Quantifying the benefits of legume cover crops

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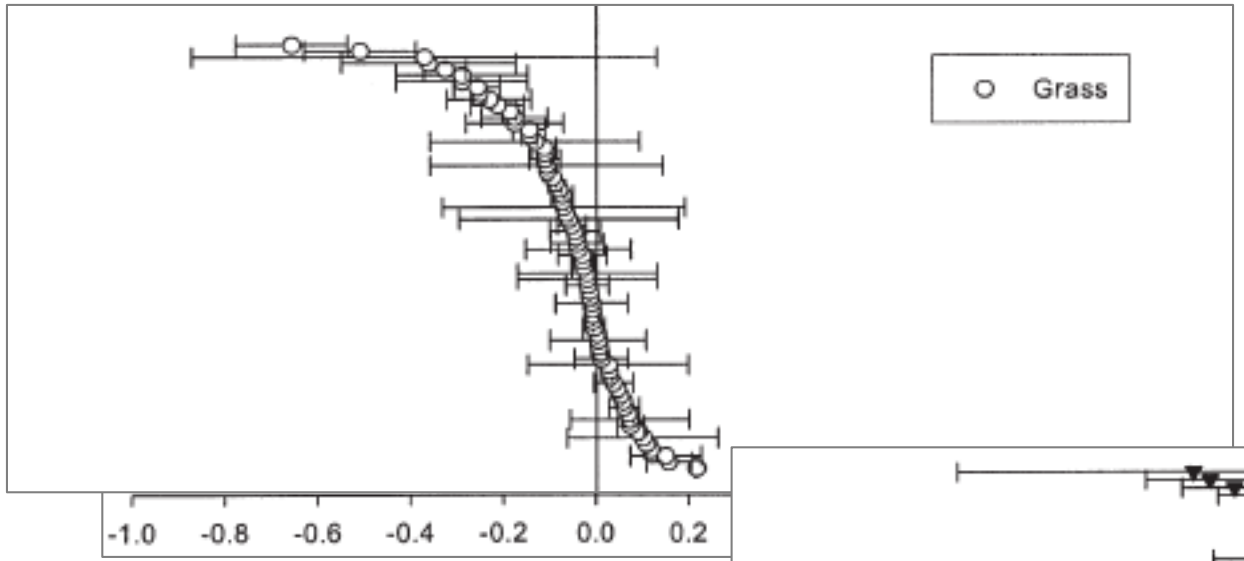
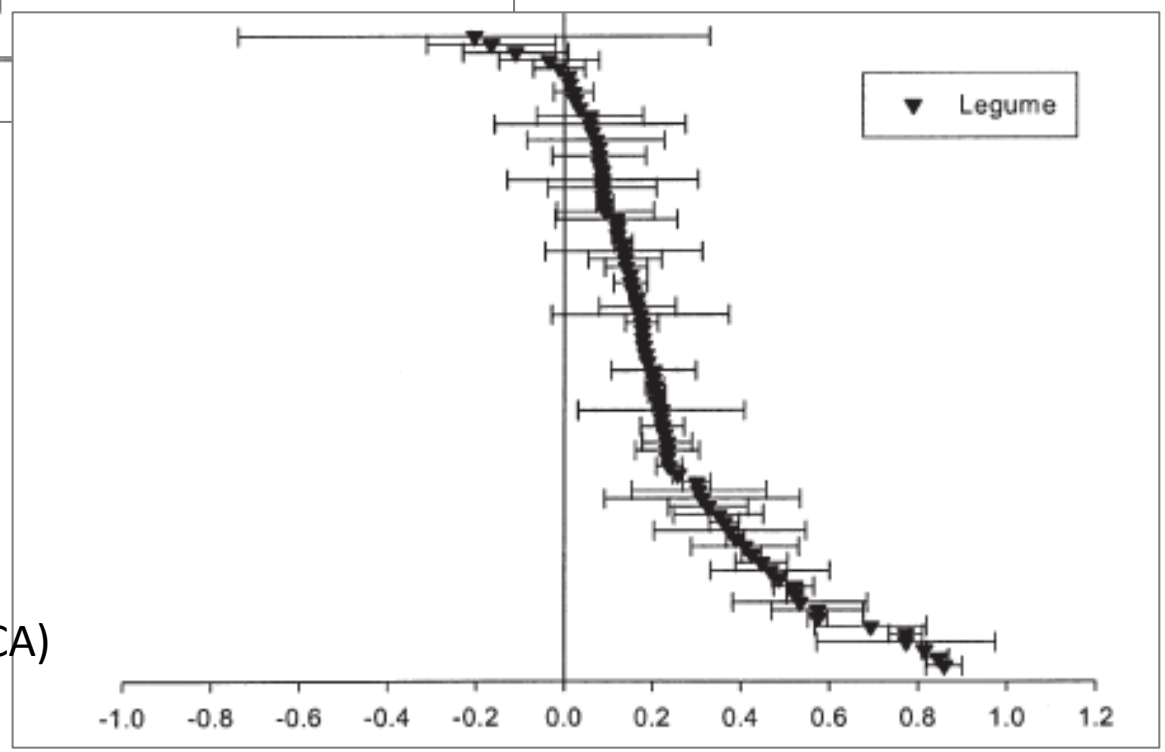
Review of Corn Yield Response under Winter Cover Cropping Systems Using Meta-Analytic Methods

