2014-2018 Research and Extension Summary

Henry J. Stumpf International Wheat Center, Grant, Nebraska

Table of Contents

Stumpf Family Gift Supports Ag Research at University of Nebraska

A generous gift of more than $3 million provides the University of Nebraska with potential to take wheat breeding and cropping systems research to a new level of innovation not seen since the early days of plant genetics. Marvin H. Stumpf III of Grant, Neb., has made the gift to the University of Nebraska Foundation to establish the Stumpf Family Research and Development Fund to support agricultural research and university extension services. The contribution includes a $1 million outright gift and donation of 640 acres of land in Perkins County, located in southwest Nebraska, with an appraised market value of more than $2 million.

"This gift is about honoring my family and our Nebraska heritage," Marvin Stumpf said. "This state has meant so much to generations of my family, and it's a privilege to give back in a way that will further agricultural research and service well into the future."

Ronnie Green, University of Nebraska vice president and Institute of Agriculture and Natural Resources Harlan vice chancellor, said Marvin Stumpf's rich and active legacy will live on through these gifts, providing researchers, faculty and students the opportunity to make new discoveries on his land. "We are excited about additional opportunities this donation creates for the wheat industry in Nebraska and even more excited about the future impact our partnership will have on our state, region and world, since as much as 50 percent of Nebraska's wheat is annually exported to international markets," Green said. "The wheat industry is big business in Nebraska, with between 65 and 75 million bushels grown each year."

Archie Clutter, dean of the Agricultural Research Division at the University of Nebraska–Lincoln, said, "UNL's robust wheat and cropping-systems research programs will grow even stronger with the help of this generous gift from the Stumpf family. This Perkins County location will add important representation of high-plains, semi-arid production to the UNL system of integrated research and allow accelerated progress in the development and application of new plant science biotechnologies."

A Nebraska native, Marvin Stumpf worked for the U.S. Postal Service in Denver and received a degree from Metropolitan State University in Denver. He returned to Nebraska to help his parents, Henry J. and Darlene Stumpf, with the family farm. Through hard work and determination, the family built the farm into a successful enterprise in Perkins County, Neb., where Stumpf continues to live and work. The family's use of dryland cropping techniques, combined with organic farming experience, are the tangible results of their willingness to experiment with new ideas while using the land to its fullest potential.

In making this gift to the university, Marvin Stumpf said he wishes to honor the legacy of his family, including his late wife, Pearl Stumpf, his grandparents, Henry J. and Margaret Stumpf, his parents Henry J. and Darlene Stumpf, and his wife's late husband, Sam Peterson.

"The Stumpf family devoted their lives to acquiring and improving their land through the use of good farm management practices," Green said. "Their desire to honor the hard work and sacrifices of their family members by using the property for the benefit of the citizens of Nebraska and United States is commendable."

2015-2018 UNL Winter Wheat Breeding
A Note from Dr. Stephen Baenziger

Author: Dr. Stephen Baenziger, UNL Professor and Nebraska Wheat Growers Presidential Chair

The Henry J. Stumpf International Wheat center has been a key testing location for the Wheat Improvement Program. The UNL Wheat breeding program now has a three-year summary and the individual-year data from our elite wheat breeding trial (NIN) at this location. This includes data on the DUP (Preliminary yield trial) and the TRP (Intermediate yield trial) as well as a few miscellaneous studies over time.

Our group does this work to assure SW NE wheat growers have well trusted varieties that are developed and tested at one of the key locations from the early generations to their final release.

Figure 1. Nebraska Extension Field Day at Stumpf farm, Grant, NE, June 2018.

2016-2018 Winter Wheat Variety Trials – 3 Year Averages

Author: Dr. Teshome Regassa, Research Assistant Professor, Agronomy & Horticulture
Funding: Wheat seed industry

Results: Table below contains three-year mean performance for dryland winter wheat in West Central region. Yields were averaged across Perkins County, Lincoln County and Red Willow County.

West Central Dryland Wheat Variety Tests 2016- 2018

Brand	Variety	Grain Yield (bu/a)	Bushel Weight (lb/bu)	Kernel Weight (000/lb)	Grain Protein (%)	Plant Height (inches)
			Three year averages			
AgriPro Syngenta	SY Monument	77	55	16	12	33
Limagrain Cereal Seeds	LCS Link	77	57	15	13	33
-----	Ruth	76	56	16	13	35
WestBred	WB-Grainfield	76	57	15	12	34
Kansas Wheat Alliance	Tatanka	75	56	16	12	33
Limagrain Cereal Seeds	LCS Chrome	75	56	16	13	33
Kansas Wheat Alliance	Oakley CL	74	56	14	13	33
Husker Genetics	Freeman	74	55	15	13	33
Husker Genetics	Robidoux	73	55	16	13	34
Limagrain Cereal Seeds	T158	73	56	13	13	33
AgriPro Syngenta	SY Wolf	72	55	15	13	33
Limagrain Cereal Seeds	LCS Mint	72	56	15	12	34
AgriPro Syngenta	SY Sunrise	72	56	15	13	32
WestBred	Winterhawk	71	57	15	13	34
WestBred	WB4721	71	58	14	13	33
Dyna-Gro Seeds	Long Branch	70	55	15	13	34
AgriPro Syngenta	SY Flint	69	55	15	13	33
Husker Genetics	Overland	69	56	15	13	35
Husker Genetics	Settler CL	68	55	15	12	32
----	Infinity CL	68	56	15	13	34
----	Mace	62	53	17	13	33
----	Wesley	62	54	15	14	32
----	Scout 66	51	54	14	14	37
----	Turkey	49	55	16	14	38
Average of all entries		**70**	**56**	**15**	**13**	**34**
Difference required for significance at 5%		**7**	**1**	**1.0**	**0.5**	**2**

2016-2018 Wheat Plant Date and Population Experiment

Author: Dr. Cody Creech, Dryland Cropping Systems Specialist, Panhandle Research and Extension Center
Funding: NE Wheat Board

Study outline:

One of five locations utilized for this effort to update NE wheat planting recommendations, the Stumpf Center was seeded in the fall of 2016 and 2017 with 360 plots each year. The plots included three varieties (Goodstreak, Wesley, and Robidoux), four populations (14, 16, 18, and 20 seeds per foot of row), and two row spacings (7.5 and 10 inch). These combinations were seeded on three different dates representing an early, on-time, and late planting. The objective of the experiment was to evaluate wheat planting recommendations for NE wheat growers.

Figure 1. Harvesting first year of wheat population and seeding rate experiment at the Stumpf Center in Grant, NE, July 2017.

Measurements included stand counts, height, biomass, number of heads in an area, seeds per head, seed weight, protein, yield, test weight, and moisture. Results will be disseminated at field days, Crop Production Clinics, winter meetings, science meetings, and through print media and journals.

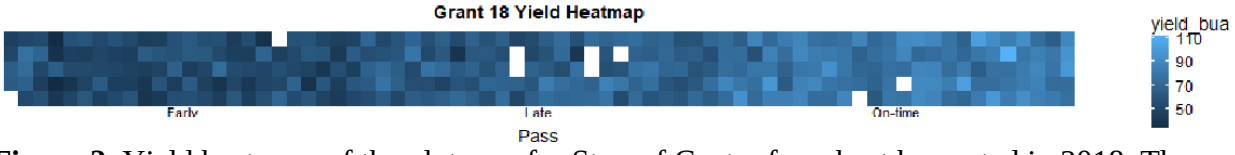


Figure 2. Yield heat map of the plot area for Stumpf Center for wheat harvested in 2018. The left third of the heat map is early seeded, the middle third is late, and the right third is on-time. The lighter the color, the higher the yield. Plots that are white were excluded from the analysis. This map demonstrates the reduced yield that was observed due to seeding early.

