

2019 NDSU North Central Research Extension Center Summary

Our goals at the North Central Research Extension Center (NCREC) are to conduct research to find practical answers to crop production problems, conduct educational programs and demonstrations to address these problems, and to increase foundation grade seed of new and popular varieties for this area. New crops, varieties, and production methods are tested as they become introduced to determine their feasibility in our environment.

Agronomy

The North Central Research Extension Center conducts the majority of its agronomic field research trials at the main research facility south of Minot. The agronomy program also utilized off-station locations to strengthen and enhance its research capabilities. Off-station sites have been established at the Dean Schoenberg Farm west of Mohall, at the Dave Teigen Farm west of Rugby, at the Bendickson Farm east of Garrison and at the Wes Doepke Farm north of Wilton. A few individual trials were also conducted at various locations throughout the region and are noted in individual research reports. The NCREC thanks these farmer-cooperators along with county Extension staff, agricultural crop improvement associations and many others for their dedicated support of these research efforts.

Beginning with the 2013 cropping year, agronomic research studies (with a few exceptions) were conducted utilizing no-till methods in a continuous cropping system. In 2016, all crop production research and variety trials were moved to a new permanent location directly west of the Research Center. Broadleaf crops were typically planted into small grain stubble and small grain crops were typically planted into soybean or canola stubble. Soil samples from each research site were collected and analyzed for macro and micro nutrients. Each research site then received fertilizer applications based on those results. Urea (46-0-0) was the primary source of nitrogen and was “planted” prior to seeding or was applied in a mid-row band at seeding time. Monoammonium phosphate (11-52-0) was the primary source of phosphorous and was applied either directly in the seed row or in a mid-row band at planting. Seeding rates were adjusted for seed size and germination to provide a uniform number of pure live seeds (PLS) per acre for each crop and variety. Small plots were seeded with no-till drills equipped with coulter disc openers set at a 7 or 7 ½ -inch row spacing. Row crops were planted with a SRES small plot planter utilizing Great Plains no-till openers and Monosem singulation seed meters. All small grain crops received an early post-emergence herbicide application for weed control. Broadleaf crops typically received a pre-plant herbicide application to control broadleaf weeds followed by a post-emergence herbicide application to control grassy weeds. Other specific pest problems such as flea beetles in canola and leaf rust on sunflower were also treated with appropriate pest control measures when possible.

The fall of 2018 was relatively dry through October. Very little winter wheat was planted in the North Central region of the state. Research plots had good fall growing conditions and had good establishment going into dormancy. Late January through mid-March was bitterly cold. A heavy snow storm during the last week of April provided much needed moisture but delayed planting into May. Canola and other early seeded crops generally had poor and uneven emergence. There was very little precipitation throughout the small grain growing season until the last week of June. Above average precipitation in July provided much needed moisture to finish small grain crops and provided row crops with excellent growing conditions during their reproductive stages. Extended periods of wet weather in most areas prevented farmers from harvesting any crop and caused poor grain quality. These conditions were exacerbated by a snow storm in October with some areas receiving 30” of snow. Most row crops in the North Central region were harvested in December. Plant diseases generally were not an issue this year, however, insect issues like grasshoppers and flea beetles were more prominent. Low commodity prices were precipitated by a trade war with China, Europe and our largest trade partners, Mexico and Canada. This was not a good year for North Dakota’s farm economy.

Extension Education

The North Central Research Extension Center provides information and producer education through a number of Extension specialists located at the Center who work with county Extension agents and state specialists. Activities include consultations and presentations delivered through individual contacts and group meetings, workshops, schools, field days and tours on a variety of topics and issues associated with crop production, livestock production, and resource management. Producers and allied industry are welcomed to contact the NCREC at (701) 857-7682 to discuss issues or concerns with available Extension specialists.

Crop Protection: Activities centered on crop protection focused on pest management, beneficial insects, and native pollinators among area crops. During the 2019 season, extension and research activities were focused on pest management and prevention. Research related activities investigated control of wireworm and flea beetle. Additionally, pest and disease pressure were monitored throughout North Dakota and reported with weekly contributed updates released through the publication of NDSU's Crop & Pest Report. Educational activities included producer attended meetings, summer field tours, beneficial insect and native pollinator field day, and agent trainings. Field tours were well attended and focused on a variety of crop protection/cropping system topics. Pollinator conservation topics were popular with programs offered throughout the region. Youth education continues to serve as an on-going mission in the area with several presentations centered on area entomology and their relation to crop protection and cropping systems.

Soil Health: Activities at the NCREC continued to focus on soil pH, salinity, fertility, and cover crops. County based workshops highlighted management of saline areas and soil fertility. Six soil testing clinics were held across North Dakota to teach producers about soil test interpretation and fertility recommendations. Three saline management studies were monitored and evaluated to determine the effectiveness of managing these areas with perennial crops. Two acid soil remediation projects started this year where results will help producers determine lime application amounts as well as the frequency of lime applications. Year four of a shrub salinity tolerance study continued. A pipeline reclamation study was started this year at the NCREC. Soil replacement methods are being evaluated on their impacts on soil characteristics and crop yields. Three Café Talks were held in oil impacted areas. An oil brine spill tour near Mohall was held for regulators, producers, and industry personnel.

Foundation Seed Increase

The NCREC Foundation Seed program works closely with the Foundation Seedstocks program and plant breeders at NDSU's main campus in Fargo. The NCREC's role is to help facilitate the increase of new varieties from Fargo's main campus out to producers in north central North Dakota. The program also maintains inventory of several popular crop varieties grown in the area.