Fernando E. Miguez and Germán A. Bollero*

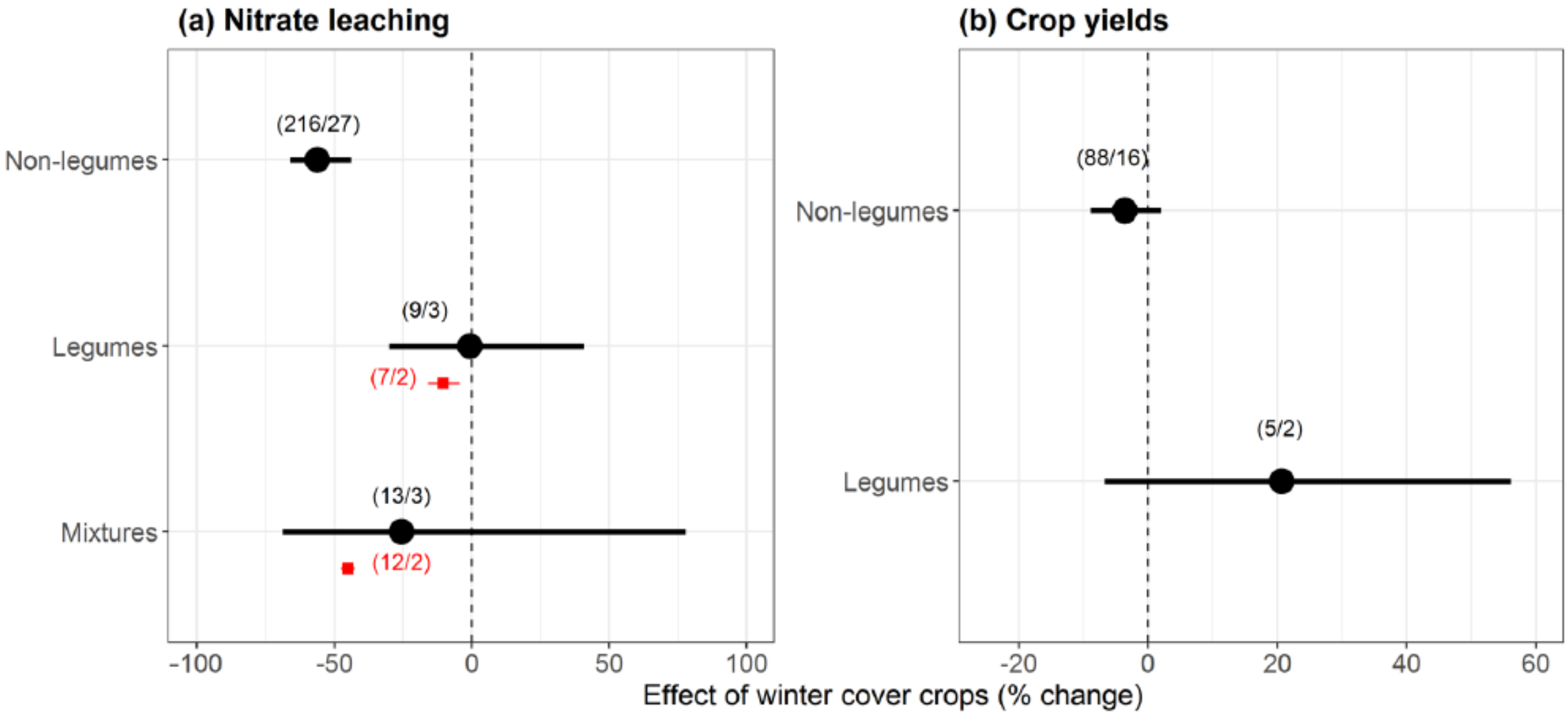
2005 publication



68 observations (US & CA)



82 observations (US & CA)



Journal of Environmental Quality REVIEWS AND ANALYSES

Cover Crops Reduce Nitrate Leaching in Agroecosystems: A Global Meta-Analysis

Resham Thapa, Steven B. Mirsky, and Katherine L. Tully*

How can we get more legume cover crops planted?

