Diversifying /Intensifying Crop Rotations in Semiarid Environments?

Strahinja Stepanovic

November - 2017

Outline

1. *Growing field peas*
   - *Field pea markets*
   - *Variety evaluation*
   - *Herbicide carryover*
   - *Seeding practices*
   - *Harvest and post-harvest*
2. *Rotation studies – Intensifying wheat-corn-fallow*
   - *Fallow vs Field Peas*
   - *Cover Crops planted after Wheat*

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Whole peas

Split peas

Field pea seed fractionation

Pea protein

Pea flour

Pea fiber

GMO-free
GLUTEN-free
pet food

Lactose-free
Soy-free
milk alternative

World's biggest pea processing plant coming to Portage la Prairie

France's Roquette to build $400M vegetable-processing facility, bring 150 full-time jobs to Manitoba

CBC News Posted: Jan 18, 2017 3:36 PM CT | Last Updated: Jan 18, 2017 5:11 PM CT

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Variety selection

Variety selection

- **3-4 year averages** *available for some varieties in Nebraska and Kansas:*

Nebraska variety testing:
https://cropwatch.unl.edu/varietytest/othercrops

NEBRASKA CROP IMPROVEMENT ASSOCIATION

Kansas variety testing:
https://www.ksre.k-state.edu/

Kansas Certified Seed Directory
Spring 2017

Outline – 2015-2017 Research data

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Top 5 field peas beginner mistakes

1. **Herbicide carryover**
2. *Inadequate inoculation with rhizobia*
3. *Poor seed handling – poor germination*
4. *Late planting*
5. *Weed control*

Be careful with herbicide carryover

ATRAZINE

MESOTRION

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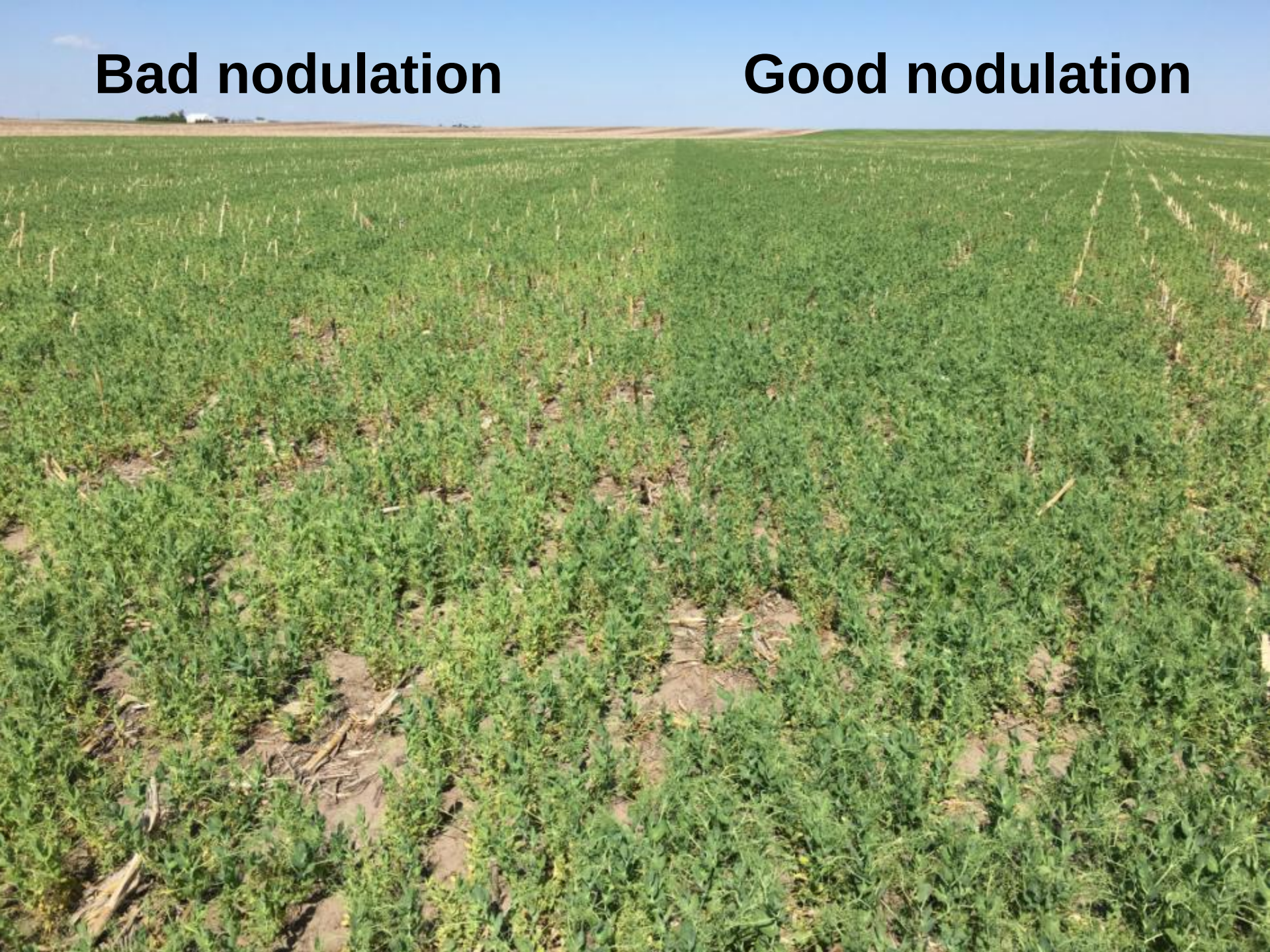
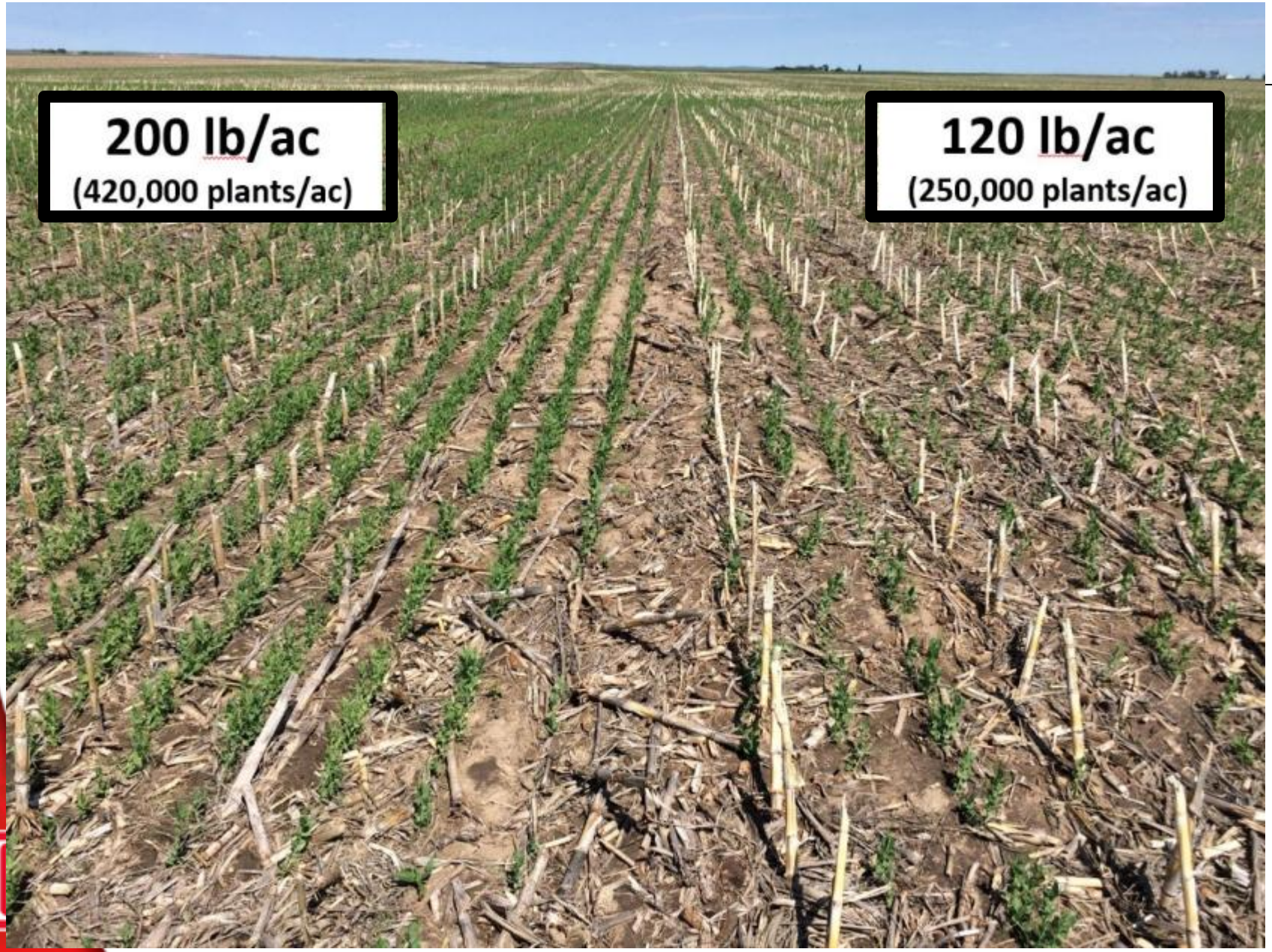
Make sure you inoculate!