2016-2017 Gibberellic Acid to Enhance Wheat Establishment and Yield

Author: **Dr. Cody Creech**, Dryland Cropping Systems Specialist, Panhandle Research and Extension Center
Funding: In part by NE Wheat Board

Study outline:

The Stumpf farm at Grant, NE, was one of three locations utilized to evaluate gibberellic acid on wheat establishment and yield. The Stumpf Center was seeded in the fall of 2016 and 2017 with 96 plots each year.

The benefit of using gibberellic acid (GA), a growth regulator to boost wheat establishment and yields, has been reported in some areas of the United States. The objective of this research was to evaluate a seed treatment and foliar applications of GA to determine if their use would benefit Nebraska wheat growers.

Results yet to be reported:

Similar to the planting date experiment, measurements included stand counts, height, biomass, number of heads in an area, seeds per head, seed weight, protein, yield, test weight, and moisture. Results will be disseminated at field days, Crop Production Clinics, winter meetings, science meetings, and through print media and journals.

2016-2018 Impact of Cover Crop Species Selection on Corn Production in Semi-Arid Rainfed Cropping Systems

Author: **Alex Rosa**, PhD Student in Cropping Systems
Funding: In part by NE Wheat Board

Study outline:

We investigated impact planting of eight cover crops (CC) combinations after wheat harvest on the following corn crop. Treatments included: No cover crop (NCC), spring triticale (ST), cereal rye (CR), spring oats (SO), purple top turnip (PTT), kale Siberian (KS), balansa clover (BC), and hairy vetch (HV).

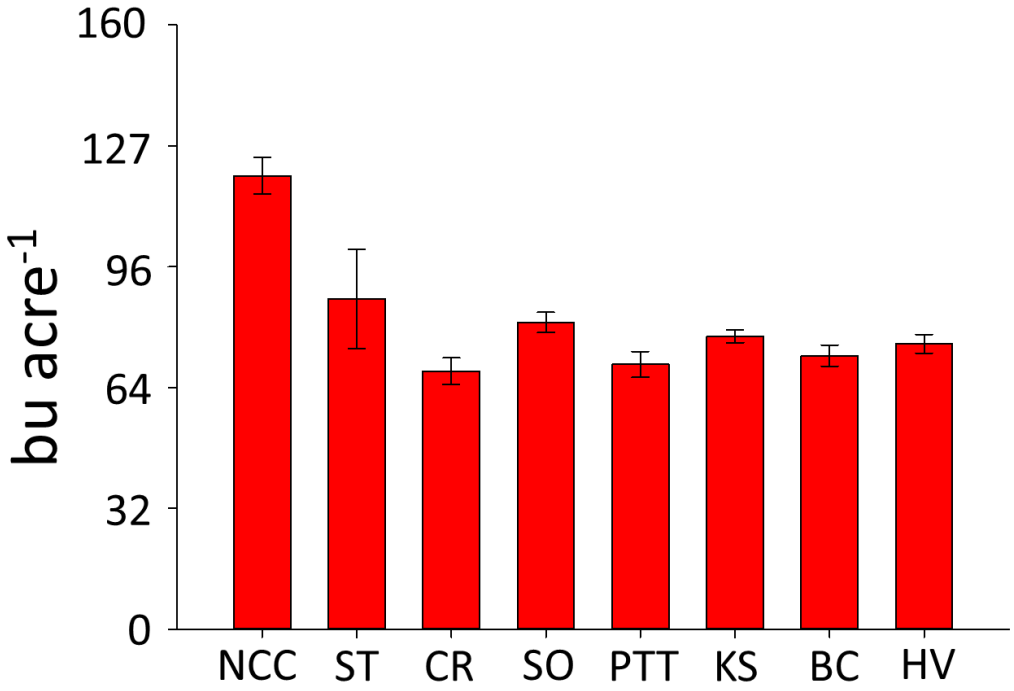


Figure 1. Corn grain yields in Grant, NE, according to different CC species in 2017.

Results:

Corn yields were reduced by all CC species (Figure 1). Cereal rye showed to be the species with the biggest detrimental impact on corn yield. Since the CC were terminated at corn planting, the increased biomass accumulation plus a possible nitrogen immobilization penalized corn grain yields.

2016-2018 Effects of Cover Crop Planting and Termination Time on Subsequent Corn in Western Nebraska

Author: **Alex Rosa**, PhD Student in Cropping Systems
Funding: In part by NE Wheat Board

Study outline:

We investigated the impact of:

- Three CC planting times after wheat harvest:
  - P1 (08/18/16)
  - P2 (09/08/16)
  - P3 (09/27/16)
- Four CC termination times:
  - Winter-sensitive mix killed in the winter
  - Winter-hardy mix terminated with glyphosate 3 weeks prior corn planting
  - Winter-hardy mix terminated with glyphosate at corn planting
  - No cover crop

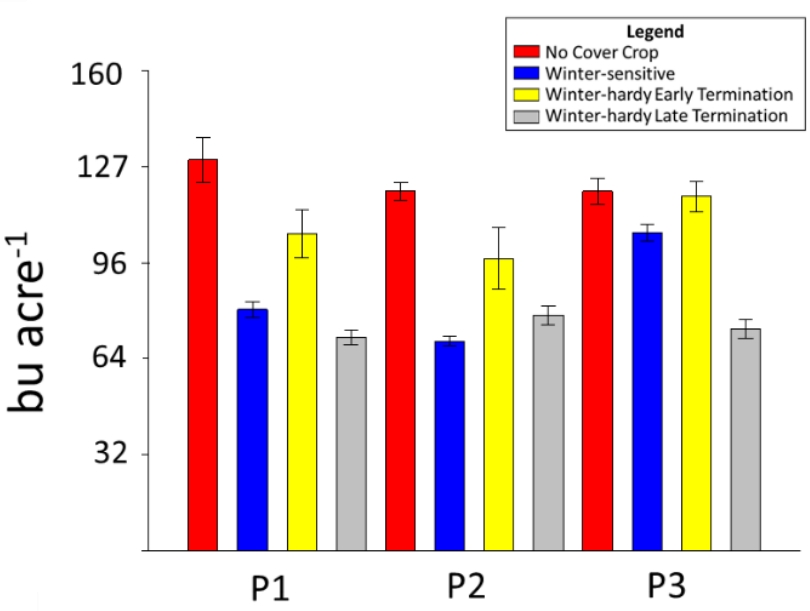


Figure 1. Corn grain yields at Grant, NE, in 2017 season according to planting and termination times of cover crops.

Results:

In general, corn yields were reduced by cover crops. The winter-hardy late planting and early termination treatment had the least impact on corn grain yield. Late termination of CC leads to soil water depletion by those "non-cash" crops affecting subsequent corn productivity.