Easy

- Frost seed into winter wheat
- Drill seed following winter wheat or a summer harvested crop

Possible

- Interseed into corn

Difficult

- After corn or soybean

All studies have the same approach

1. Plant legume cover crops
2. Cover crops die
3. Plant corn
4. Conduct N rate trial

Determine the effect of the cover crop on: (1) corn yield and (2) optimum N rate

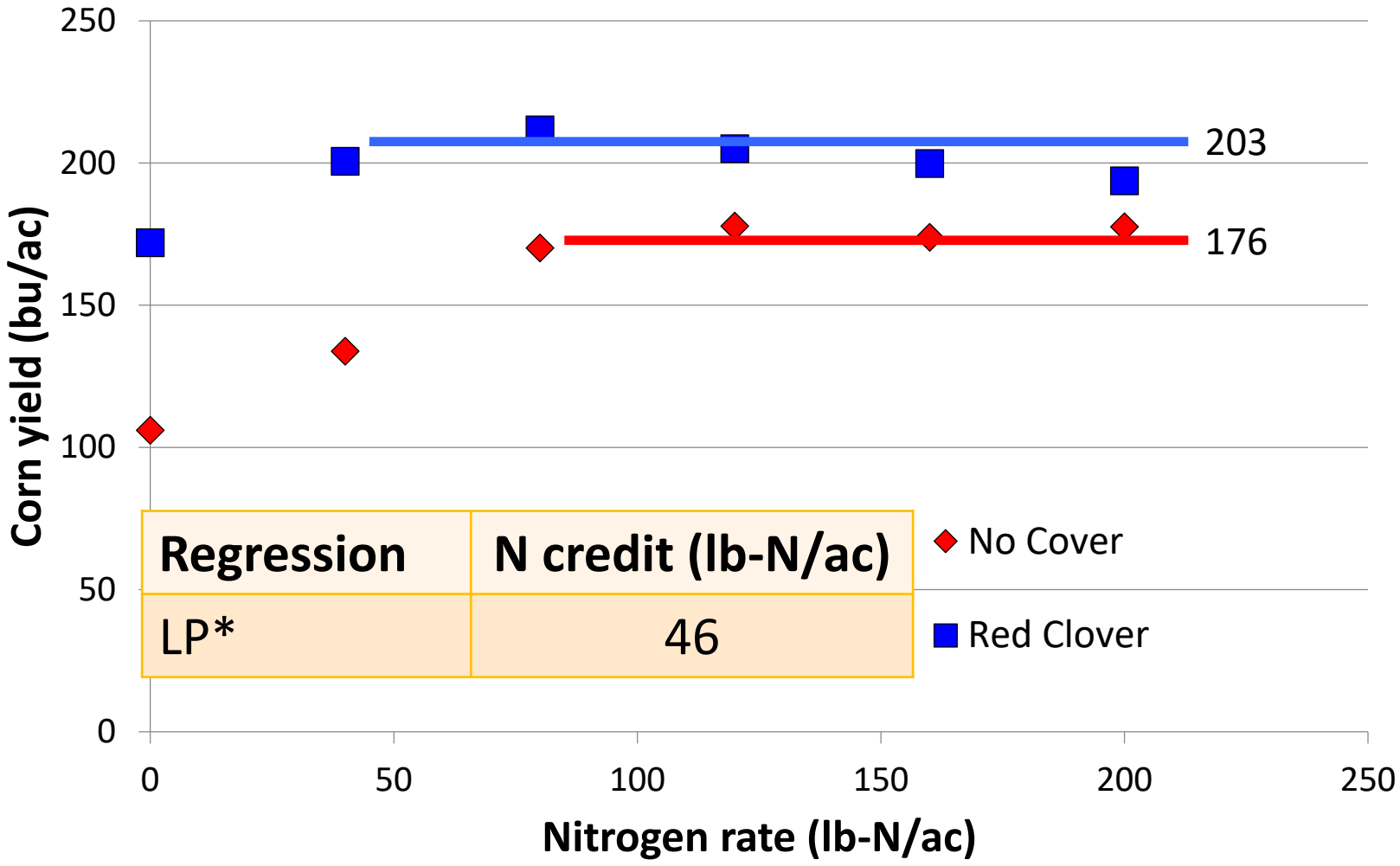
Frost seeding red clover


MONROE
ILLINOIS
MICHIGAN
WISCONSIN
JOHN DEERE
GATOR
4X2

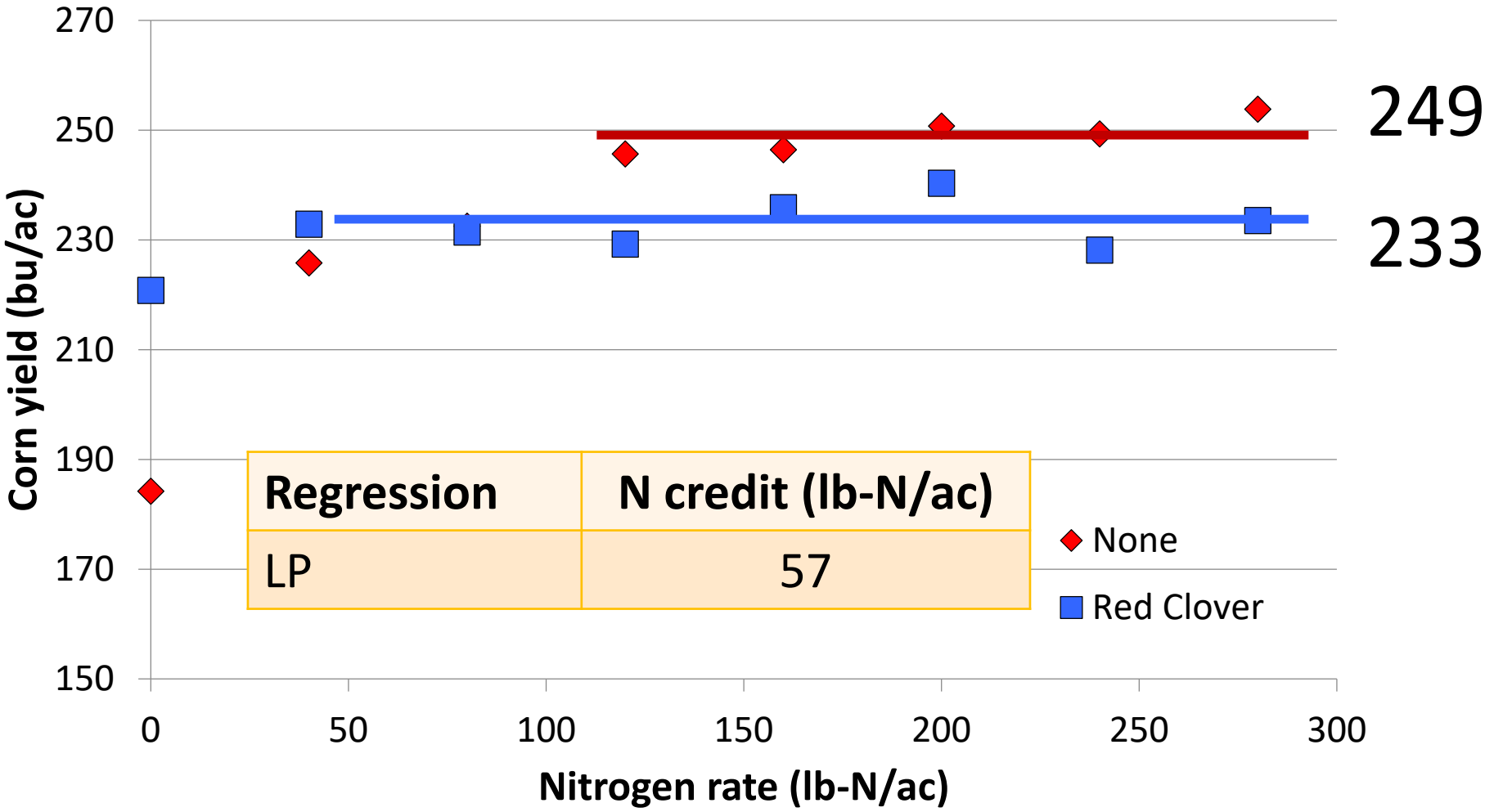

GATOR
JOHN DEERE
GATOR


80-110 lb/ac of N in the above ground biomass of red clover

