2013 UWEX & WPVGA Grower Conference

PREDICTING NITROGEN RELEASE, UTILITY OF PETIOLE TESTING, AND THE FUTURE OF NITROGEN MANAGEMENT ON POTATO

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Funding provided by WPVGA and USDA-NRCS

OUTLINE

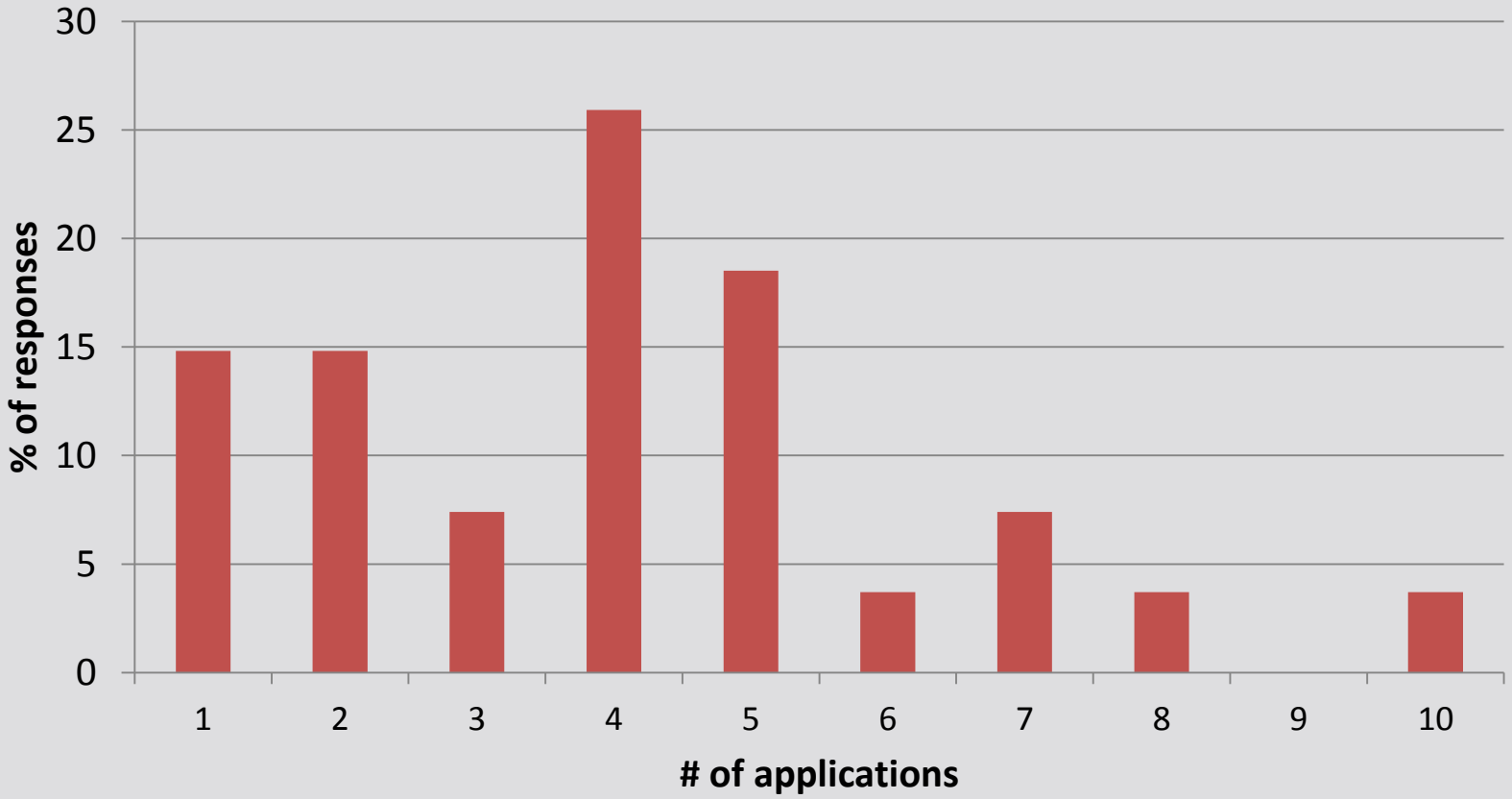
- What are common N applications?
- Research update on assessing the need for supplemental N applications
- N fertilizer products
- Evaluating the release rate of PCU
- The value of petiole testing
- Current efforts with improving N management

2012 SURVEY

- 31 responses
- 1 silt loam, 1 muck, 2 muck & sand, 27 sand
- 100% apply starter (60% liquid, 40% dry, applying 9 to 50 lb/ac of N)

2012 SURVEY

- How many applications?



2012 SURVEY
WHAT N SOURCES?

N product	Mentions
Ammonium sulfate	12
Urea	11
UAN (28-32%)	21
Ammonium nitrate	3
Ammonium Thiosulfate	3
Calcium nitrate	4
ESN	2

Paper mill waste (2), urea stabilizers (2), other “controlled” release N (3), special blends (1)

HOW TO DETERMINE IF YOU SHOULD APPLY EXTRA N?

Reason	# of responses
Petiole testing	23
Plant color/health	15
Large rainfall event (2-3”)	17
Soil tests	3

Do you apply N through irrigation?	
Answer	# of responses
Yes	22
No	9

2012 SURVEY

- Thanks to everyone who contributed.
- Not a scientific poll, but give us a snapshot.
- What did we learn?
- No two growers are doing the same thing or taking the same approach.