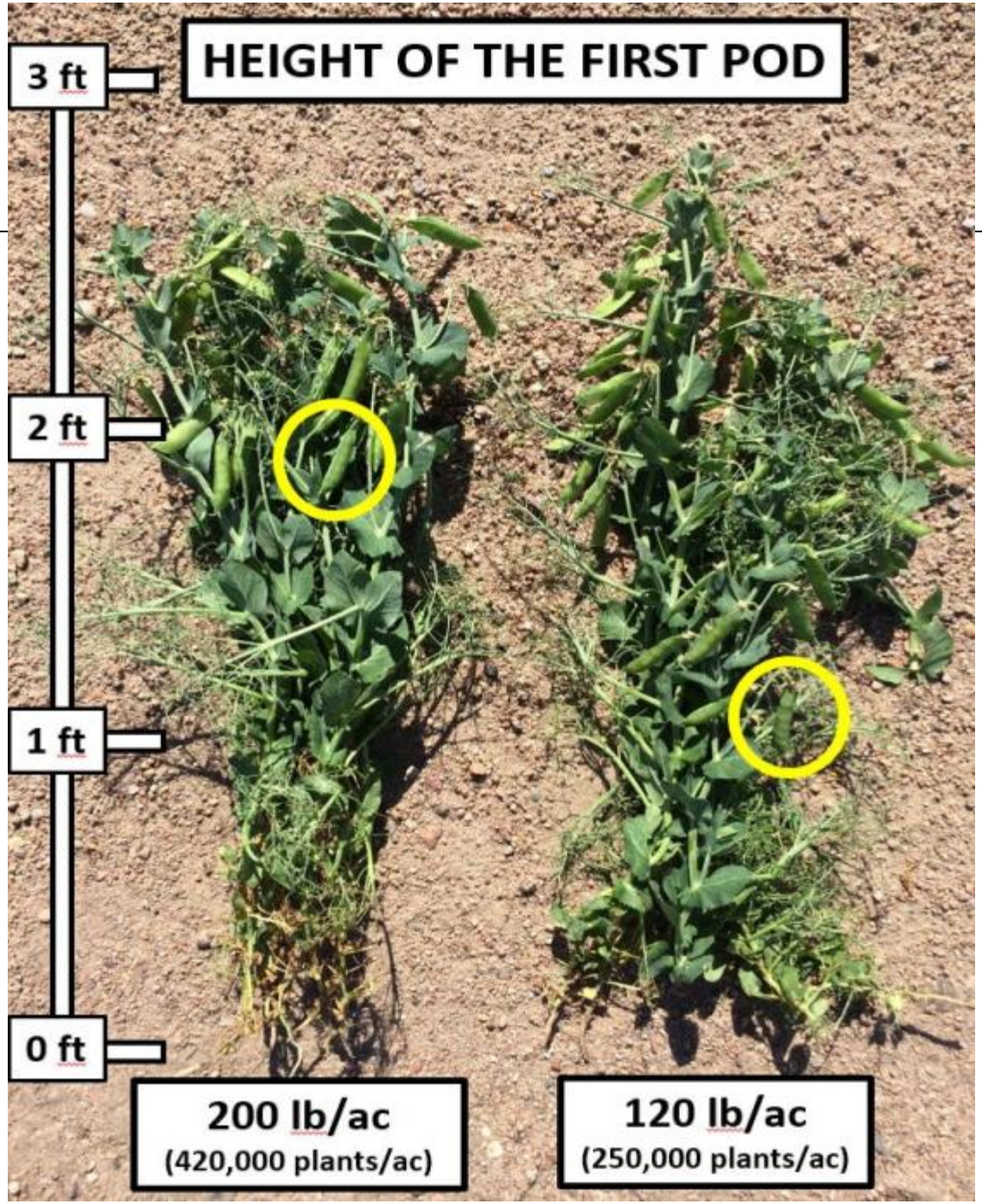
INOCULANT:

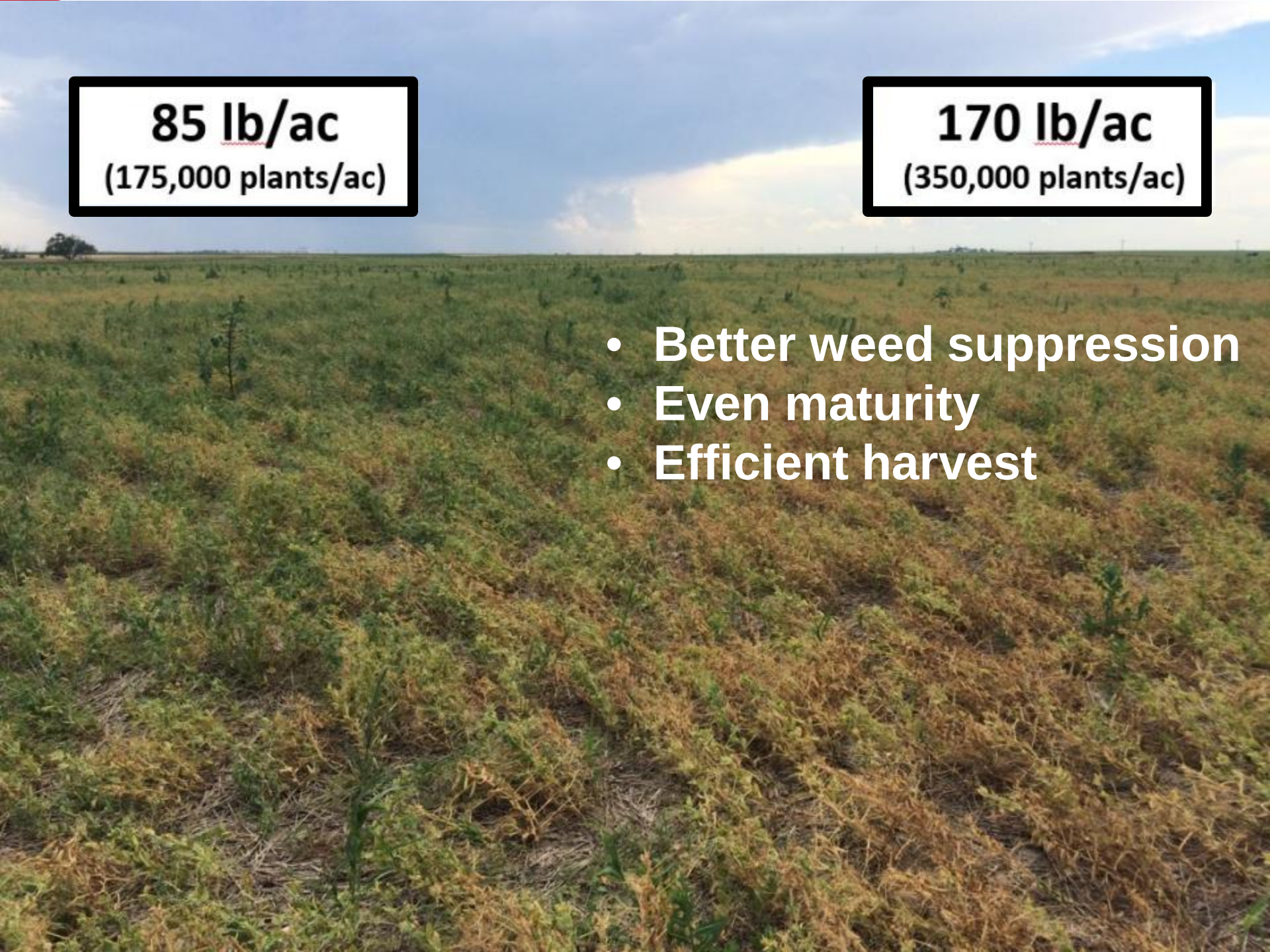
a) Liquid only
b) Peat only (on seed)
c) Dry (in-furrow)
d) Liquid + Peat
e) Peat + Peat


Bad nodulation
Good nodulation

Make sure you have a good stand




HEIGHT OF THE FIRST POD
3 ft
2 ft
1 ft
0 ft
200 lb/ac
(420,000 plants/ac)
120 lb/ac
(250,000 plants/ac)