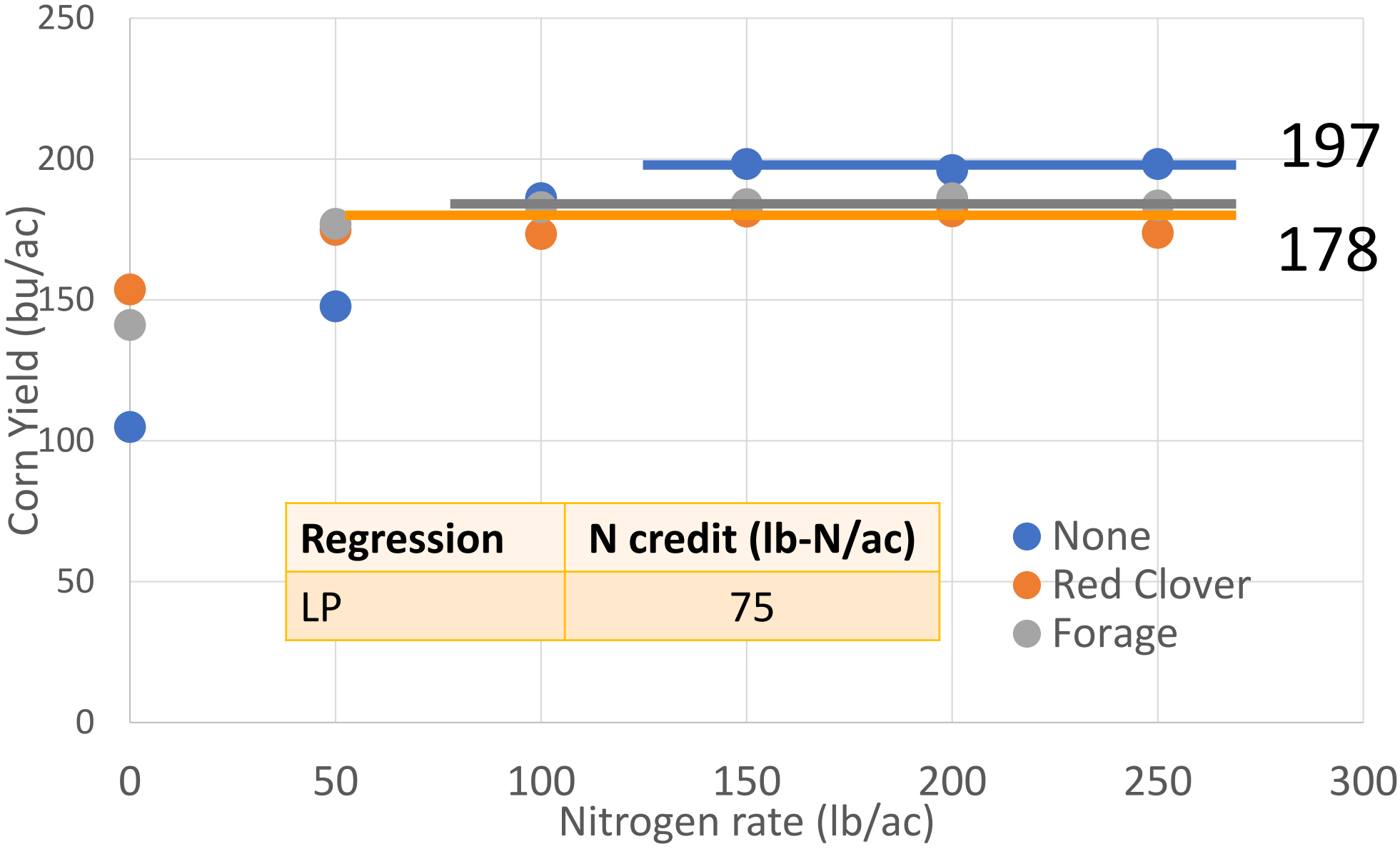
Yield response from Janesville in 2010 shows a 46 lb-N/ac N credit from red clover (plus yield gains)



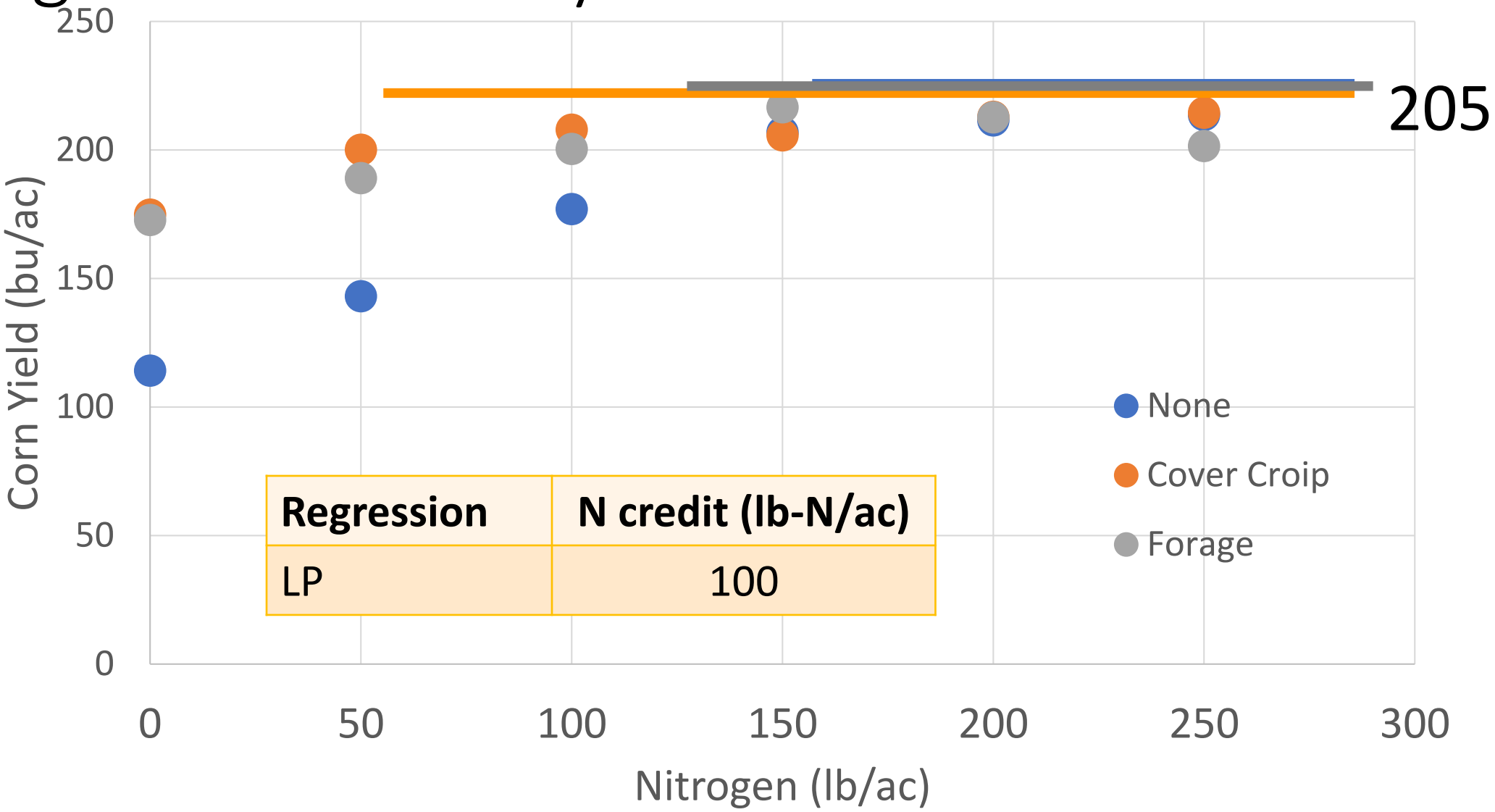
Nitrogen credits were also measured at Arlington in 2016, although 16 bu/ac yield drag