2012 RESEARCH

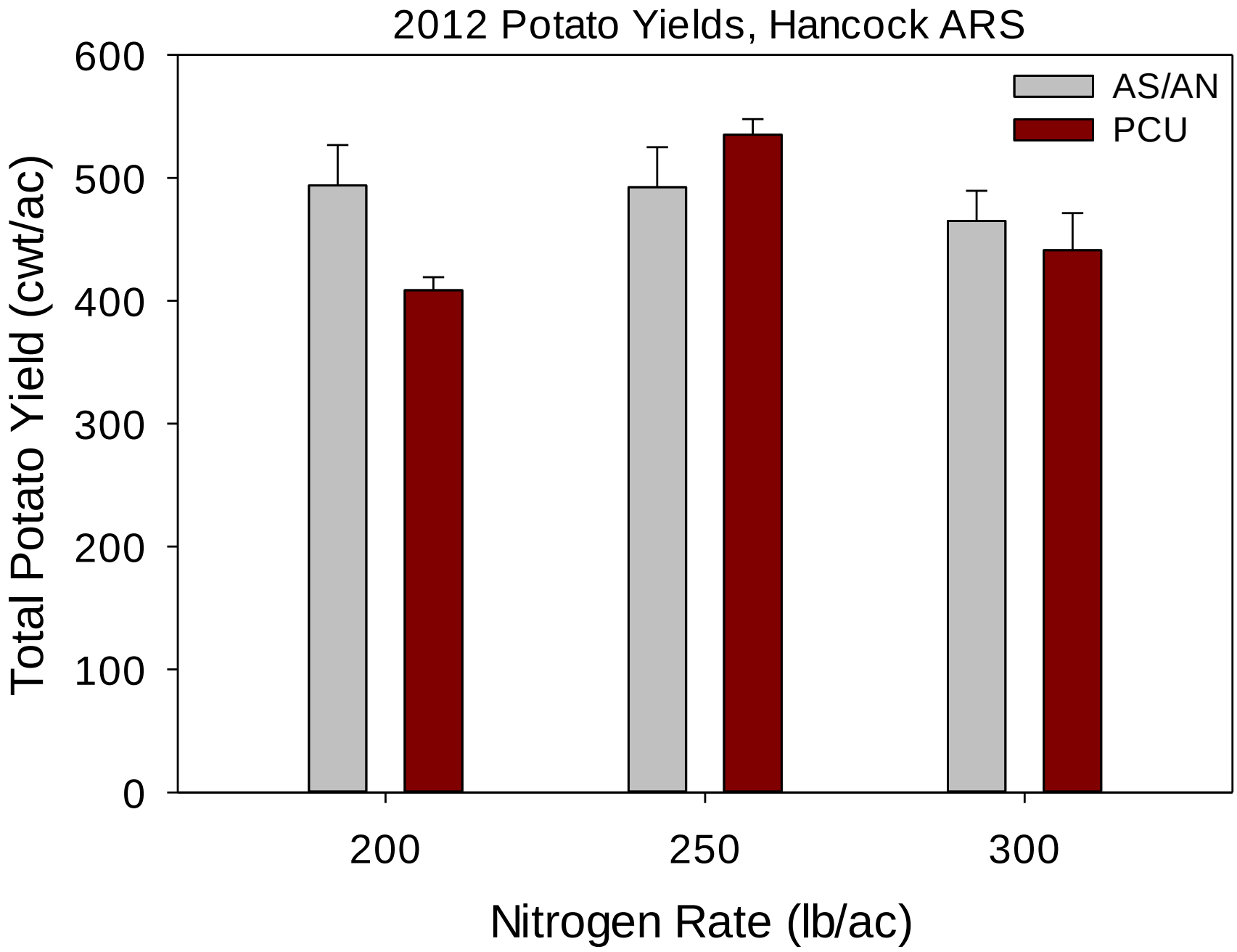
FOCUS OF CURRENT N RESEARCH

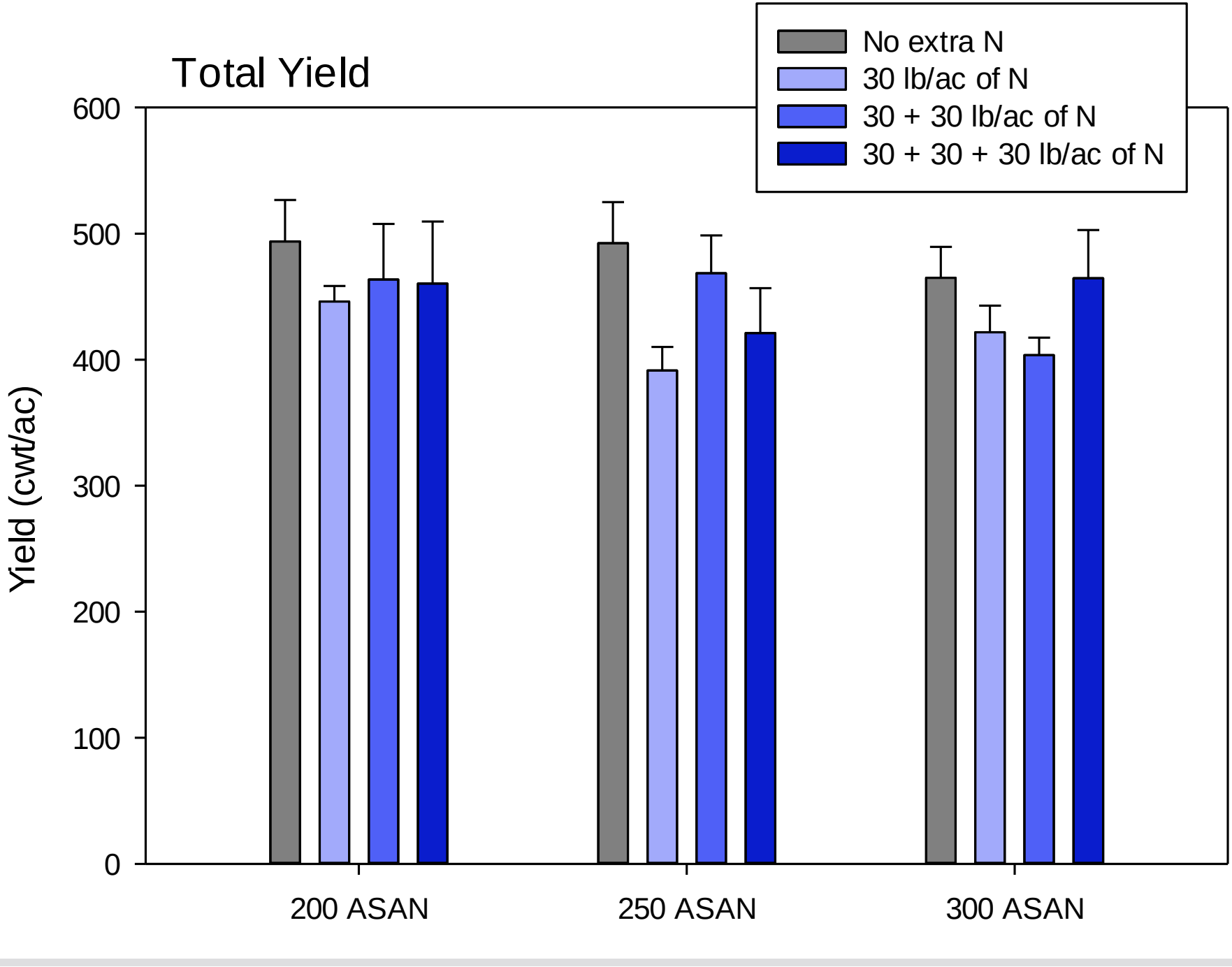
1. Evaluating use of alternative N products (controlled and delayed release N) for potato
2. Better understanding of when supplemental N is needed