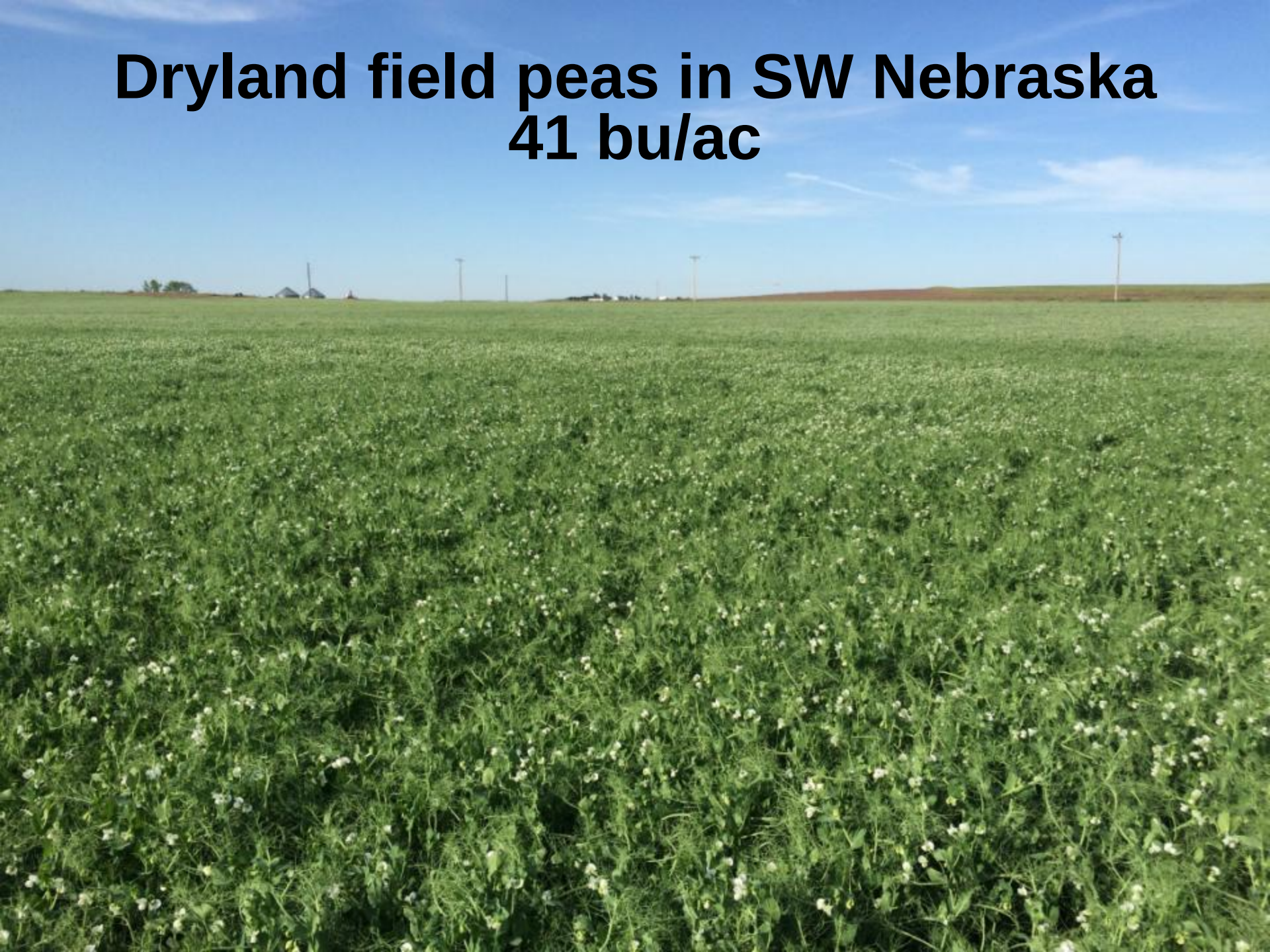

85 lb/ac
(175,000 plants/ac)
170 lb/ac
(350,000 plants/ac)
• Better weed suppression
• Even maturity
• Efficient harvest

Cold germ 98%, Warm germ 95%
Field germ 30%

Splits in 1 linear foot

Don’t get hailed

Dryland field peas in SW Nebraska
41 bu/ac




Irrigated field peas on sandy ground
SW Nebraska
65 bu/ac

DRYLAND vs IRRIGATED

1.35” of water

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Shelbourne
REYNOLDS


QUESTIONS about field pea production?

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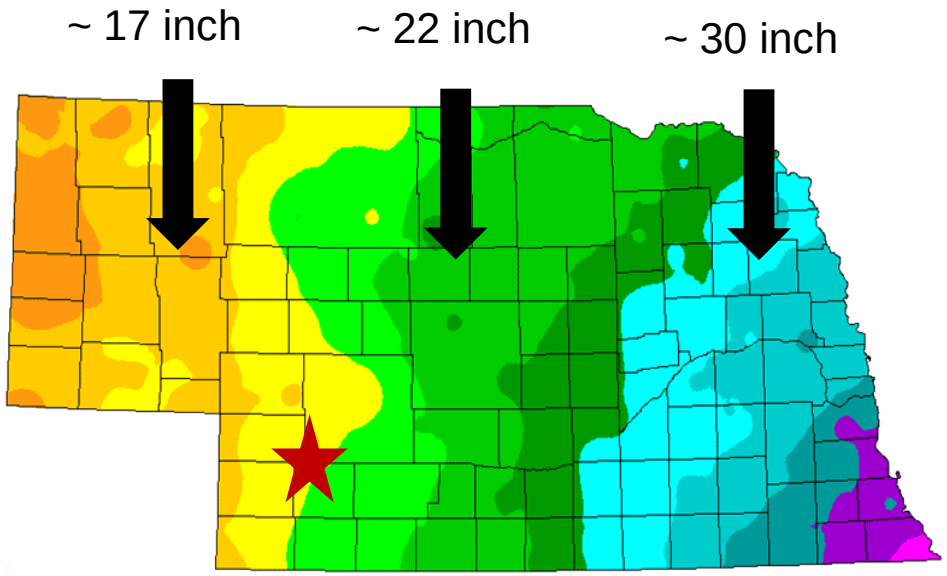
   - *Fallow (f) vs Field Peas (p) after corn (c)*
   - *Cover Crops (cc) after Wheat (w)*

Dryland Rotation Strategies

	Field Peas			Winter Wheat								Cover Crops				Corn																	
Fallow				Winter Wheat								Fallow				Corn																	
Year 1												Year 2													Year 3								
J	F	M	A	M	J	J	A	S	C	N	D	J	F	M	A	M	J	J	A	S	C	N	D	J	F	M	A	M	J	J	A	S	C	N	D