Arlington 2018 – some yield loss under no-till



Arlington 2019 – no yield loss!



Planting berseem clover or crimson clover after winter wheat harvest

2014-2015 and 2015-2016 studies in Sheboygan County

Seeding rate 15 lb/ac

Crimson clover had 47 lb-N/ac in above ground biomass (C:N = 16)

Berseem clover had 75 lb-N/ac in above ground biomass (C:N=14)

Berseem Clover—Spring Residue

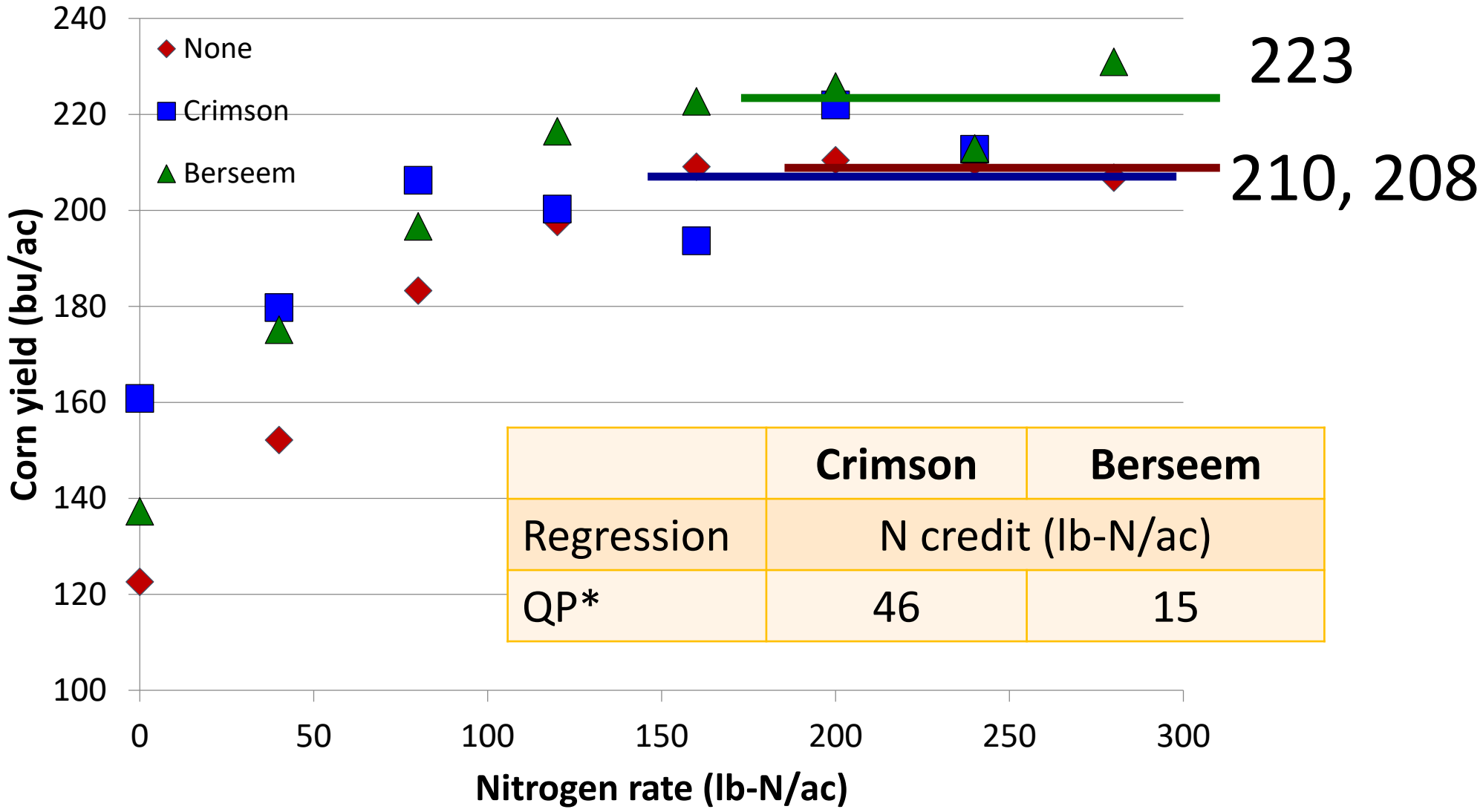
Crimson Clover—Spring Residue


81 lb-N/ac in AGB
C:N 11


70 lb-N/ac in AGB
C:N 13