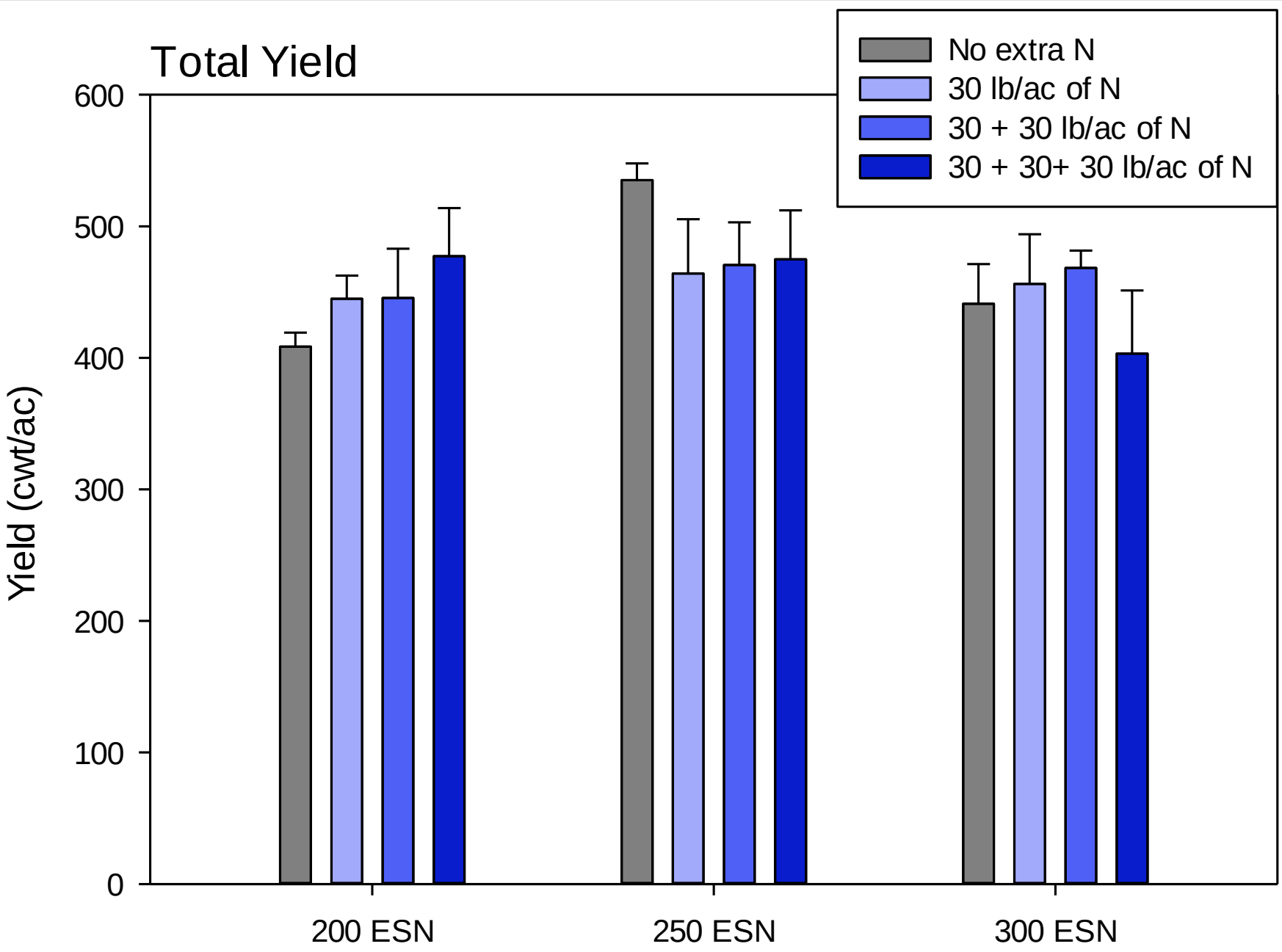
EXPERIMENTAL DESIGN

2012 research

- Hancock ARS
- 200, 250, or 300 lb/ac
  - AS / AN
  - ESN
- Within each of these we add 1, 2, or 3 applications of 30 lb/ac as AN
  - 45, 60, 75 DAE