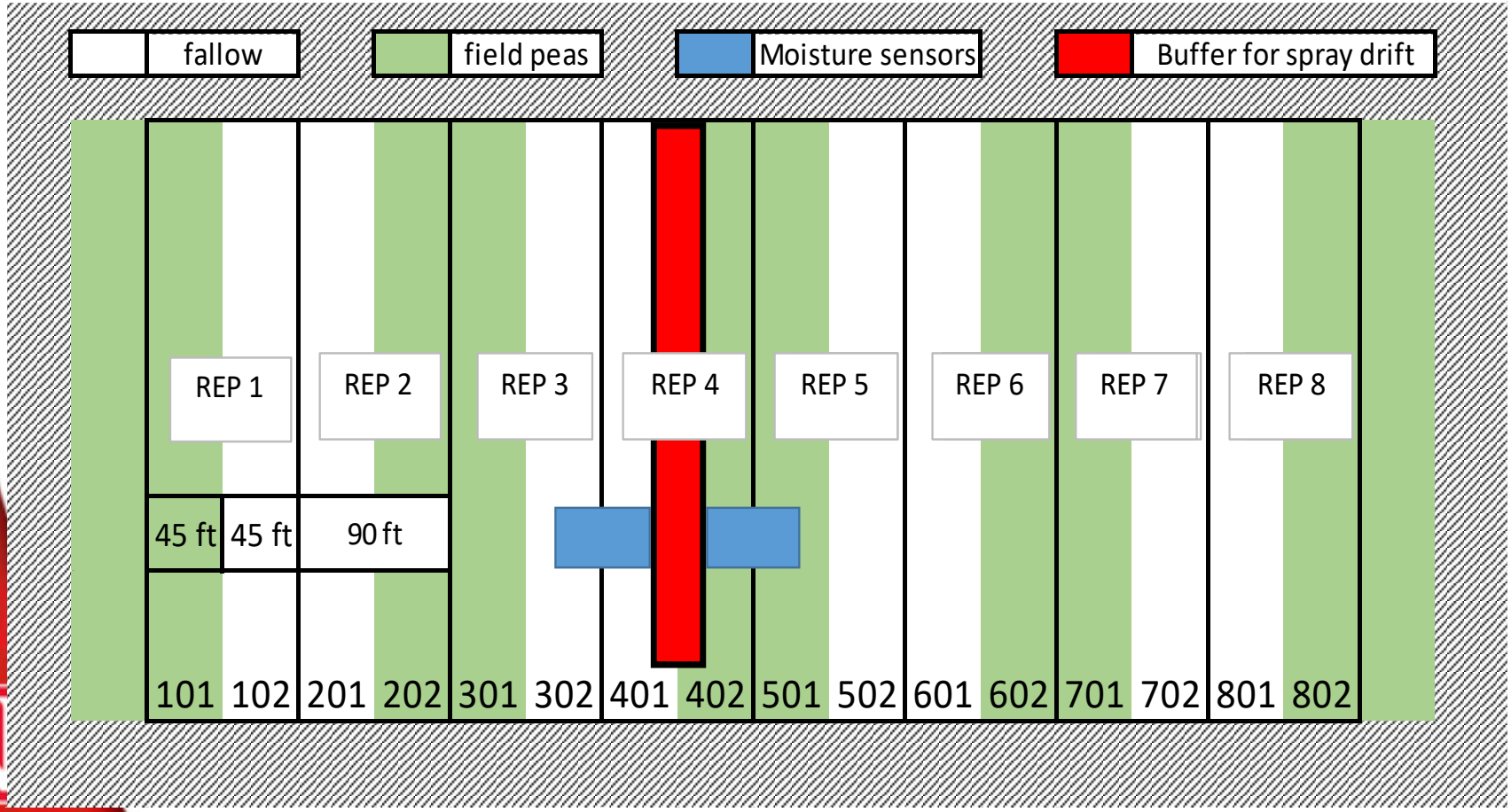


Winter Wheat
Fallow
Corn
Cover Crops
Field Peas

Source: Spatial Climate Analysis Service.

Field peas vs Fallow in SW Nebraska

- *2015, Chase County*
- *2016, Chase and Perkins County*



Data collection

1. **Rotational Study (fallow vs field pea):**

- *Soil nutrients*
- *Soil microbial activity*
- *Soil infiltration*
- *Soil aggregation stability*

SOIL HEALTH

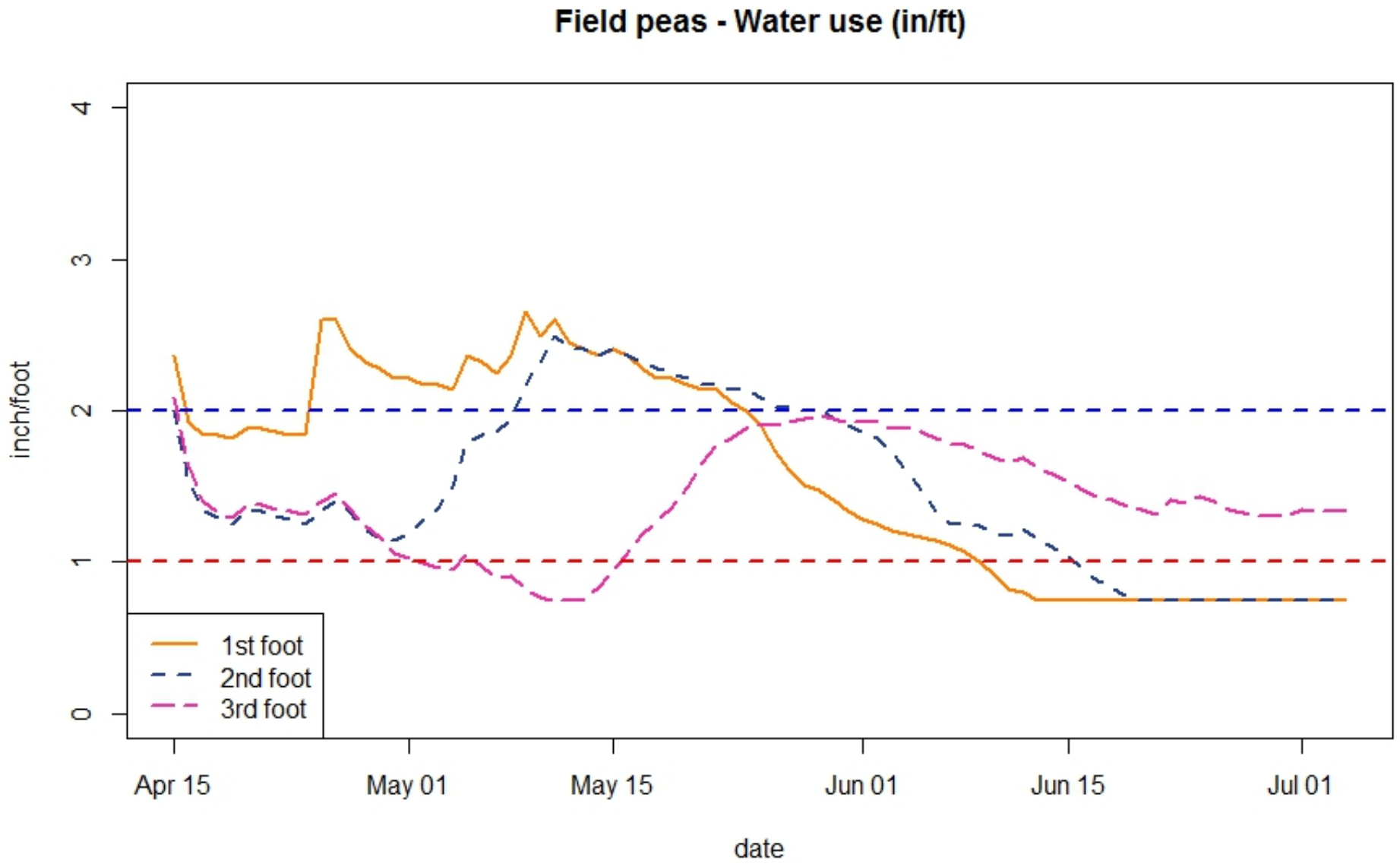
- *Beneficial insects*
- *Beneficial microbes*