2017 Integrated Disease Management of Fusarium Root Rot Disease

Author: Tony Adesemoye, Extension Plant Pathologist, West Central Research and Extension Center
Funding: Self-funded

Study outline:

A rotation study is on-going at the Henry J. Stumpf International Wheat Center, Grant, as part of the effort to develop integrated disease management strategies for Fusarium root rot disease with focus on the two pathogens including: that Fusarium graminearum and F. oxysporum; both pathogens were the two most widely distributed and virulent pathogens causing Fusarium root rot in corn, soybean, and wheat crops.

The study is being conducted to evaluate the effect of fungicide seed treatment and the use of biological control products for the management of root rot diseases in wheat, corn and soybean. Study treatments included:

1. Seeds fungicide with or without
2. Biological product with or without
3. Pathogen inoculation with or without

Figure 1: Wheat and corn plots in a wheat-corn-soybean rotation study at the Henry J. Stumpf International Wheat Center, Grant, NE.

Results:

Findings will be provided to producers through multiple media, including Crop Production Clinics, CropWatch, Field Day, and individual contacts.

2019 Optimizing Wheat Fertility Management to Address Protein and Acrylamide Issues

Author: Bijesh Maharjan, Extension Soil and Nutrient Management Specialist, Panhandle Research and Extension Center

Funding: ARD Innovation Fund for Wheat/Cereal Crops

Initiated in the fall of 2018, this two-year experiment will evaluate the impact of nitrogen rates and timings on wheat yields. An additional experiment will evaluate sulfur rates and timings on yield and acrylamide accumulation. Results will be used to update the current recommendations used by NE wheat growers. Other locations include Sidney, Scottsbluff, and Mead. The experiment will be repeated in 2019.

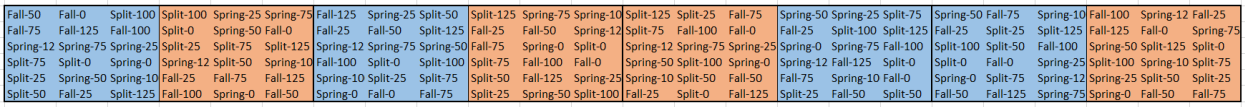


Figure 4. Plot map for wheat fertility experiment at Stumpf Center. Blue areas are seeded to Ruth and pink areas are seeded to Freeman. N rates include 0, 25, 50, 75, 100, and 125 percent applied in either the fall or the spring. Split plots receive 1/3 of the amount in the fall and 2/3 in the spring.

2017 Monsanto Impact of Planting Date and Seeding Rate on Wheat Varieties

Author: Brian Olson, Monsanto Learning Center at Gothenburg, NE
Funding: Partnership between Bayer (Monsanto) and UNL

MONSANTO

Demonstration Report

MONSANTO LEARNING CENTER AT GOTHENBURG, NE

IMPACT OF PLANTING DATE AND SEEDING RATE ON WHEAT VARIETIES

TRIAL OVERVIEW

- How is wheat yield potential affected when planting too early or too late?
- Can an increased seeding rate compensate for less tiller development and help maintain yield potential in late-planted wheat?

RESEARCH OBJECTIVE

- The objective of this study was to evaluate the influence of planting date and seeding rate on yield potential in rainfed winter wheat in west-central Nebraska.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Vertical tillage			85 bu/acre	0.8M, 1.4M, 2.0M
Grant, NE	Kuma silt loam	Wheat	Conventional tillage			40 bu/acre	0.8M, 1.4M, 2.0M

UNDERSTANDING THE RESULTS

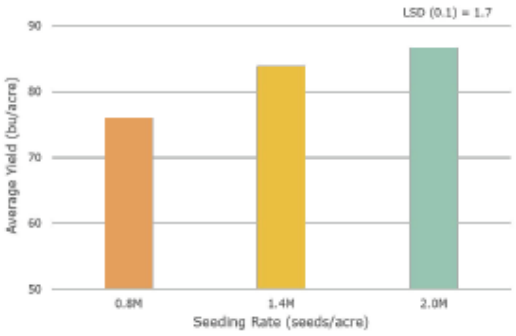


Figure 1. Average wheat yields by seeding rate at the Gothenburg site

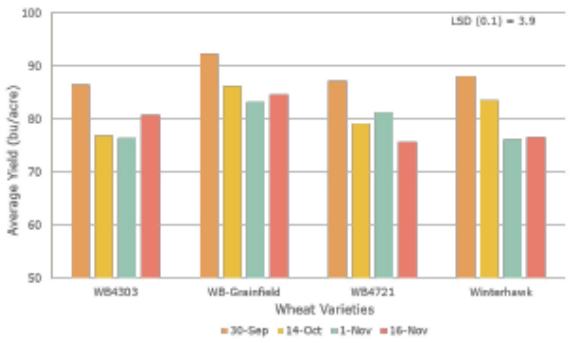


Figure 2. Average wheat yields by planting date at the Gothenburg site

- **Gothenburg**
- Higher yields were consistently obtained with higher seeding rates across all planting dates and wheat varieties (Figure 1).

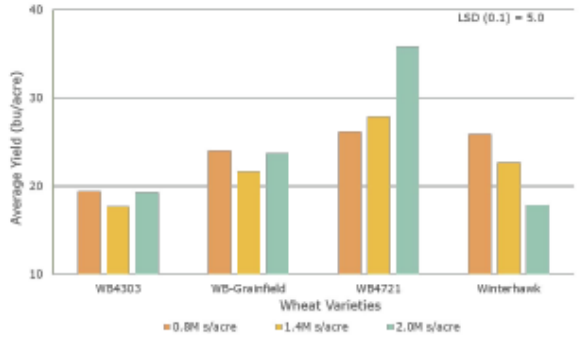


Figure 3. Average wheat yields by seeding rate at the Grant site

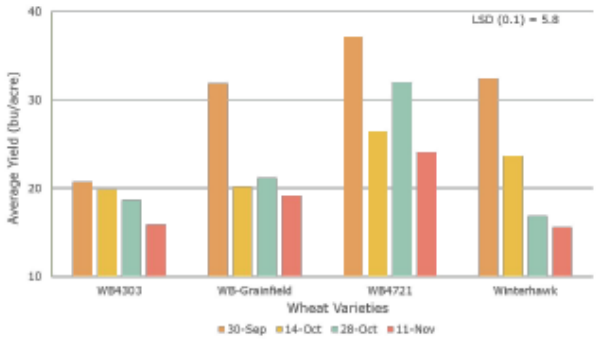


Figure 4. Average wheat yields by planting date at the Grant site

Month	Gothenburg, NE		Grant, NE	
	2016-17 total	Average	2016-17 total	Average
	Inches			
September	0.61	1.55	1.4	1.5
October	2.69*	1.41	0.6	1.3
November	0.55	0.89	0.0	0.8
December	0.38	0.45	0.1	0.4
January	0.7	0.45	0.4	0.5
February	0.43	0.51	0.0	0.7
March	2.7	1.41	1.8	1.4
April	1.5	2.26	2.1	2.2
May	2.53	3.71	3.3	3.2
June	0.75	3.67	0.4	3.1
July	1.52	3.23	3.0	3.1
Total	**14.36**	**19.54**	**13.1**	**18.2**

Table 1. Accumulated moisture at Gothenburg and Grant. *Two inches of irrigation water was applied on October 21, 2016 to ensure good stand establishment.