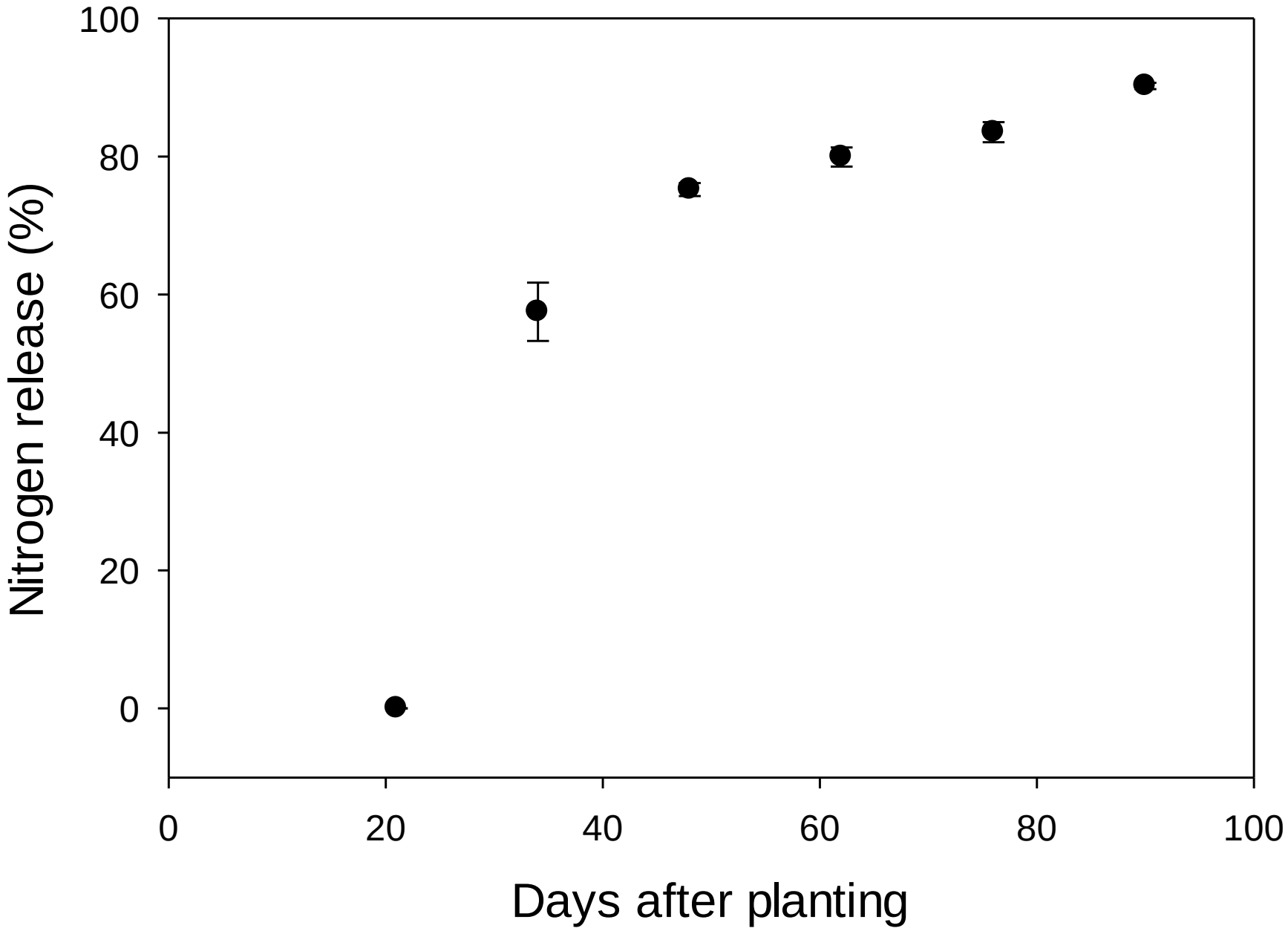

2012 Potato Yields, Hancock ARS
AS/AN
PCU
Total Potato Yield (cwt/ac)
600
500
400
300
200
100
0
200
250
300
Nitrogen Rate (lb/ac)