BIODIVERSITY

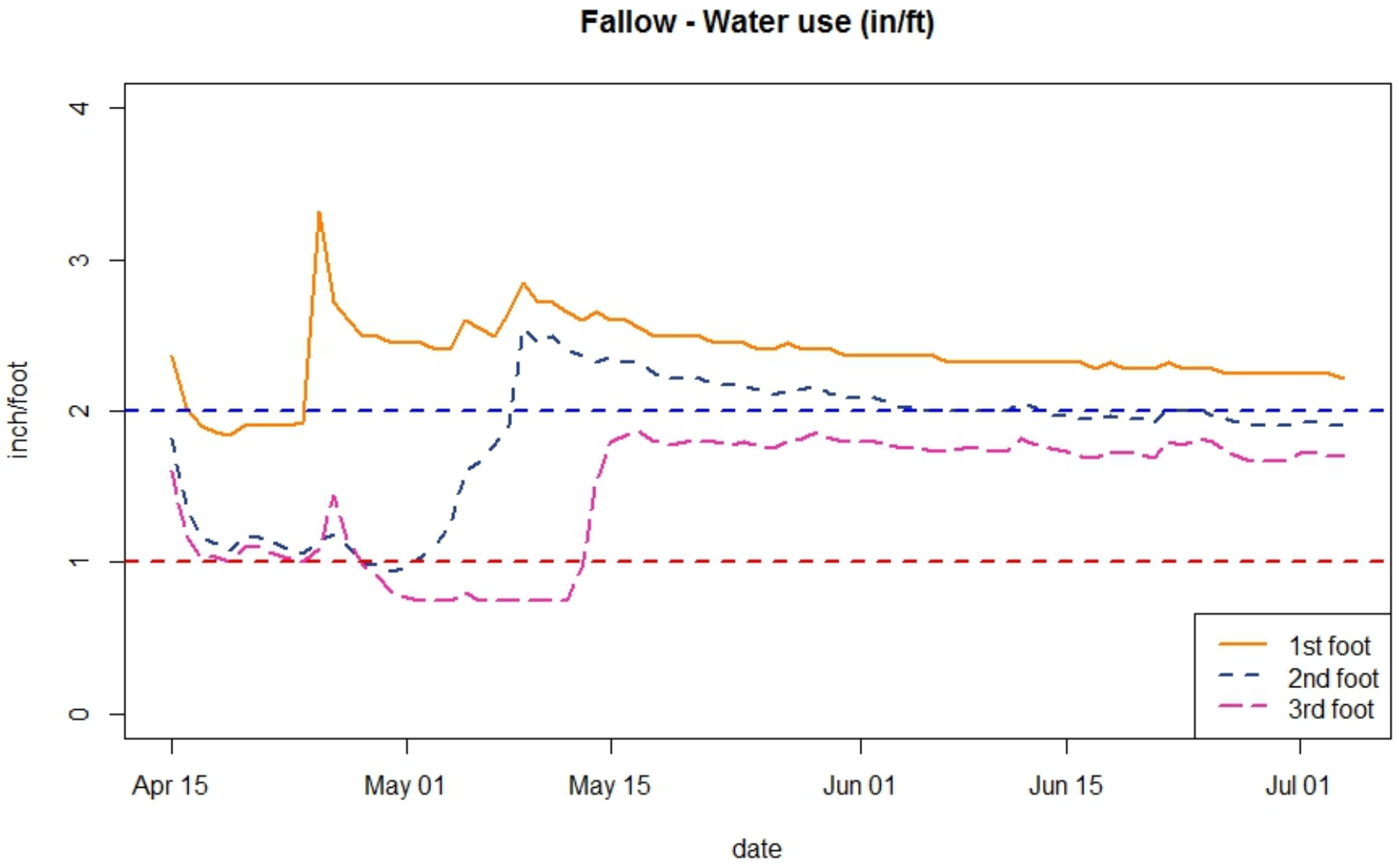
- *Water use*
- *Yield and yield quality of succeeding wheat crop*
- *Profitability*

BOTTOM LINE

Field pea water use in top 3 ft



Fallow water use in top 3 ft



Water use (Mar 27 to Jul 20)

Summer fallow

ET = 6.0 inches

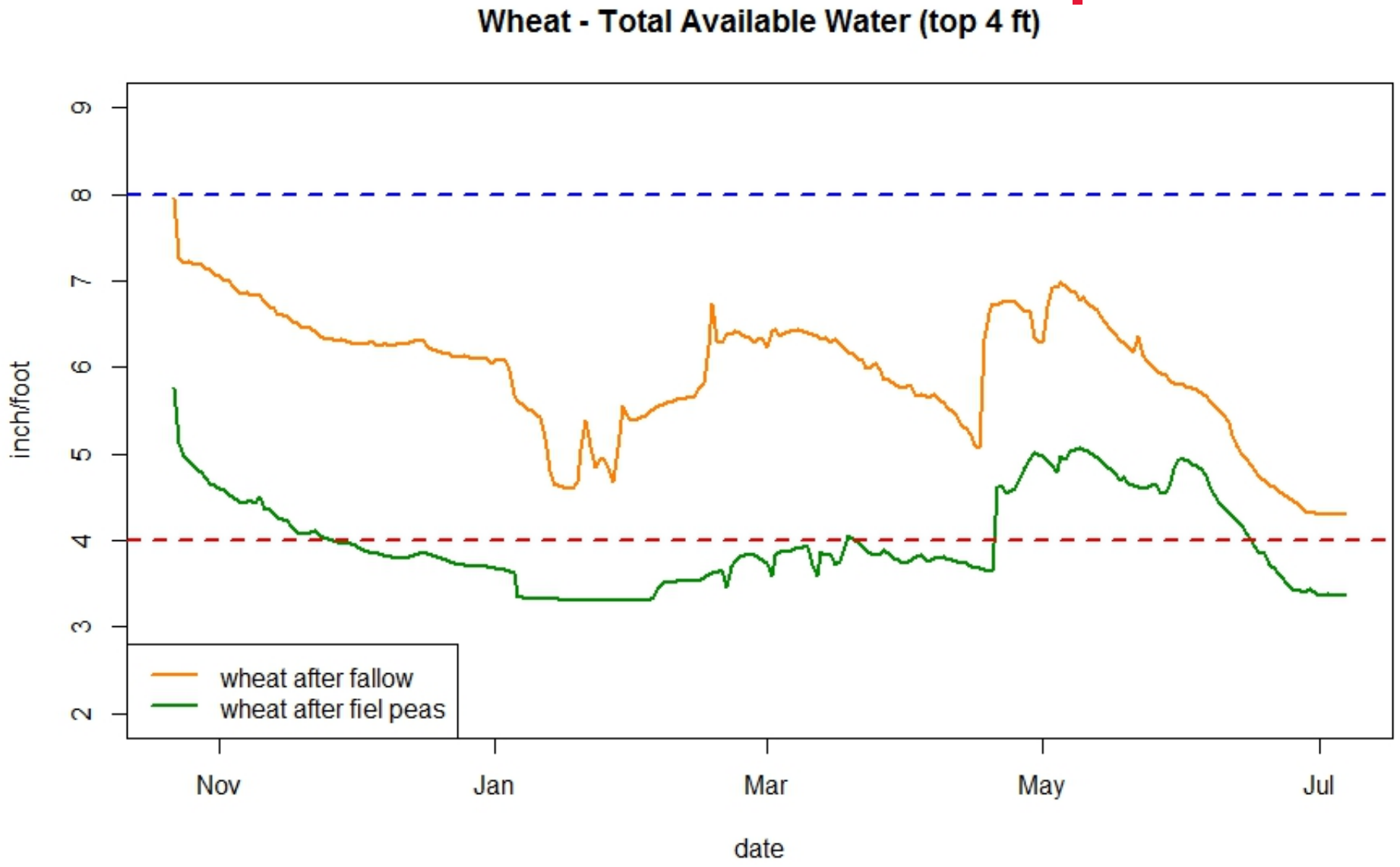
Produced nothing

Field peas

ET = 10.9

Yield = 36 bu/ac

Wheat water use after fallow vs after field peas



Water use and yield

Table 2. Temporal changes in soil moisture status (in inches) in top 3 foot of soil, rain, ET, field peas water productivity of field peas and fallow during 2015 growing season