Crimson had the clearer N credit, Berseem had the clearer yield benefit

2016



	Crimson	Berseem
Regression	N credit (lb-N/ac)	
QP*	46	15

Interseeding red clover into corn

2017-2019 research at Arlington Agricultural Field Station

8/22/2018

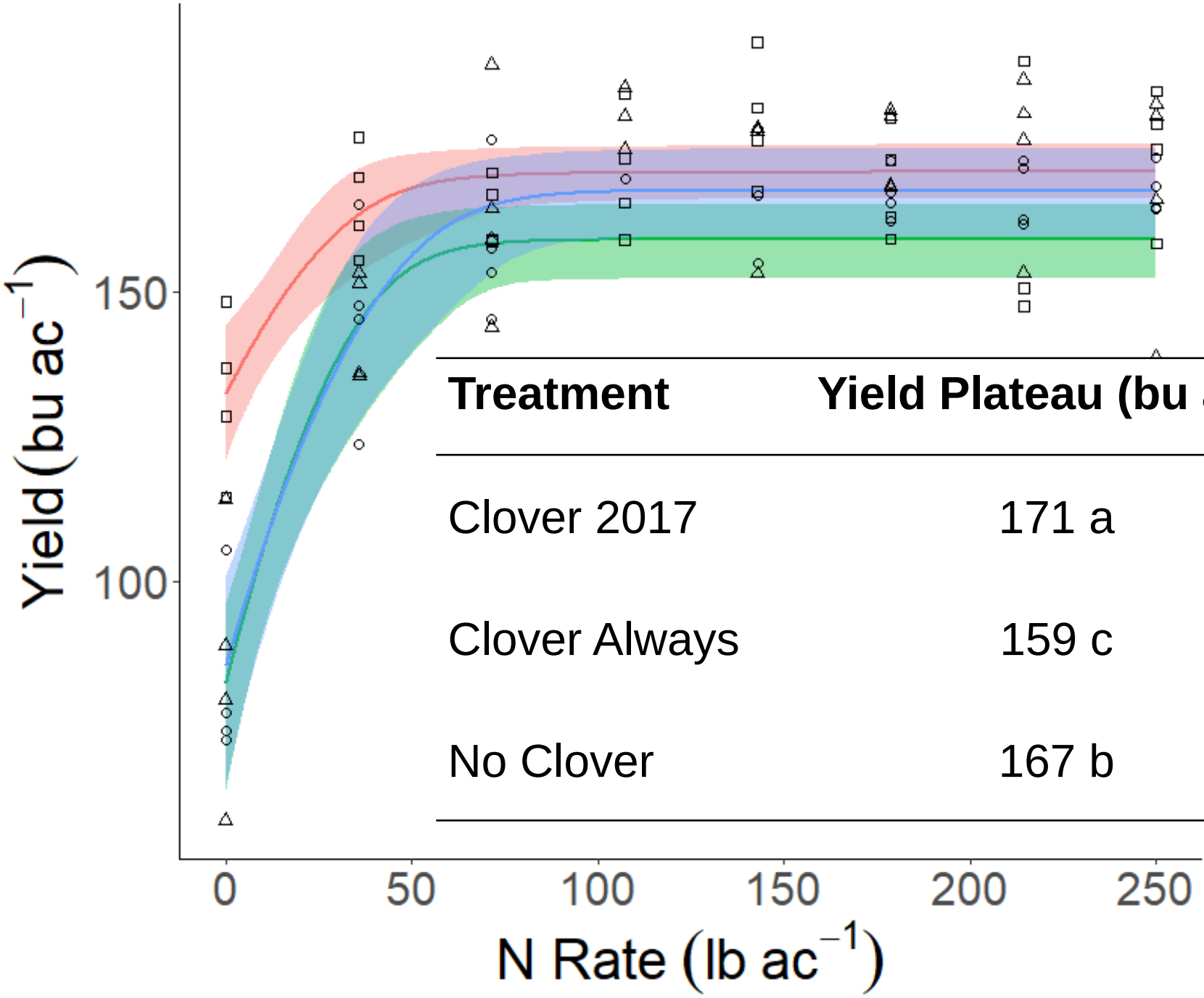
10/16/18

11/1/2018

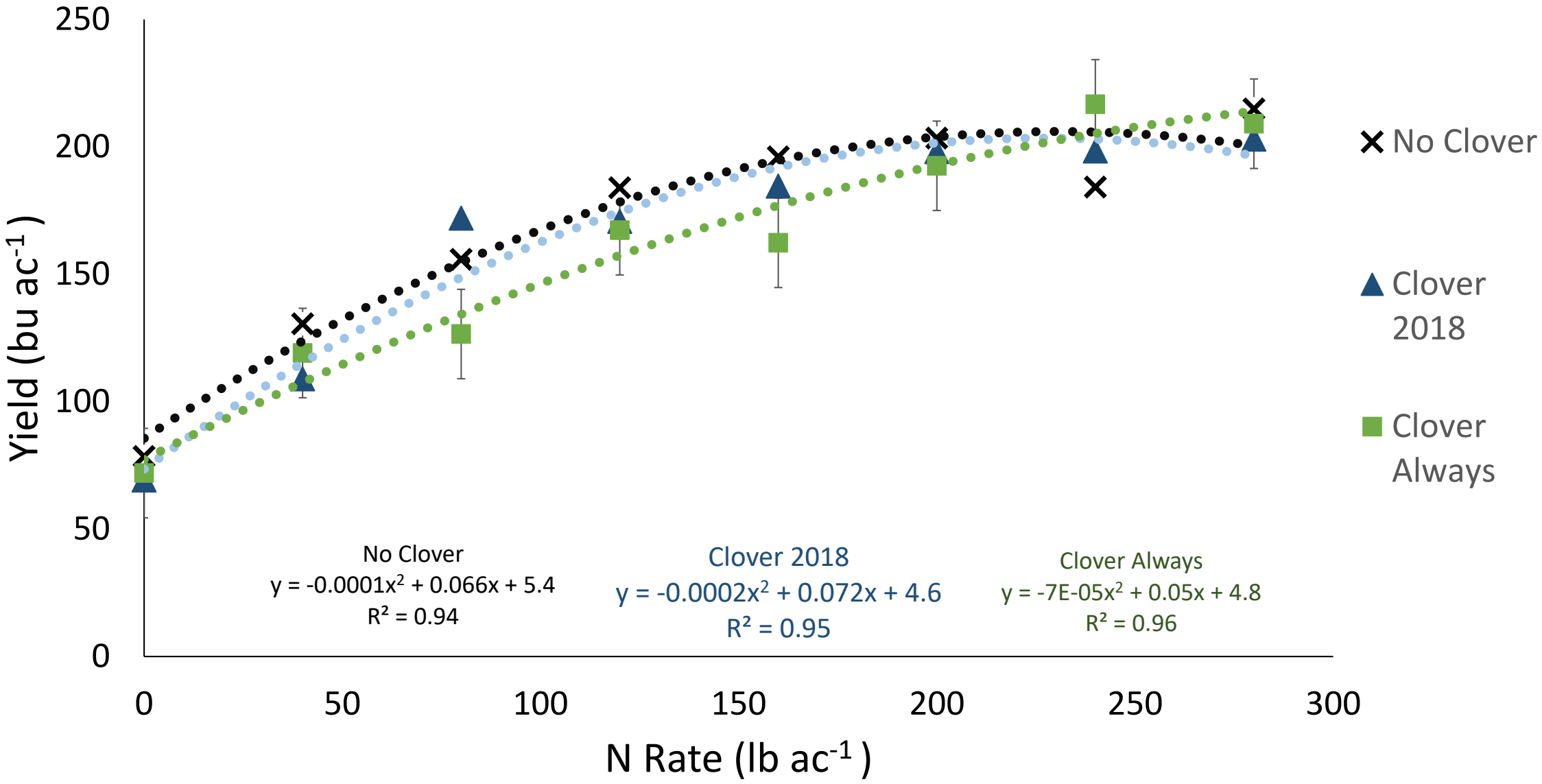
Study design - continuous corn, 2017 & 2018

- NEVER – 2017 & 2018, no clover
- ALWAYS – clover interseeded in both years
- 2017 – clover interseeded in 2017, not interseeded in 2018
- 2018 – clover not interseeded in 2017, interseeded in 2018, not in 2019

- N rate trials conducted in 2018 and 2019



Treatment	Yield Plateau (bu ac^{-1})	N credit (lb ac^{-1})
Clover 2017	171 a	15
Clover Always	159 c	15
No Clover	167 b	-


250
200
150
100
50
0
Yield (bu ac-1)
0
50
100
150
200
250
300
N Rate (lb ac-1)
No Clover
Clover 2018
Clover Always
No Clover
y = -0.0001x2 + 0.066x + 5.4
R² = 0.94
Clover 2018
y = -0.0002x2 + 0.072x + 4.6
R² = 0.95
Clover Always
y = -7E-05x2 + 0.05x + 4.8
R² = 0.96

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Questions, Comments, Concerns?