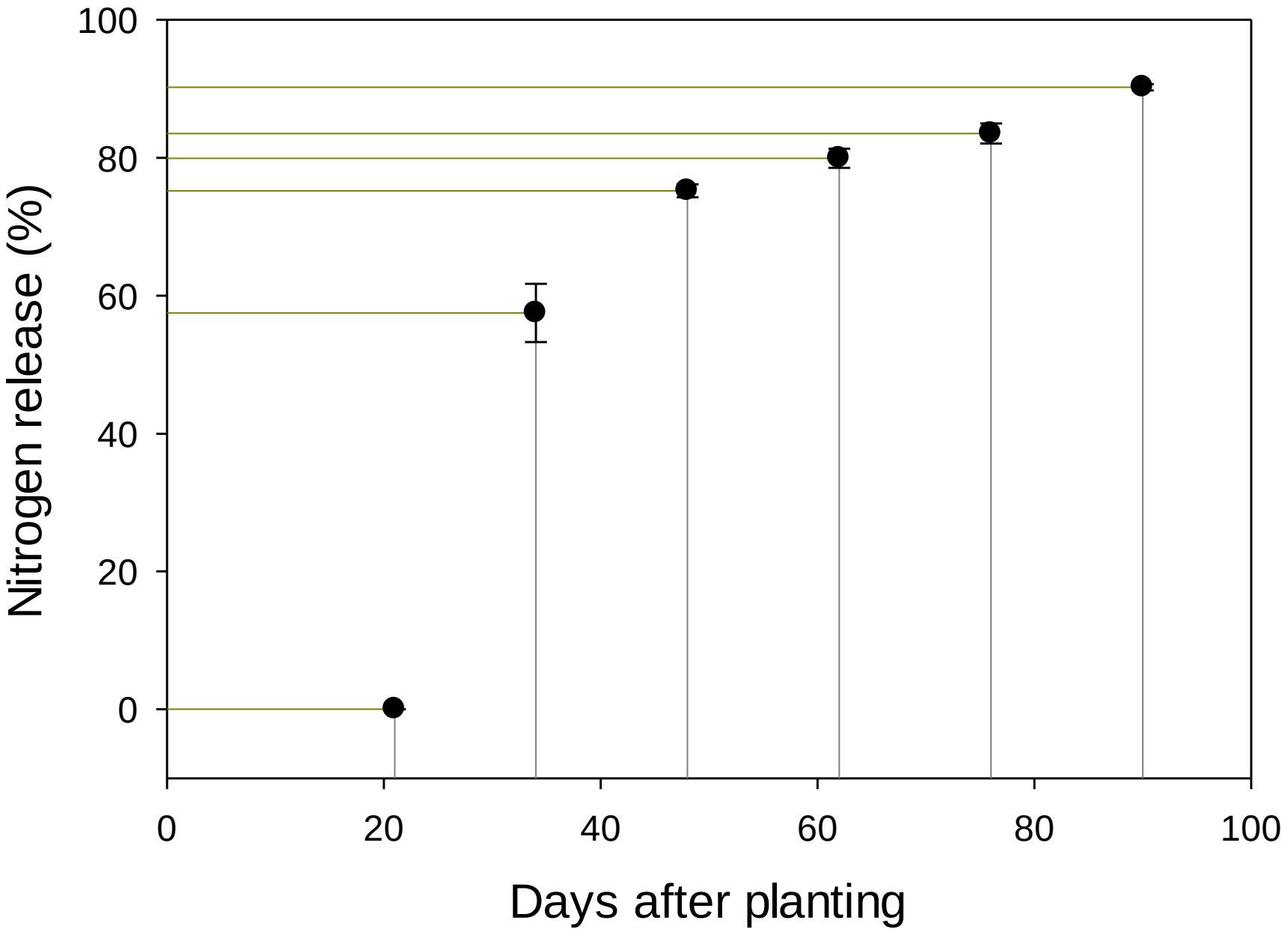

Total Yield
No extra N
30 lb/ac of N
30 + 30 lb/ac of N
30 + 30 + 30 lb/ac of N
Yield (cwt/ac)
600
500
400
300
200
100
0
200 ASAN
250 ASAN
300 ASAN

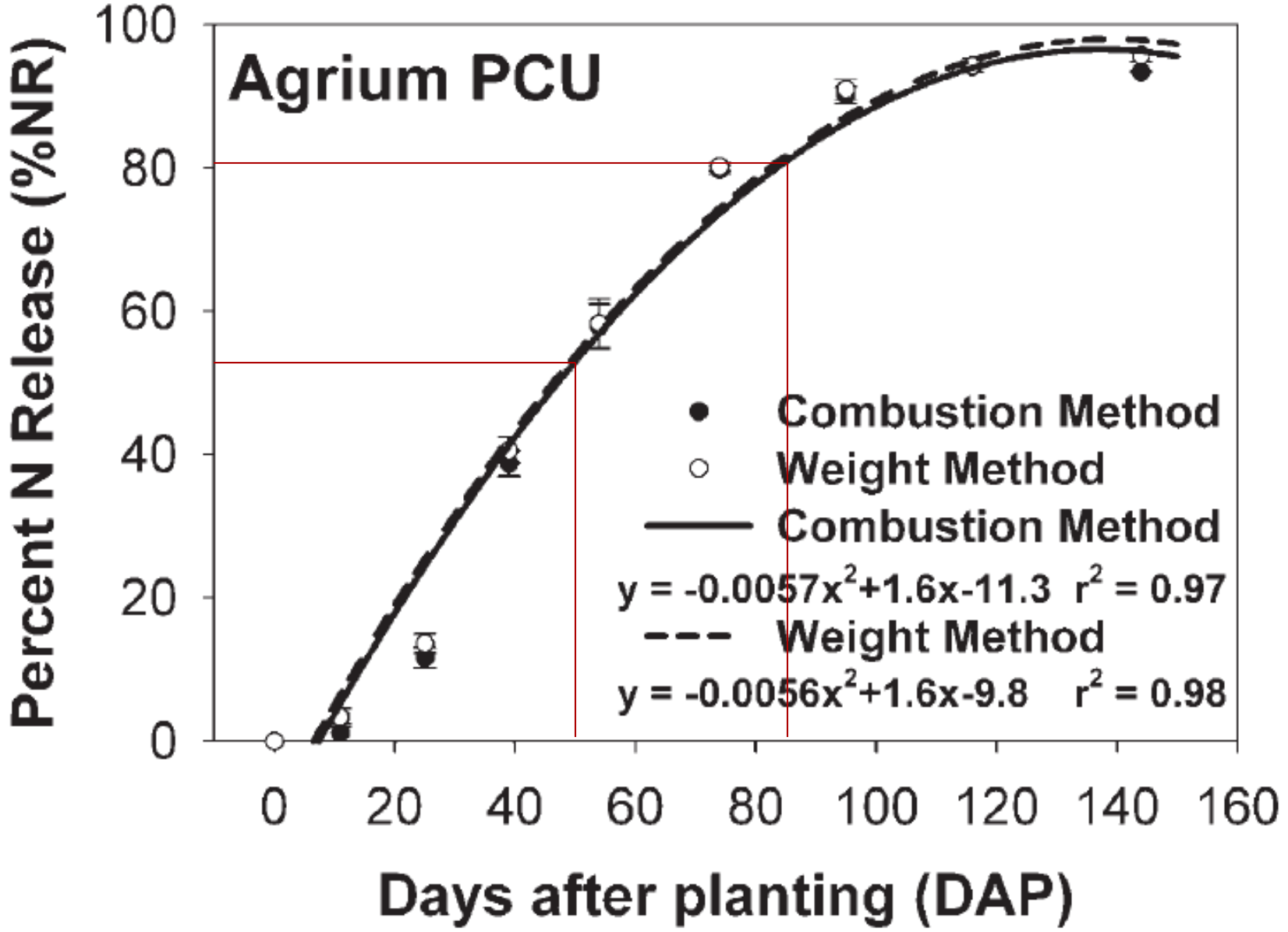

Total Yield
No extra N
30 lb/ac of N
30 + 30 lb/ac of N
30 + 30+ 30 lb/ac of N
Yield (cwt/ac)
600
500
400
300
200
100
0
200 ESN
250 ESN
300 ESN