Period	Treatment	beginning soil moisture	Rain	ending soil moisture	ET	Yield (bu/ac)
3-27 to 7-20	Field peas	10.0	12.1	6.9	10.9	36
	Fallow	10.0		9.8	6.0	
9-14 to harvest	Wheat	7.8	3.6	6.2		88
	Wheat	10.0		6.1		60

3-3-27-2015 planted, 7-20-2015 harvested, 9-14-2015 wheat planted

Field peas
Used 10.9 inches
Produced 36 bu/ac yield
Enough time to refill soil profile

>

Summer fallow
Used 6.0 inches (2.9 in less)
Produced nothing
Not enough storage for 5.3 inchrain

Wheat after field peas
70 bu/ac

<

Wheat after fallow
88 bu/ac

Rotation study:
long-term benefits

Field peas > Summer Fallow

Soil fertility

20 lb N/ac advantage

Soil water infiltration

50% faster infiltration with field peas in rotation

Beneficial insects and microbes

Increase in numbers and diversity

Evaluate economic significance next year

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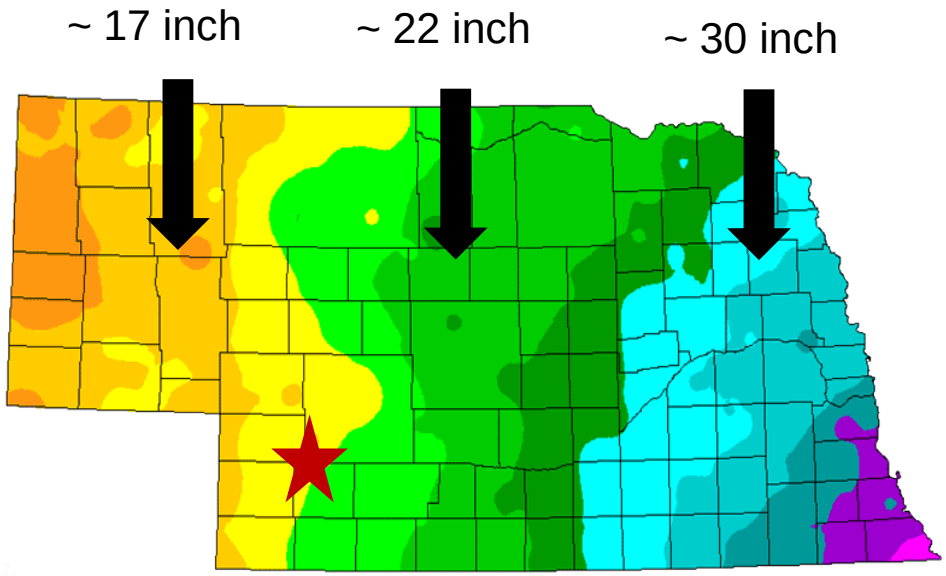


Winter Wheat
Fallow
Corn
Cover Crops
Field Peas

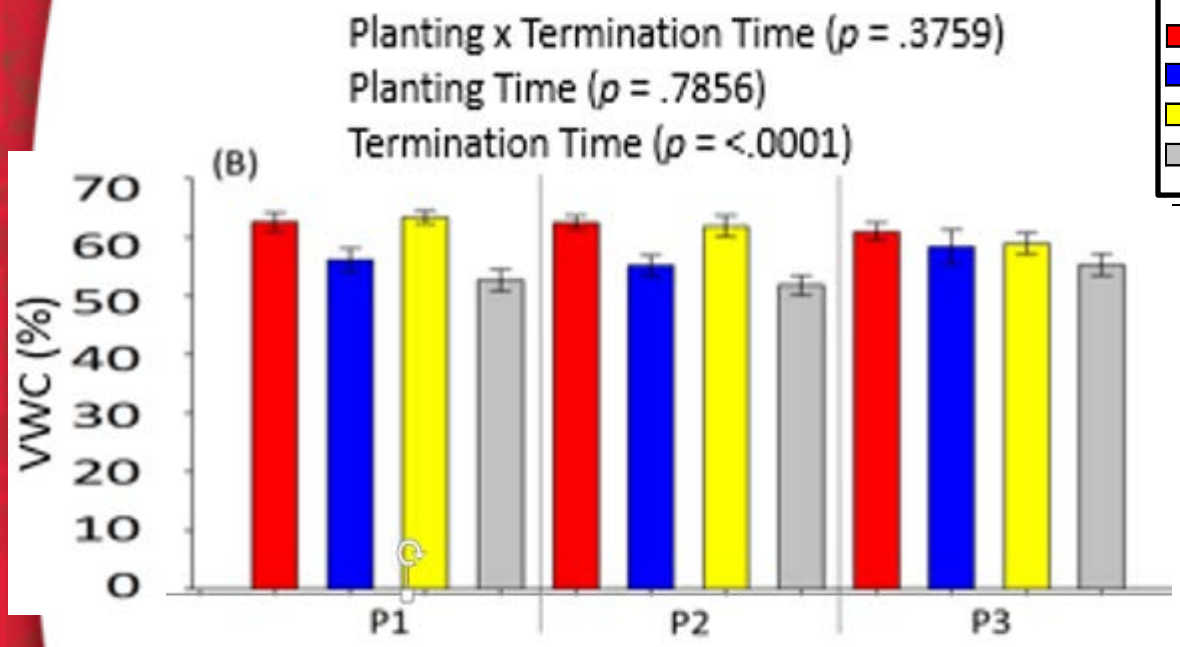
Source: Spatial Climate Analysis Service.

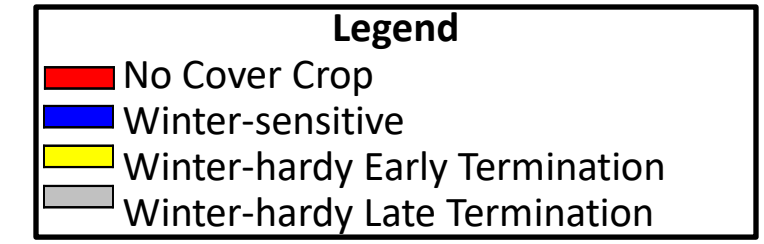
Cover Crops After Wheat?