- There was a significant interaction between planting date and wheat variety. Higher yields were observed for all varieties at the earliest planting date. However, varieties responded differently to later planting dates (Figure 2).
- **Grant**
- Across seeding rates, there was no significant difference in yield for two of the varieties, WB4303 and WB-Grainfield, whereas WB4721 had increased yield with increasing seeding rate and Winterhawk had decreased yield with increasing seeding rates (Figure 3).
- The earliest planting date (September 30) had the highest yields across all varieties; however, the magnitude of the yield increase varied. Three of the four varieties had significantly higher yields for the earliest planting date (Figure 4).

WHAT DOES THIS MEAN FOR YOUR FARM?

- The impact of planting date affects yield potential with typically higher yields observed with planting dates that allow for sufficient tiller development without excessive foliage growth in the fall. Planting dates from mid-September to the first part of October are reasonable for the central Great Plains.
- The results of this study suggest that in high-yielding environments (above 75 bu/acre), higher seeding rates may result in higher yield potential. In lower-yielding environments (below 35 bu/acre) wheat varieties may have more variability in regards to yield potential.

2018 Frenchman Valley Coop Strip Trial on White Wheat Management Approaches

Study outline:

Aspen Traditional		Snowmass Greater Acre
Sunshine Traditional		Sunshine Greater Acre
Snowmass Traditional		Aspen Greater Acre
Grainfield Traditional		Granfield Greater Acre
Winterhawk Traditional	Alley Way	Winterhawk Greater Acre
Sunshine		Sunshine
Sunshine		Sunshine
Sunshine		Sunshine
Traditional wheat will be planted at 800,000 seeds per acre. 8 gal of 10-34-0 at planting. .56oz Amber applied in the fall.		Greater Acre plots will be planted at 1.2 million seed per acre. 15 gal of 9-27-0-5-.5z at planting. .56 oz. Amber applied in the fall.
10 gal 32-0-0 at tillering		20 gal Protein Plus at green up.
		20 gal of28-0-0-5 after joint & 4oz of Alto fungicide.
		9.4 oz. of Trivapro fungicide at flag leaf.
Total nutrients including residual.		Total nutrients including residual.
60#N, 30#P		130#N, 45#P, 35#S, 1#Z

Results:

Greater Acre

Variety	Moisture	Test Weight	Protein	Yield
Snowmass	10.2	61.2	11.8	90.5
Sunshine	10.3	60.3	11.7	85.2
Aspen	9.4	61.2	11.7	88.7
Grainfield	10.5	60.2	12.2	80.1
Winter Hawk	10.2	60	12.1	93.5
		Average	**11.9**	**87.6**

Traditional Acre

Variety	Moisture	Test Weight	Protein	Yield
Snowmass	10.7	61.5	10.3	71.4
Sunshine	9.8	60.4	10.4	69.3
Aspen	9.8	59.9	10.6	70
Grainfield	10.3	60.3	10.2	63.8
Winter Hawk	9.9	57.5	10.5	69.5
		Average	**10.4**	**68.8**

Letter of Support from Our Industry Collaborators

University of Nebraska Stumpf Farm
Monsanto/Westbred/Bayer

Wheat Research

The UNL Stumpf Farm has provided results from research plots since the 2014-2015 season. The site is strategically located in an important wheat growing region of the western high plains, and within easy access to our testing hub based out of Gothenburg, NE.

The site has the capacity to provide and has provided, both irrigated, and dryland results. Quite remarkably for winter wheat in the region, we have obtained results every year attempted. Data obtained from this site has contributed to every testing stage of our breeding lines, and contributed to the release of over ten new varieties in this timeframe.

In addition, we have utilized the site for special studies such as seeding density trials and seed treatment studies, which have contributed greatly to our characterization of new products and input on the potential of new products.

Due to the location and facilities available, combined with the typically excellent plots, we have utilized this site as a demonstration plot/field day opportunity in the past, and hope to continue in the future. This allows us to not only reach potential customers, but also provides a teaching opportunity for our seed associates and dealers.

We are deeply appreciative of the contribution and availability of this site by the University of Nebraska, and collaborative opportunities it provides. We look forward to future opportunities and projects at the UNL Stumpf Farm.

Greg Feather, Wheat Testing Team, Gothenburg, NE
Mark Lubbers, Wheat Technical Agronomist, Wichita, KS
Sid Perry, Hard Winter Wheat Breeder, Filer, ID

2018 Soybean Row Spacing and N Management

Author: Strahinja Stepanovic, Extension Educator, Perkins, Chase and Dundy Counties
Funding: NE Soybean Board

The NE Soybean Board supported research at the Henry J. Stumpf International Wheat Center in 2018. This project is a continuation of soybean On-Farm Research done in SW NE. Below you can find a brief summary on two studies; follow the link for full online report:

1. How Row Spacing Affects Irrigated Soybean in Southwest Nebraska, link https://cropwatch.unl.edu/2018/how-row-spacng-affects-irrigated-soybean-southwest-nebraska

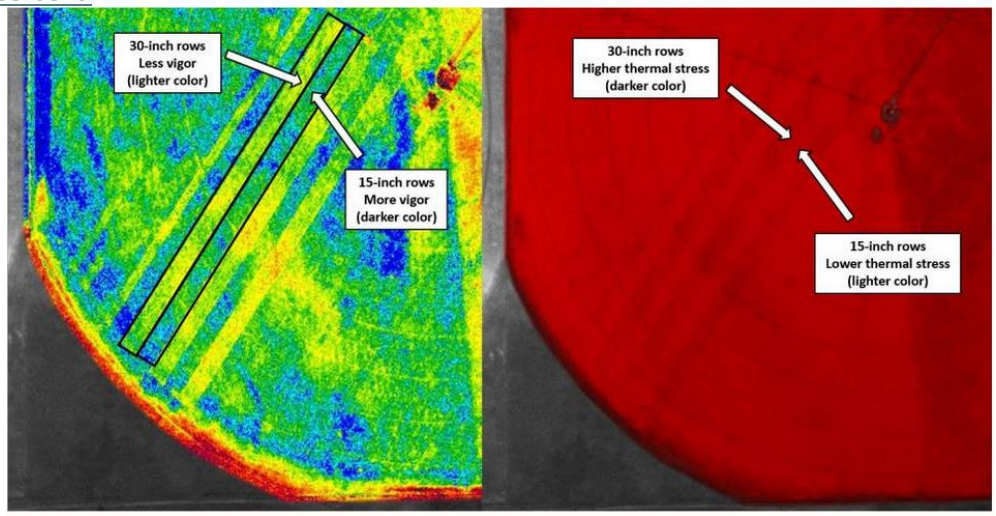


Figure 1. TerrAvion aerial imagery taken on Aug 4, 2017 at Chase County site showing less vigor and higher thermal stress in 30-inch row soybeans than in 15-inch row soybeans.

2. Is Late Season N Fertilization Warranted for Irrigated Soybean in Western Nebraska? Link, https://cropwatch.unl.edu/2018/late-season-n-soybeans

Figure 1. Final soybean stand count was not necessarily an indicator of yield in this 2017 study of the effects of late-season (R3) nitrogen application in soybean. The Lincoln County plot (left) had a final stand count of 72,000 plants per acre and yielded 72.7-73 bu/ac. The Perkins County plot (right) had a final stand count of 161,000 plants per acre and yielded 74.4-77 bu/ac.

Table 1. Site description, agronomic information and data on grain yield (bu/ac), oil content (%), protein content (%), soil N after harvest, N in the plant residue (lbs/ac), and marginal net return ($/ac) for irrigated soybeans at three western Nebraska sites in 2017.