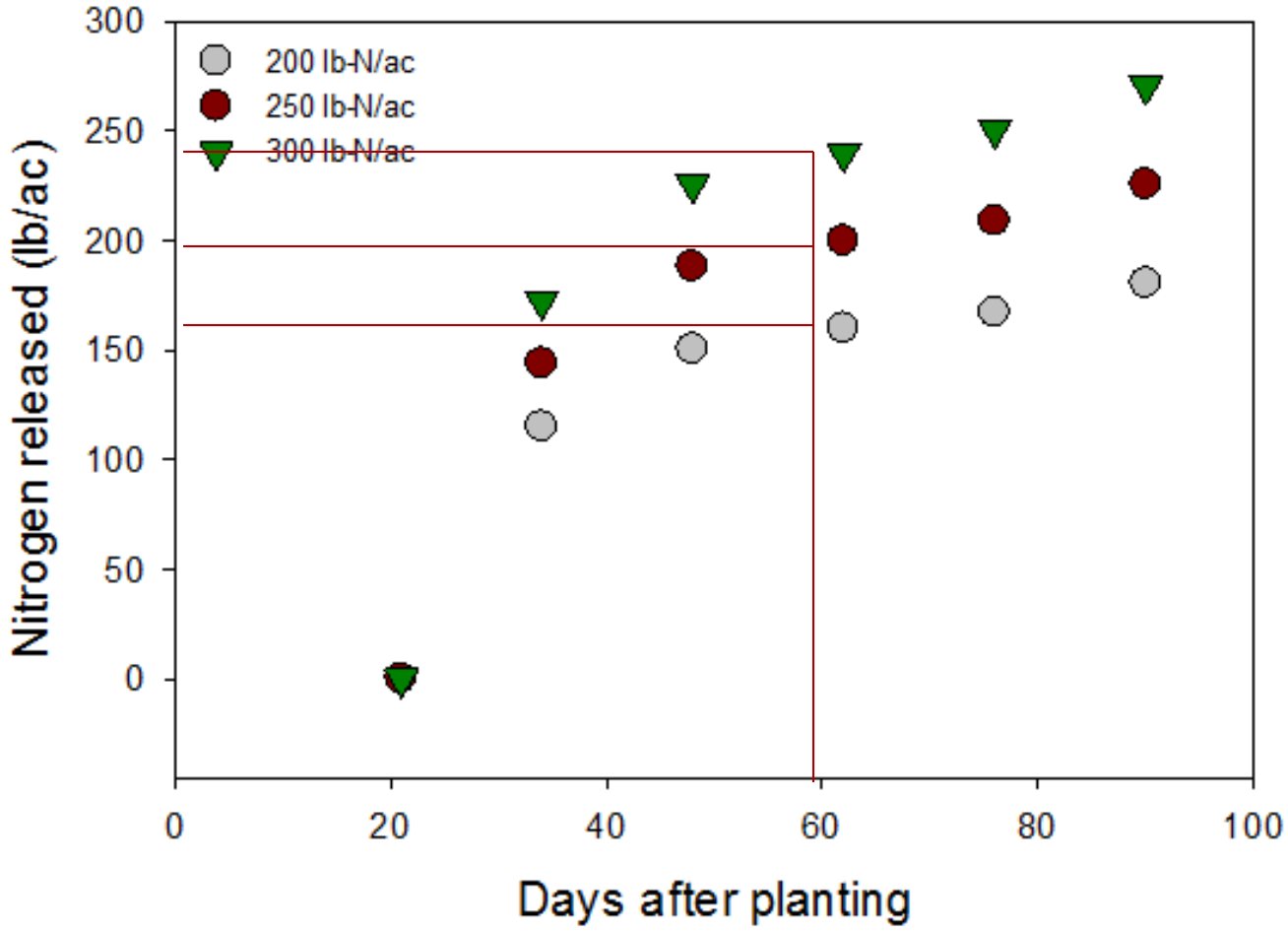
NITROGEN RELEASE FROM ESN COATINGS

- We buried a known amount of ESN in a mesh bag.
- Eight bags per plot, four reps
  - 250 ESN (no extra N)
- Weighted the remaining ESN
- The weight of the polymer is known


100
80
60
40
20
0
Nitrogen release (%)
0
20
40
60
80
100
Days after planting


Nitrogen release (%)
100
80
60
40
20
0
0
20
40
60
80
100
Days after planting


Agrium PCU
Percent N Release (%NR)
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
Days after planting (DAP)
Combustion Method
Weight Method
Combustion Method
y = -0.0057x2+1.6x-11.3 r2 = 0.97
Weight Method
y = -0.0056x2+1.6x-9.8 r2 = 0.98


200 lb-N/ac
250 lb-N/ac
300 lb-N/ac
Nitrogen released (lb/ac)
300
250
200
150
100
50
0
0
20
40
60
80
100
Days after planting

WHY THE DIFFERENCE BETWEEN YEARS?

- 2012 was very warm
- The release of N from ESN is governed by temperature
- The heat expands the “pores” of the plastic, allowing the nitrate to diffuse through.
- Perhaps the heat allowed for faster diffusion in 2012.

HANCOCK VS. ON-FARM?

USDA-NRCS-CIG

Sweet corn:

- 198 lb-N/ac ESN: 8.2 ton/ac
- 180 lb-N/ac CTL: 8.8 ton/ac

Russet Burbank:

- 275 lb-N/ac ESN: 397 cwt/ac
- 206 lb-N/ac CTL: 441 cwt/ac

Field corn:

- 251 lb-N/ac ESN: 242 bu/ac
- 296 lb-N/ac CTL: 296 bu/ac

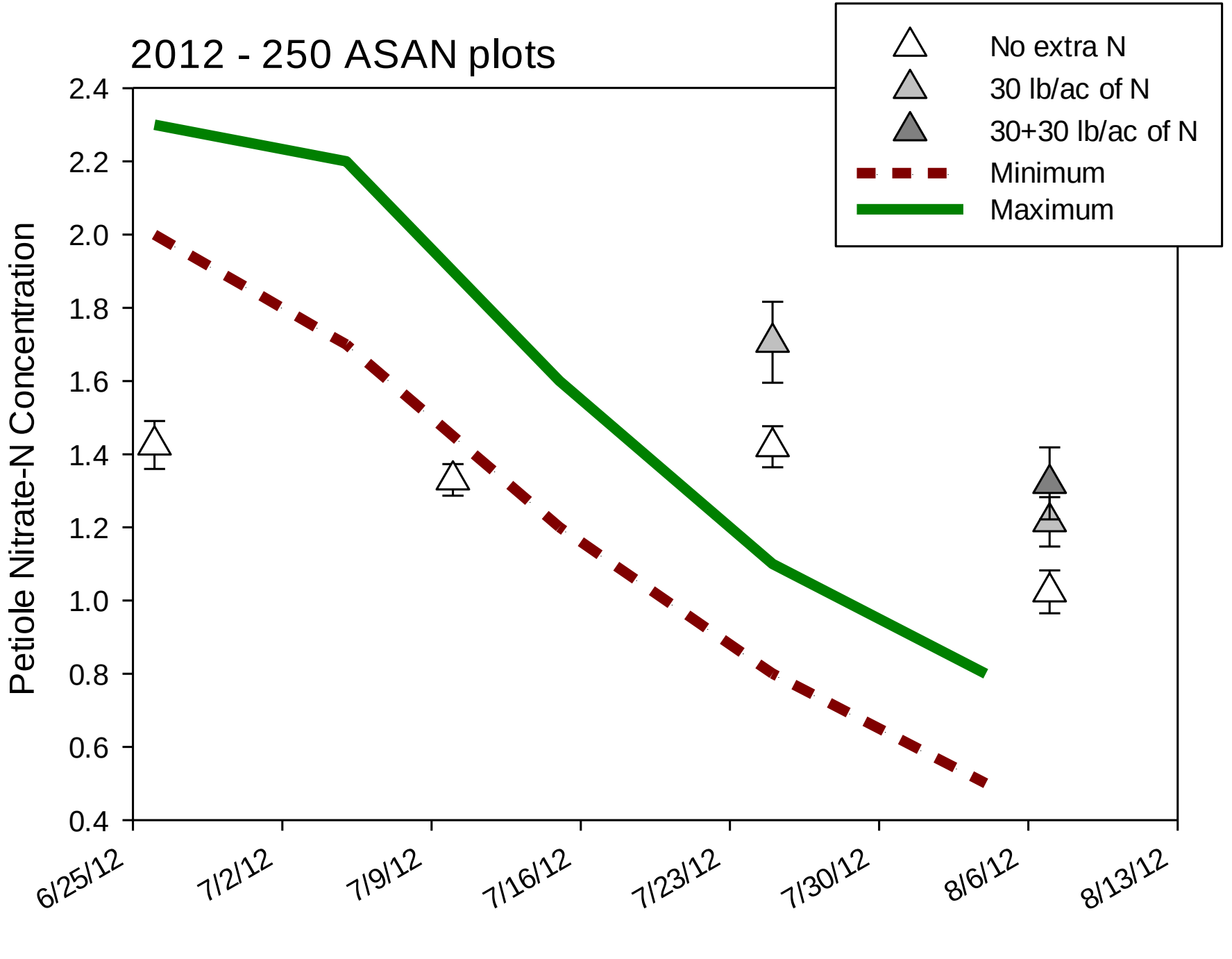
SO WHAT HAPPENED?

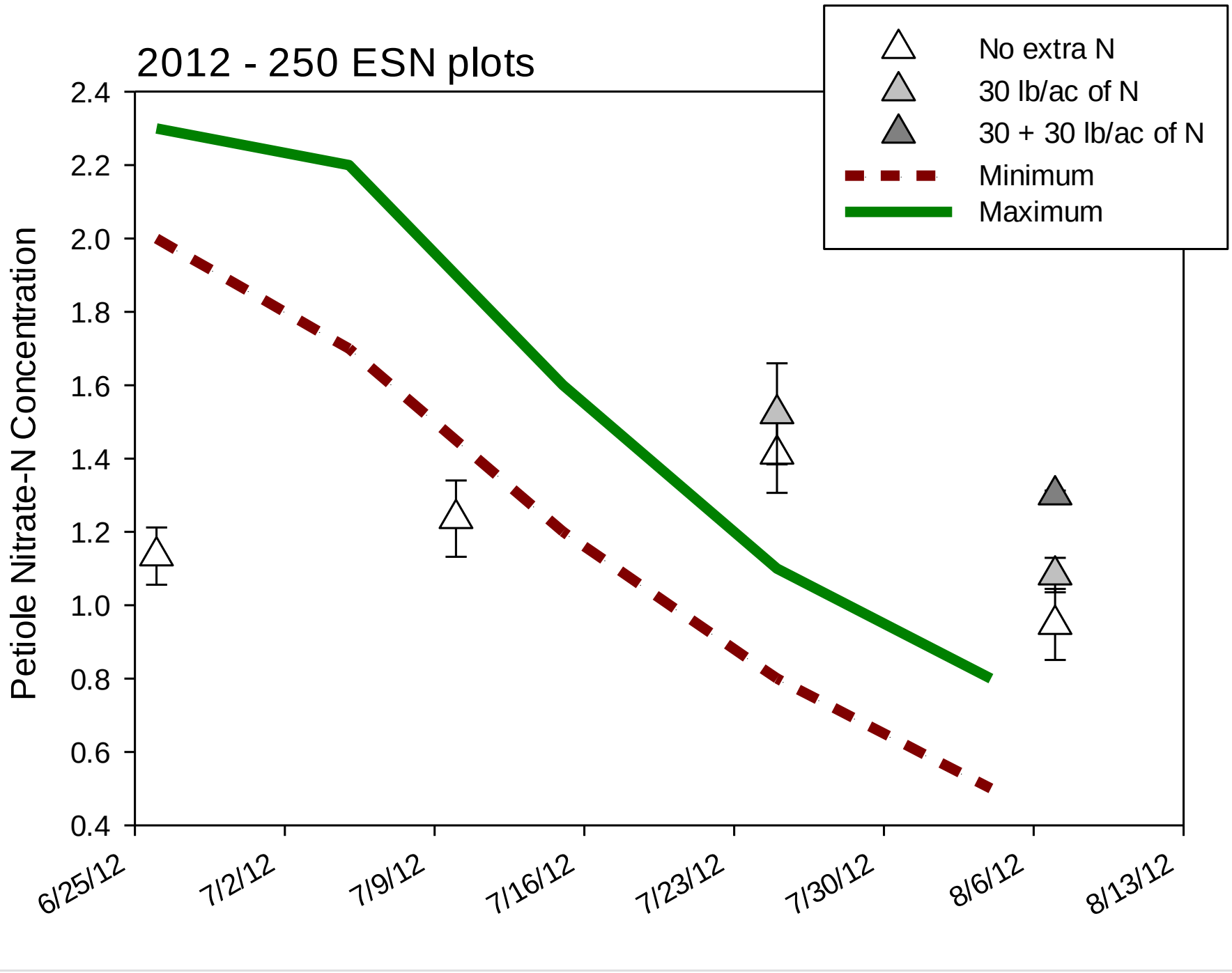
- Disadvantage to ESN: no ability to reduce overall rate if you apply full rate early in season.
- ESN at Hancock appeared to release quickly.
- My ESN is pristine – is yours?
- Faster release, damaged prills, all N applied up front…
- …but no real leaching events…so the N should have been there…

