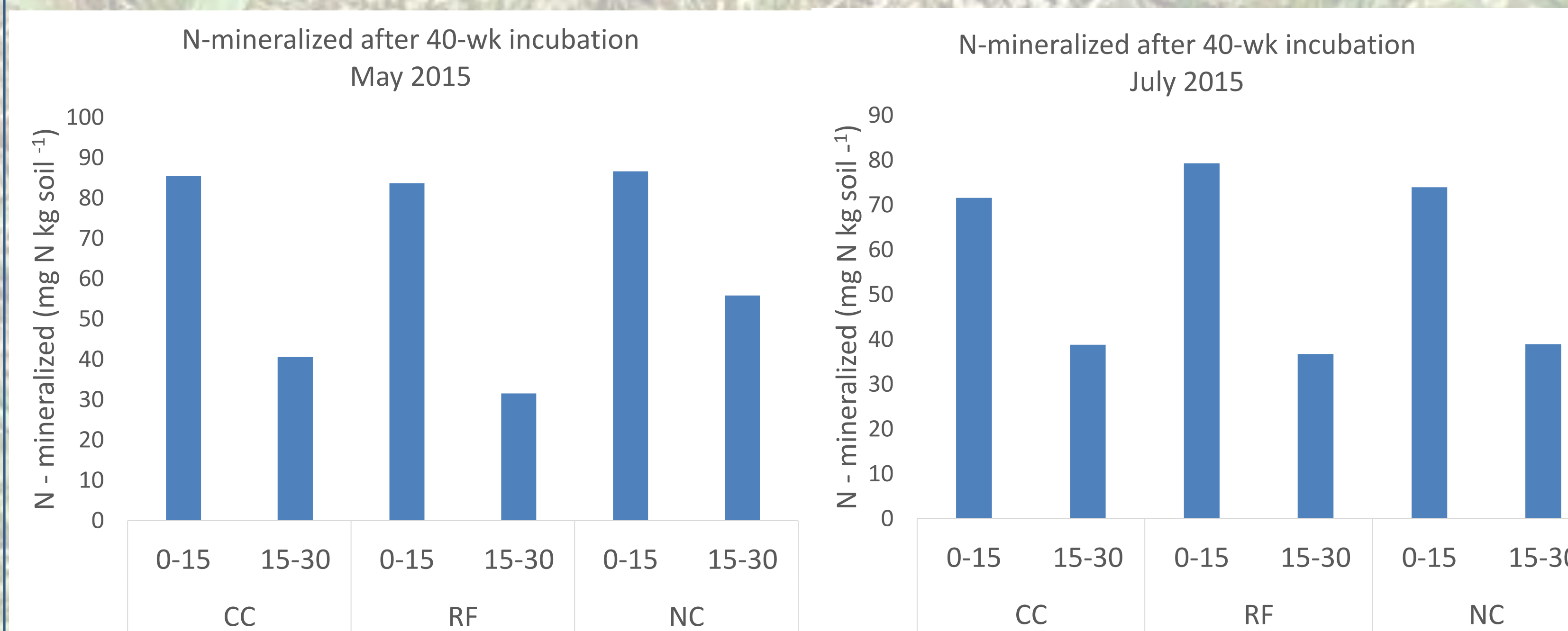
- Randomized complete block, split plot design
- Whole plot treatment-
 - No cover (NC)
 - Rye as a cover crop (CC)
 - Rye as a forage crop (RF)
- Split plot treatment – Depth
 - 0-15 cm
 - 15-30 cm
- Sampling Dates
 - Every other month in 2015 (May, July, Sep)
 - Monthly in 2016 (May-September)
- Measured PMN from sample using two methods
- 7 day anaerobic method (7day-AN)
- 40 week aerobic method (40wk-AE)
- Measured yield and N removal of corn silage. Corn in all plots past physiological maturity
- Analyzed using Proc Mixed with time as a repeated measure

Results

There was a significant difference of N uptake in the corn between treatments in both years. Corn in the NC treatment showed over the twice the uptake than corn in the RF treatment in 2016.