	Site - Year							
Site description	**Perkins County - 2017**			**Lincoln County - 2017**			**Chase County - 2017**	
Soil organic material	Keith silt loam			Holdrege fine sandy loam			Valent loamy sand	
Previous crop	corn			corn			corn	
Planting date	May 15			May 25			May 15	
Harvest date	Oct 20			Oct 15			Oct 16	
Rainfall (inches)	12			15			11.5	
Irrigation (inches)	10.5			13.5			11	
Hail	minor injury			no hail			40% damage	
Agronomic information								
Tillage	Vertical till			No-till			Vertical till	
Row spacing	10-inch			15-inch			10-inch	
Variety	Pioneer 22T41			Chanel 2402			NK S30C1	
Maturity group	2.6			2.4			2.6	
Final stand (plants/ac)	161,000			72,000			168,000	
Nodulation	excellent			excellent			poor	
Nitrogen applied (32-0-0) @ R3	70 lbs N/ac			85 lbs N/ac			65 lbs N/ac	
Study results								
Treatment (N applied at R3)	**High N**	**No N**		**High N**	**No N**		**High N**	**No N**
Yield (bu/acre)†	77.0	74.4		73.0	72.7		65.1	64.4
Oil content (%)	34.5	34.4		36.0	35.9		34.5	34.4
Protein content (%)	20.4	19.9		20.2	19.7		21.7	18.6
Soil N at harvest (lbs N/ac)	44.7	47.0		34.0	27.8		28.8	30.5
N in the residue (lbs of N/ac)	47.0	39.0		34.0	28.8		52.3	38.0
Marginal net return‡ ($/ac)	656.00	646.00		614.00	646.00		573.00	552.00

†Bushels per acre corrected to 13% moisture. ‡Marginal net return $8.90/bu soybean.

Late season N study (Table 1):

Supplementing N to soybeans at R3 did not increase yield, grain protein, oil content, or marginal net return at any of the three locations. The post-harvest soil N was similar in both N treatments. The only notable difference in end-of-season N balance was N content in plant residue, which was 5, 8, and 14 lbs of N/ac higher in the N treatments at Chase County, Lincoln County, and Perkins County, respectively.

Recommendations:

Late season (R3) N fertilization did not increase yield or profit of soybeans grown at three on-farm trials in southwest Nebraska in 2017. Supplementing N to soybeans is more likely to be beneficial in higher yielding environments, perhaps higher than yields achieved in these studies (up to 77 bu/ac).

Table 2. Site description, agronomic information and data on grain moisture at harvest (%), yield (bu/ac) and marginal net return ($/ac) for irrigated soybeans grown in 15-inch and 30-inch row spacings at three site-years in SW NE.

	Research site (year)					
Site description	**Perkins (2017)**		**Chase (2017)**		**Chase (2015)**	
Soil type	Valent Loamy sand		Valent loamy sand		Valent loamy sand	
Planting date	May 25		May 17		May 26	
Harvest date	Oct 28		Oct 14		Oct 12	
Previous crop	corn		corn		corn	
Rainfall (inches)	12		15		11	
Irrigation (inches)	13		13		13	
Agronomic information						
Tillage	no-till		conventional		no-till	
Variety	Curry® 1264		Asgrow® 2733		Asgrow® 2733	
Maturity	2.6		2.6		2.6	
Population (plants/ac)	120,000		145,000		160,000	
Study results						
Row spacing	**15-inch**	**30-inch**	**15-inch**	**30-inch**	**15-inch**	**30-inch**
Moisture at harvest (%)	12.6 B*	13.5 A	10.4 A	10.3 B	10.1 A	10.7 B
Yield (bu/acre)†	61 A	49 B	62 A	58 B	78 A	74 B
Marginal Net Return‡ ($/ac)	553 A	425 B	545 A	520 B	694 A	659 B

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 13% moisture. ‡Marginal net return $8.90/bu soybean.

Row spacing study (Table 2).

When averaged across site-years, soybean planted in 15-inch rows yielded 67 bu/ac which was 7 bu/ac more than soybeans planted in 30-inch rows (yielded 60 bu/ac). Yield differences ranged from 4 to 12 bu/ac depending on the location and were 12 bu/ac at Perkins County in 2017 and 4 bu/ac at Chase County in 2015 and 2017. Soybeans planted in 15-inch rows also had lower grain moisture at harvest (up to 0.9 %) and significantly greater marginal net return (from $25-128/ac) than soybeans planted in 30-inch rows.

Aerial imagery showed less thermal stress in 15-inch row spacing soybeans, which suggests that in cases where water may be limiting, such as in sandy soil with low water holding capacity and higher evaporative losses, there may be an even greater benefit to 15-inch row spacing. More research is needed to evaluate soybean yield response to narrower rows in heavier soils compared to sandier soils.

Recommendations:

Planting irrigated soybeans in 15-inch (instead in 30-inch) rows definitely showed a potential for SW NE farmers to increase soybean yield and profit.

2018 Dryland Corn Agronomy Study

Author: Strahinja Stepanovic, Extension Educator, Perkins, Chase and Dundy Counties
Funding: Self-funded

Study outline:

The study was conducted in response to 2017 drought in SW NE that caused early planted dryland corn to wilt early in the season. Study was conducted in 2018 with the primary goal to re-evaluate the effect of planting date on yield performance and consequently crop insurance policies in SW NE dryland corn production.

This was a large strip trial conducted on 75 acres and study treatments included:

1. 4 corn hybrids: Dekalb DKC51-20RIB, Croplan 4079SS, Golden Harvest G03C84-5122-EZ1, and Pioneer P0589AMXT
2. 5 planting dates: May 1, May 10, May 20, May 30, June 10
3. 5 seeding rates: 7,000, 11,000, 15,000, 19,000, and 23,000 seeds/ac

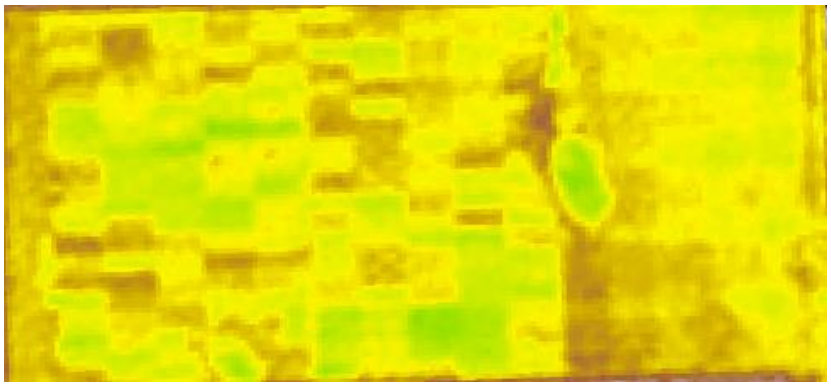


Table 1 Yield (bu/ac) of dryland corn (averaged over four hybrids) as affected by planting date and seeding rate.