Planted on 08/17/2016

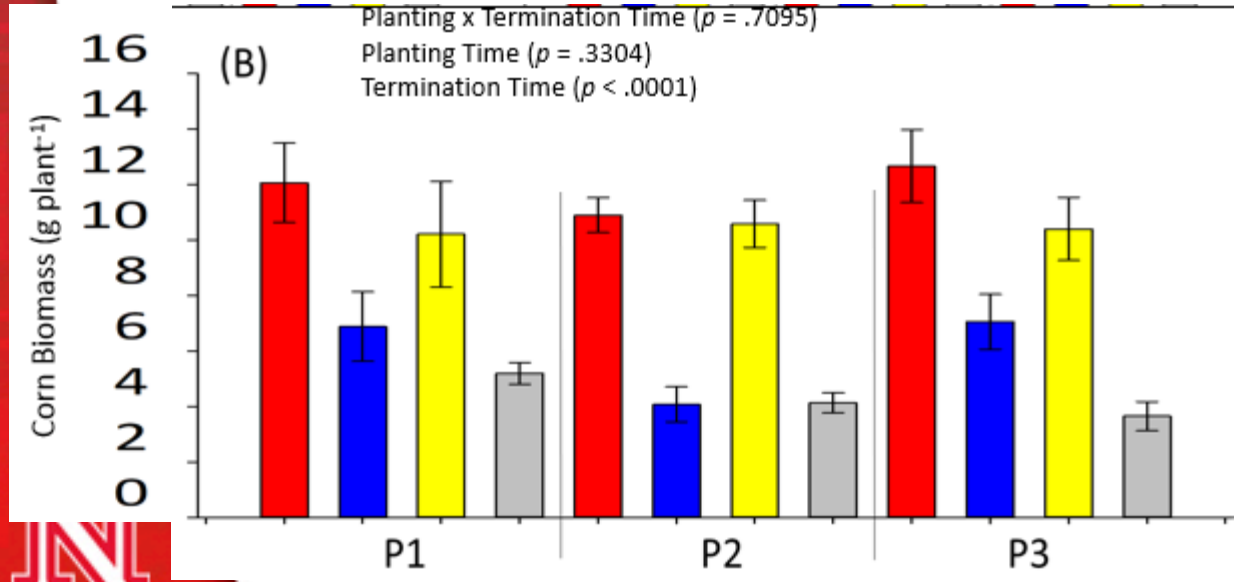
Planted on 09/07/2016

Planted on 09/26/2016





Soil Volumetric Water Content (VWC)



Corn Biomass at V6

Cover crop termination time matters

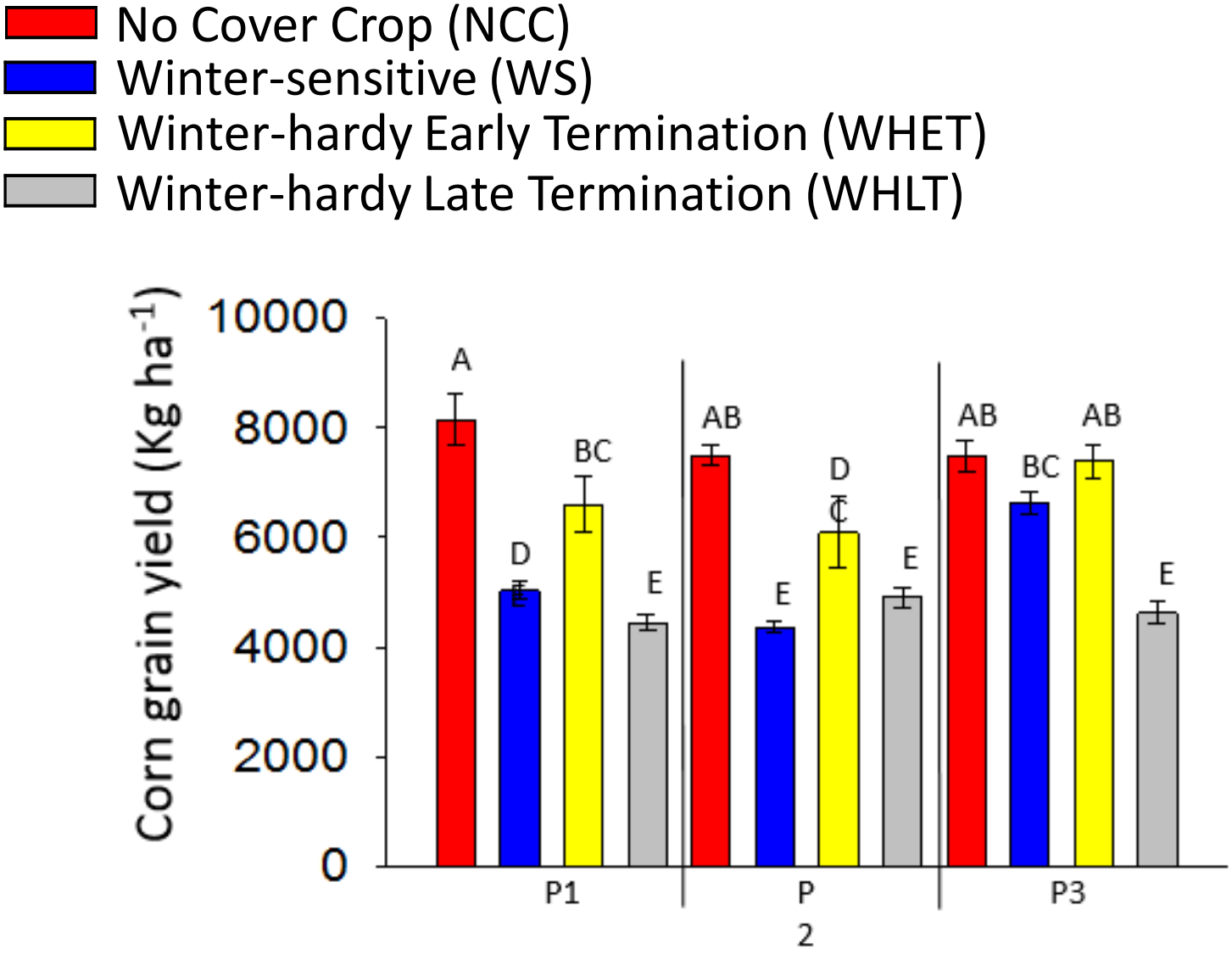


Fig. Corn grain yields in Grant, NE according to planting and termination times of cover crops.

Water use (Mar 27 to Jul 20)

Field peas

ET = 10.9

Yield = 36 bu/ac

SOYBEAN VS FIELD PEAS

What is the yield?

What is the water use?

How is it going to next crop?

QUESTIONS?