USDA-NRCS CIG

- Field evaluations of ESN
  - Half-pivot comparisons
  - Replicated strips
  - Single strips
  - Field-to-field comparisons
- Work within your system
- Soil cores preplant & post harvest
- Petioles, harvest, biomass samples
- We also want to take a sample of your ESN to evaluate its damage

THE PETIOLES


2012 - 250 ASAN plots
No extra N
30 lb/ac of N
30+30 lb/ac of N
Minimum
Maximum
Petiole Nitrate-N Concentration
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
6/25/12
7/2/12
7/9/12
7/16/12
7/23/12
7/30/12
8/6/12
8/13/12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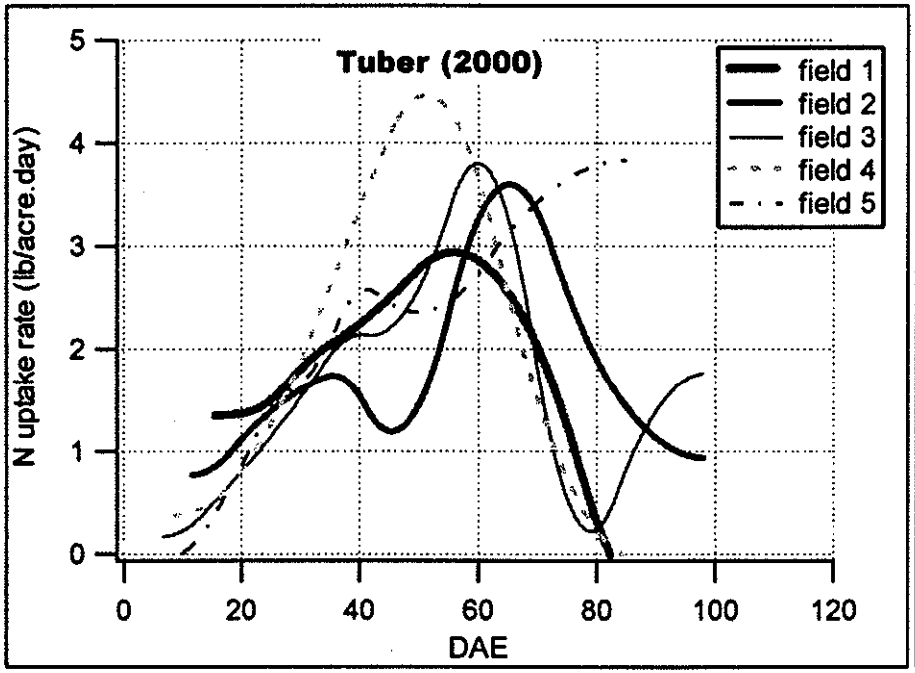
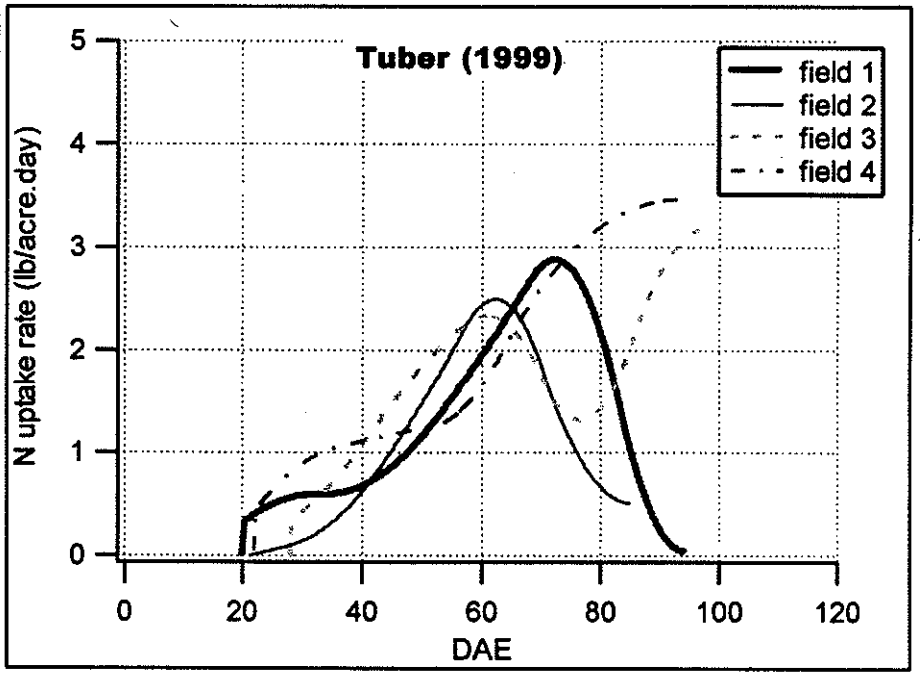
1.0
0.8
0.6
0.4
6/25/12
7/2/12
7/9/12
7/16/12
7/23/12
7/30/12
8/6/12
8/13/12

THE FUTURE

- Development of a tool to predict supplemental N need of potato





(a) N uptake rate

THE LAYERS

- Nitrogen uptake curve of potato
  - By variety, by planting date
- Release curve of ESN
- Timing and rate of urea/AN/AS/UAN
- Timing, intensity, and duration of rainfall

THE LAYERS

- How much N has the plant taken up?
- How much N was leached out of root zone?
- What is the likelihood that the extra N is needed to increase yield?
  - Considering supplemental N will also be used to promote above ground growth
- Develop model over time – and have ability to calibrate based on these field studies.

QUESTIONS?
COMMENTS?
CONCERNS?