Seeding rate	Planting date								
(seeds/ac)	1-May	6-May	11-May	16-May	21-May	26-May	31-May	5-Jun	10-Jun
23,000	114	113	110	109	106	104	99	88	75
21,000	111	110	109	107	105	104	99	87	73
19,000	107	108	107	106	105	103	98	86	71
17,000	103	104	105	103	103	101	97	84	68
15,000	98	99	100	98	99	97	93	80	64
13,000	92	92	93	91	90	90	87	75	60
11,000	84	84	84	81	79	81	79	69	55
9,000	74	74	73	71	69	71	71	62	49
7,000	63	63	62	60	59	62	62	54	43

2014-2018 Agroecosystems Entomology Lab Projects

Author: Dr. Julie A. Peterson, Extension Entomologist, West Central Research and Extension Center
Funding: NE Wheat Board

1) Wheat Insect IPM

Surveys for wheat stem sawfly
Years: 2014-2017 (projected 2019)
Summary: The wheat stem sawfly is a damaging pest of winter wheat. Annual surveys conducted across the Panhandle and West Central NE districts (of which Stumpf was one of ~30 sampled sites) indicate that this pest has not yet reached southwestern or West Central Nebraska. Surveys were suspended in 2018 but will likely continue in 2019 to document the range of this pest so that any changes can be rapidly detected and wheat growers informed.
Funding: Internal from Peterson and Jeff Bradshaw programs.
Products & Impact: Distribution maps generated each year and presented in four extension talks (by Peterson, many more presented by Bradshaw) and published in four extension articles (CropWatch and Crop Production Clinic Proceedings).

2) Corn Insect IPM & Resistance Management

Biological control for western corn rootworm
Years: 2014-2015
Summary: The Stumpf farm irrigated corn pivot was one of five locations sampled in a region-wide survey that found potential biological control agents (naturally-occurring microbes that will attack and kill rootworm larvae). Promising samples of entomopathogenic fungi (132 isolates) and nematodes (15 isolates) were collected, identified, and studied for their potential to be used to control corn rootworm larvae. Over a dozen highly promising candidates were found and will be further developed for potential use in the field to manage this highly damaging and resistance-prone corn pest.
Funding: Nebraska Corn Board Grant ($18K), Peterson start-up funds, collaboration with Drs. Tony Adesemoye, Tom Powers, Lance Meinke, and Gary Yuen.
Products & Impact: Major focus of dissertation by PhD student Camila Oliveira Hofman (defended August 2018); one manuscript under review and one manuscript in prep. Results shared in two published abstracts, seven research talks, five research posters, eleven extension talks, and one extension poster.

Insecticide and Bt trait efficacy trials for western corn rootworm
Years: 2017 (projected 2019)
Summary: The efficacy of at-plant, in-furrow chemical insecticides, seed treatments, and Bt traits (and various combinations/rates of these crop protection products) was tested by looking at rootworm feeding to corn roots and impact on crop yield.
Funding: Valent USA ($16K).
Products & Impact: Results presented at three extension talks and manuscript in-prep for editor-reviewed journal *Arthropod Management Tests*.

Insecticide efficacy trials for western bean cutworm

Years: 2016-2018 (projected 2019+)
Summary: The efficacy of foliar insecticides and Bt traits was tested by looking at WBC survival, feeding damage to ears, and impact on crop yield. Impact on natural enemies was also assessed. Pest pressure is highly reliable at Grant and I wish to continue these trials at the Stumpf location for 2019 and beyond.
Funding: FMC, Dow-Dupont Pioneer (Corteva), Syngenta, [total $27K].
Products & Impacts: Results shared in one published and one in-prep article for *Arthropod Management Tests*, one CropWatch article, two CPC Proceedings articles, and ten extension talks.

Western bean cutworm population sampling for pyrethroid and Bt resistance bioassays
Years: 2017-2018 (projected 2019)
Summary: Extensive resistance bioassays were performed from WBC populations in Nebraska (Stumpf was one of eight NE sites), Kansas, Ohio, Michigan, New York, and Canada to test for resistance to Bt traits (primarily Cry1F) and pyrethroid insecticides (primarily bifenthrin). This includes installation of a large walk-in black light trap and monitoring multiple times per week during the moth flight. Results indicate that Cry1F resistance is widespread in NE and other states; however, bioassay results did not find significant resistance to pyrethroids; therefore, other pesticide application issues that could lead to failures of these products in the field are being studied in collaboration with Dr. Greg Kruger.
Funding: USDA-CARE Grant ($150K) and USDA-Biotechnology Risk-Assessment Grant ($500K). Collaborators at Kansas State, Ohio State, Michigan State, Cornell, Univ. of Guelph and USDA-ARS.
Products & Impact: Major focus of dissertation by PhD student Débora Montezano (will defend November 2018) and post-doctoral scholar Katie Swoboda Bhattarai; one manuscript in prep. Results shared in one published abstract, six research talks, three research posters, twelve extension talks, and one extension poster.

Impact of Bt refuge design on cross-pollination and protein expression
Years: 2018 (projected 2019)
Summary: Bt and non-Bt corn plants have been planted in various structured vs. mixed refuge scenarios to better understand how the Refuge-in-a-Bag approach may be affecting cross-pollinations between Bt and non-Bt plants, expression of Bt proteins in these plants, and subsequent infestations of WBC. This data will be critical in assessing the risk for resistance evolution under these scenarios.
Funding: USDA-Biotechnology Risk-Assessment Grant ($500K)
Products & Impact: As this field work has just started in 2018, we do not yet have any products. Impacts will include affecting decisions by EPA on refuge requirements for western bean cutworm.

Biological control of western bean cutworm using parasitoid wasps
Years: 2018 (projected 2019)
Summary: Two million parasitoid wasps (tiny insects that attack WBC eggs) were released at two replicated plots in 2018. Results indicate that these wasps will rapidly disperse within an area of one hectare and will readily attack WBC egg masses in field corn. This is a collaborative project with Jeff Bradshaw.
Funding: USDA-Hatch Multistate Project Grant ($500K)

Products & Impact: Results shared in two research talks, two research posters, four extension talks, and one extension poster.

3) Pollinator Conservation

<u>Pheasants Forever Youth Pollinator Habitat planting</u>
Years: 2016
Summary: Assisted in the planting of a 0.5 acre Pollinator Habitat just south of the main building, in partnership with Pheasants Forever, USDA-NRCS, and local Perkins County youth.
Funding: Pheasants Forever
Products & Impact: Engaged >25 youth from the community in pollinator conservation.

<u>Survey of conservation habitats near crop fields for pollinators and pests</u>
Years: 2018 (projected 2019)
Summary: Recorded plant-insect associations for pollinators and pests at pivot corner conservation planting at the southwest corner of the irrigated pivot at Stumpf. Part of collaboration across the state with five other UNL Dept. of Entomology faculty.
Funding: USDA-NIFA/North Central Region IPM Center Agricultural Production Pollinator Habitat Survey grant ($20K).
Products & Impact: One research poster presented.

2018 Tillage Effects on Pulse Crops Germination and Yield

Author: Strahinja Stepanovic, Extension Educator, Perkins, Chase and Dundy Counties
Funding: Nebraska Environmental Trust

For full report, check Crop Watch article, link: https://cropwatch.unl.edu/2018/tillage-effect-pulse-germination-yield

Study outline:

The objective of this field study was to evaluate effects of tillage on germination patterns and grain yield of three pulse crop/varieties including Frontier (chickpea), Orion (chickpea) and Durwood (yellow field pea).