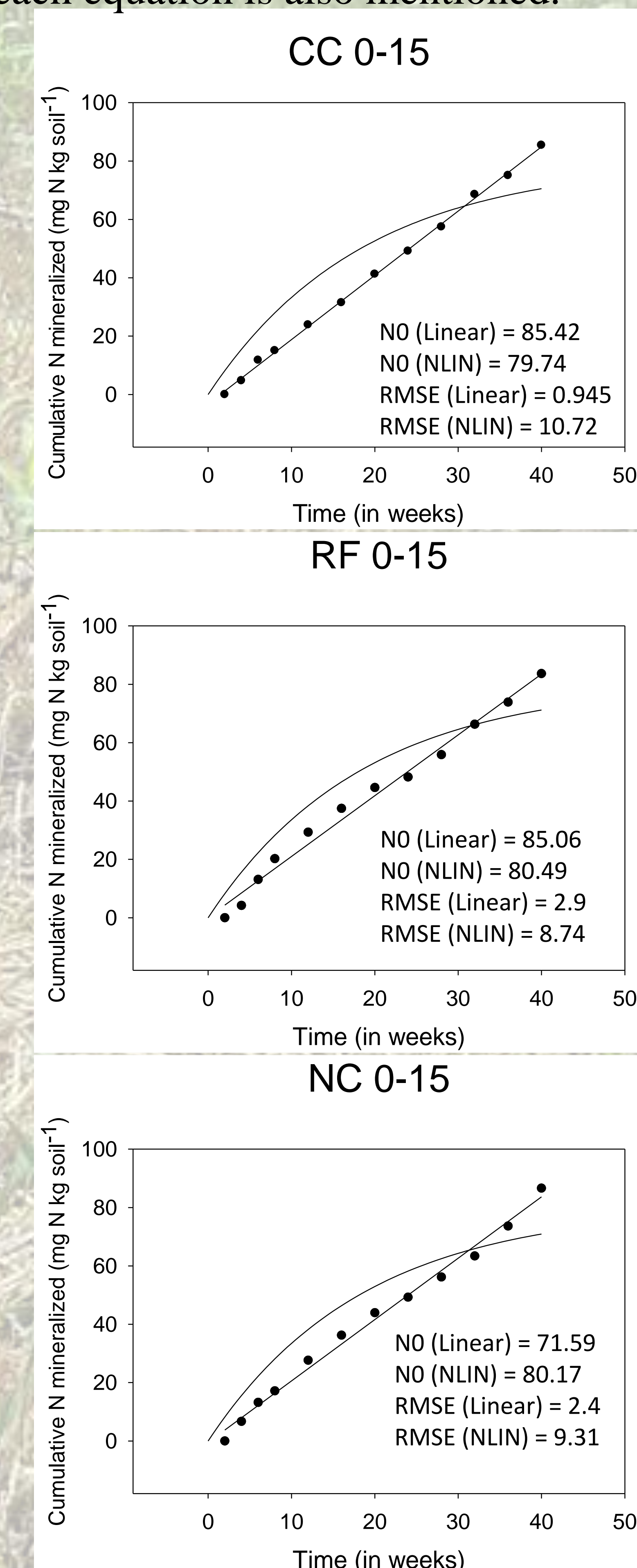
The 7day-AN incubation showed a significant interaction between treatment and time, as well as depth and time, in 2016. There was no significant interactions between treatment, depth or time in 2015.



From the 40wk-AE incubation, N mineralized (cumulative between week 2-40 of incubation) increases in a linear fashion with no significant differences in treatment or time but with significant differences in depth.

Results

N mineralization (derived from 40wk-AE incubation) on these soils appear linear and not first-order exponential. Here the linear equation and the first order exponential model is depicted for CC 0-15 and the N0 (calculated) and RMSE of each equation is also mentioned.



Conclusions

- Rye as a cover or forage crop decreased N uptake but had differing effects on PMN (7day-AN) over the 2016 growing season. PMN in the CC treatment decreased over the growing season (except for in Aug) while PMN in the NC and RF treatments initially decreased before increasing again.
- The effect on N mineralization wasn't seen in the soil measures, but in the plant measures.
- N-mineralized in 40 wk incubations on these soils (collected in the year following a fall application of manure) appear strongly linear. Kinetic models, widely used to determine N mineralization potential, appear to underestimate N mineralization on these manured soils