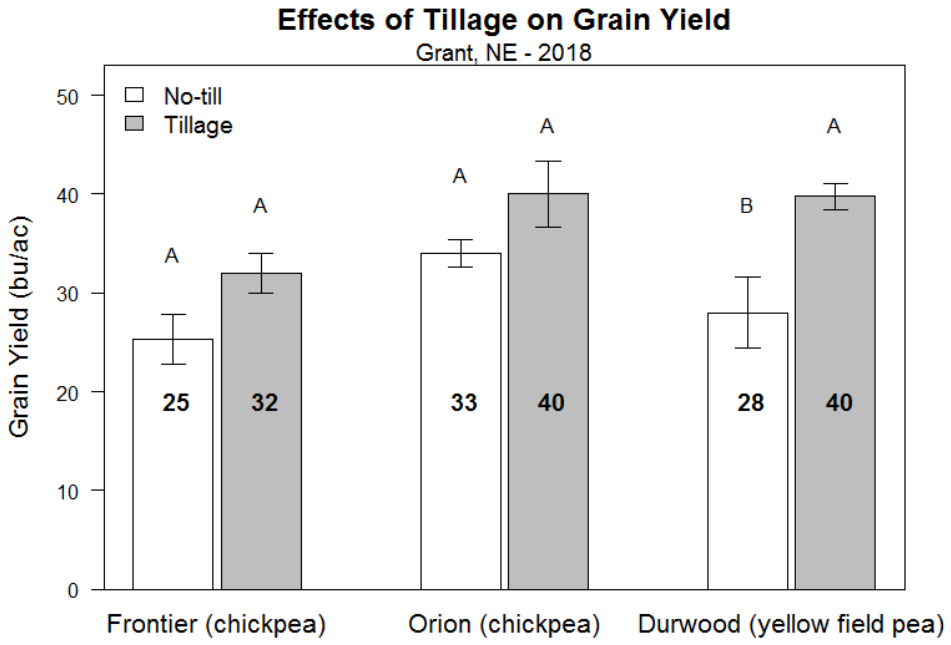


Figure 1. Effects of tillage treatment on grain yield of Frontier (chickpea), Orion (chickpea) and Durwood (yellow field pea) in field experiments conducted at Grant, NE, during 2018 growing season. Different letters refer to statistically significant differences between the treatments.

Recommendations:

Spring tillage prior to planting caused to faster germination and better yield of field peas and chickpeas as compared to no-till in field experiment conducted at Grant, NE, during the above-average wet and cool 2018 growing conditions. We would caution farmers to carefully examine this practice on their fields, especially when pulse crops are grown on lighter soils and in dryer conditions.

We were able to gather some baseline information on GDD models to predict emergence of pulse crops in terms of base temperatures and GDD accumulation in different tillage treatments. In the future, these predictive models need to be validated within year and over years as well as by location to validate our models.

2018 Field Pea Variety Trials

Author: Dr. Dipak Santra, Alternative Crop Breeding Specialist, Panhandle Research and Extension Center

Funding: Field pea seed industry

2018 Pea Variety Trial at Grant (Perkins Co.)_Rainfed

Planting Date: March 23, 2018 **Harvest Date:** July 21, 2018

Brand	Variety	Yield rank	Entry	*Yield (lbs/a)	*Yield (bu/a)	Test wt (lbs/bu)	Flowering 50% (DAP)
Legume Logic	CDC Dakota	1	9	3377	56	60	62
Great Northern Ag	AAC Profit	2	12	2751	46	60	62
Legume Logic	Majestic	3	32	2636	44	60	61
Pulse USA	Durwood	4	23	2539	42	61	60
Legume Logic	AAC Asher	5	10	2450	41	62	61
Montana Integrity	Polancos	6	34	2399	40	62	62
Meridian Seeds	CDC Spectrum	7	5	2381	40	60	62
Meridian Seeds	CDC Amarillo	8	7	2358	39	60	62
Meridian Seeds	CDC Saffron	9	8	2307	38	62	61
Great Northern Ag	Spider	10	16	2250	38	63	61
Meridian Seeds	AAC Carver	11	4	2179	36	62	61
Great Northern Ag	Salamanca	12	15	2149	36	61	61
Pulse USA	Nette 2010	13	27	2145	36	61	59
Meridian Seeds	CDC Inca	14	6	2019	34	62	62
Pulse USA	DS-Admiral	15	22	1999	33	60	59
Arrowseed	Montech 4193	16	21	1885	31	61	59
Pulse USA	SW Midas	17	26	1829	30	61	60
Great Northern Ag	Shamrock	18	17	1789	30	62	60
Pulse USA	LG Sunrise	19	25	1626	27	62	59
Great Northern Ag	Bridger	20	13	1555	26	63	59
Meridian Seeds	Jetset	21	2	1551	26	59	60
Pulse USA	Pro 133-6243	22	29	1507	25	61	60
Meridian Seeds	Agassiz	23	1	1493	25	59	60
Pulse USA	Korando	24	28	1479	25	53	61
Pulse USA	Pro 133-7410	25	30	1454	24	59	61
Arrowseed	Montech 4152	26	20	1433	24	60	60
Great Northern Ag.	SGL 7647 (Empire)	27	37	1384	23	62	60
Pulse USA	SW Arcadia	28	31	1298	22	60	60
Meridian Seeds	AC Earlystar	29	3	1293	22	58	60
NS Seed	DUKAT	30	35	1286	21	62	58
Great Northern Ag	Navarro	31	14	1189	20	59	58
Pulse USA	LG Amigo	32	24	1182	20	62	60
Great Northern Ag	Gunner	33	19	1075	18	60	62
NS Seed	PARTNER	34	36	1073	18	56	60
Great Northern Ag	Hyline	35	18	663	11	57	61
Average of all entries				**1828**	**30**	**60**	**60**
Difference required at 5% significance				**673**	**11**	**4**	**1**
CV				**16**	**16**	**5**	**2**

**Yield @13% moisture 1 bu=60 lbs DAP=Days After Planting*

2018 Field Pea Agronomic Study

Author: Samuel Koeshall, Graduate Student in Cropping Systems
Funding: NCR SARE

Study outline:

Four sites across western Nebraska (Hemingford, Sidney, Grant, & North Platte) were established to evaluate planting timing and seeding rate of yellow field pea. Three planting timing treatments (early, normal, late) and five seeding rate treatments (130,000 to 490,000 PLS/acre) comprised the study with six replications at each site. Data analysis was conducted on results from Sidney and Hemingford locations due to weather and disease damage affecting the Grant and North Platte sites.

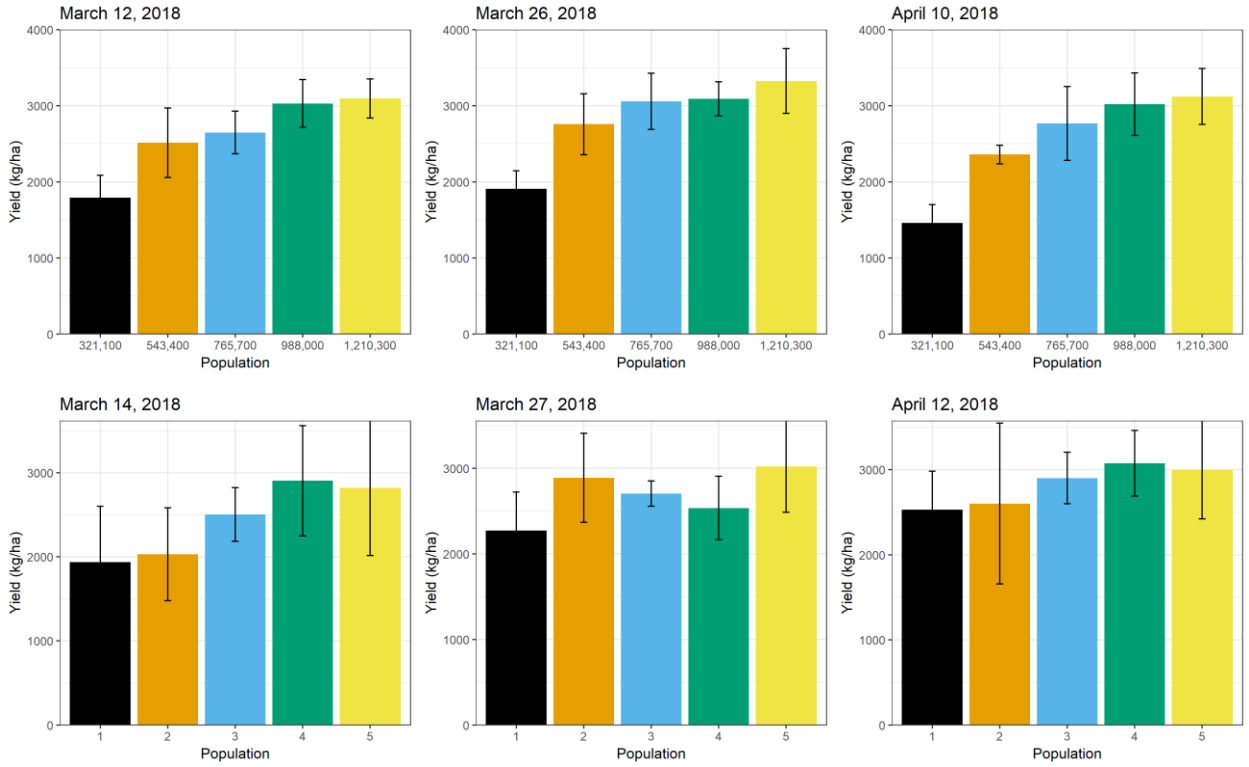


Figure 1 & 2. Grain yield at Sidney and Hemingford, NE in kilograms per hectare within each planting timing treatment.

Results:

Grain yield was different between planting timings and seeding rates at Sidney and Hemingford sites. Higher planting populations tended to increase yield while delayed planting timing tended to increase yield.

2018 Irrigated Research: Field Peas, Chickpeas and Winter Canola

Author: Strahinja Stepanovic, Extension Educator Cropping Systems, Perkins, Chase and Dundy Counties
Funding: Nebraska Environmental Trust

Study outline:

In many areas of NE, declining groundwater levels, frequent drought, reduced stream flow, water allocations, light textured soils, and insufficient irrigation system design capacities often prevent SW Nebraska farmers from irrigating to meet full crop water requirements. Implementing alternative winter/spring crops such as winter canola and pulses in the irrigated crop rotations can often increase precipitation use efficiently, crop water use efficiency (CWUE), system's capacity to meet the peak ET demands, and overall cropping system profitability.

The objective of this study was to quantify grain yield and crop water use efficiency (CWUE – grain yield produced per unit of water used) of dryland, deficit irrigated and fully irrigated canola, field peas and chickpeas.

Results:

Will be published in early 2019.

Figure 1. Irrigated winter canola on the left (Oct 15, 2018) and harvest of chickpea irrigated trial (August 20, 2018) on the right.

EXTENSION EVENTS

2015-2018 Field Days (Wheat and Field Peas)

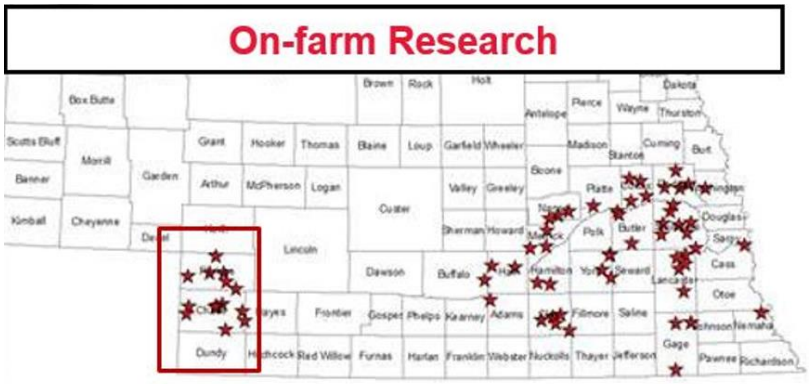
Figure 1. Approximately 100 people attend the Wheat and Field Pea Field Day every year. It is a place where farmers receive research updates, check plots and have a chance to meet with industry sponsors.

Impact of 2016 Field Days at Stumpf farm:

- 5 sponsors, 130 people attended, 27,258 acres directly farmed, 2,328,900 acres represented
- 95 % moderate to significant increase in knowledge about field pea management
- 58 % moderate to significant increase in knowledge about wheat management
- 89 % likely to change their practices
- 87 % relevancy of topics was good to excellent
- $15/ac estimated value of knowledge gained
- 79 % rated educational experience as above average and one of the best
- Testimonial: **"Was an excellent program – Please do more than one year".**

2015-2016 On-farm Research Updates

In 2016, a total of 16 study reports (out of 80) from SW Nebraska were published in Nebraska extension circulars and presented at On-farm Research Updates, generating 20% contribution to this high-impact statewide program.



2016 Bacterial Leaf Streak Disease of Corn – Timely Response to Critical Production Issue

Project leader: Tamra Jackson, Extension Plant Pathologist

In response to the disease outbreak, "Corn Disease Update" meetings were held across the state by Nebraska Extension and Ag industry sponsored events to inform producers and train ag professionals on how to identify and manage Bacterial Leaf Streak of Corn.

Impact: Grant, NE – 12 respondents out of 48 attendees valued the program at $11/A for total value of at least $5.7 M for the 524,000 acres reported

2018 Pulse Crops Expo

Project leader: Strahinja Stepanovic, Extension Educator, Cropping Systems

Attended by 165 people from 7 states including NE, KS, CO, WI, MO, ID, and UT, this event was designed to provide production and marketing updates and facilitate interaction between 17 pulse crop seed and processing businesses.

Impact as a result of this workshop:

- 19% Reduce fertilizer and herbicide inputs
- 47% Increase bio-diversity on the farm
- 35% Better utilize available water
- 19% Lowered production risk
- 19% Increase cropping system profitability
- 33% Manage farm more sustainably
- 30% All of the above
- 8% Benefits other than indicated

97% reported this event to be above average or one of the best

2015-2018 Nebraska Extension 4H Activities

Perkins County Youth Pollinator Event

On April 21, 2016, 5th grade students from Perkins County Schools along with several members of the Perkins County FFA chapter learned about the importance of pollinators and our food supply. Students also had the opportunity to help plant a pollinator plot at the research center to increase habitat for pollinating insects.

Agencies involved in this event were: Pheasants Forever, the Perkins County Chapter of Pheasants Forever, NRCS and UNL Extension.

Perkins County Youth Food and Fitness Day

NE 4H Educator Debbie Kuenning teaching NE youth about healthy food choices