The varieties that will be available for the 2019-2020 cropping season are: ND Genesis barley, Carpio, Divide, Joppa, ND Grano, ND Riveland durum, Gold ND, and Omega flax, Barlow, Bolles, Duclair, Elgin-ND, ND VitPro, Surpass HRSW, Hayden, Jury, Souris oat, and Ashtabula, ND Henson, ND17009GT, ND18008GT soybean.

Pulse Crop Breeding

The pulse crops breeding program conducts research toward the improvement of three pulse crops—chickpea, dry pea, and lentil. Dr. Nonoy Bandillo, NDSU's director of the pulse breeding and genetics program and assistant professor leads the team with assistance from Hannah Worrall, NCREC's Research Specialist based in Minot, North Dakota. Efforts for the 2019 season continued to focus on improving yield within the quality standards of the various market classes within these three species, with a special focus on developing varieties for release that have high yield and quality in the presence of several stress factors—namely *Ascochyta* blight in chickpea; powdery mildew, virus complexes, and root rot species (e.g., *Fusarium* and *Aphanomyces*) in pea; and blight caused by *Sclerotinia* and *stemphylium* in lentil. The program has also continued to progress on a genetic study aimed at understanding the inheritance of pea protein content. From the hybridization of selected parents with favorable traits to the evaluation of breeding lines, the pulse program generates new crosses every summer in the field and throughout the winter months in the greenhouse in addition to conducting trials across the state to evaluate experimental lines in different environments. Approved for release in 2017, 'ND Eagle' was grown on 933 acres in seven different counties across the state to increase seed to be available to producers in 2019. Breeder seed increases are ongoing in anticipation of the approval of a high-yielding yellow pea, high-yielding medium green lentils, and a more *Ascochyta* tolerant, high yielding kabuli chickpea.

Weed Science

Weed control studies are conducted in small grains, canola, carinata, faba bean, sunflower, safflower, flax, dry bean, pea, lentil, chickpea, mustard, corn, and soybean. We are evaluating new herbicides/adjuvants or different uses of existing products in various crops. Other experiments involve evaluation of the impact of different cultural practices such as crop rotation and conventional tillage vs. no-till on crop yield, seed quality, weed control, and economic feasibility. We also conduct IR-4 residue trials to collect data for registration of pest control products in minor crops. We have studies that target specific weeds such as Canada thistle, wild oat, foxtails, biennial wormwood, kochia, narrowleaf hawksbeard, horseweed, and others.

Interpreting Statistical Analysis

Field research involves the testing of one or more variables such as crop varieties, fertilizers, weed control methods, etc. Field testing of such variables are conducted in order to determine which variety, fertilizer, herbicide, etc. is best for the particular area of production. The main objectives of crop production research are to determine the best means of producing a crop and how to maximize yield and economic return from farming. Agricultural researchers use statistics as a tool to help differentiate production variables so that real and meaningful conclusions can be drawn from a relatively large amount of data gathered from relatively small research plots.

One of these tools is the Coefficient of Variability (C.V.). This statistic gives an indication of the amount of variation in an experimental trial and is an indication of the precision or effectiveness of the trial and the procedures used in conducting it. Attempts are made to control human error and some environmental conditions such as soil variability by replicating the variable in question. For example, there were three plots (replications) of the variety Faller grown in the Minot HRSW variety trial. The plots are mixed and dispersed throughout the trial to help eliminate differences that might be a result of soil, chaff rows or other variables. The numbers that you see in the tables are an average of all three replications.

The C.V. for yield in the 2019 Minot HRSW variety trial was 13.7 meaning that there was a 13.7 percent average variation between high and low yields among replications. In summation, a trial with a C.V. of 6 is more precise and more can be concluded from it than a trial with a C.V. of 16.

Another important statistical tool is the Least Significant Difference or LSD. If the yield of variety A exceeds variety B by more than the LSD value, you can conclude that under like environmental conditions, variety A is expected to significantly out-yield variety B. The LSD value allows you to separate varieties, fertilizers, herbicides, or any other variable and determine whether or not they are actually different. An LSD of .05 or 5% is always larger and gives you more precision than an LSD of .1 or 10%. Little confidence can be placed in a variety or treatment unless the results differ by more than the LSD value.

Weather Conditions at Minot	113 Year	Departure	2019	113 Year	Departure	
	2019	from	Average	Long Term	from	
Precipitation	Long Term	Average	Degrees	Average	Average	
	Inches		Fahrenheit			
January	0.4	0.6	-0.2	8.4	7.5	+0.9
February	1.8	0.5	+1.3	-5.7	12.0	-17.7
March	0	0.7	-0.7	20.8	24.4	-3.6
April	0.9	1.5	-0.6	41.0	40.6	+0.4
May	0.8	2.3	-1.5	50.0	53.4	-3.4
June	3.2	3.3	-0.1	63.5	62.8	+0.7
July	1.7	2.3	-0.6	68.6	68.5	+0.1
August	2.7	2.0	+0.7	65.3	66.7	-1.4
September	7.8	1.6	+6.2	57.1	56.2	+0.9
October	2.1	1.1	+1.0	37.5	43.9	-6.4
November	0.7	0.7	+0.0	25.8	27.3	-1.5
December	*	0.6	*	*	13.4	*
Total	22.8	17.1	+5.7	39.3	39.7	-0.4

*Data not available at time of printing.

	2019	Long Term
Coldest Date	Jan 30	Feb 15, 1936
Coldest Temp	-32	-49
Days $\leq 0^\circ$	50	39
Days $\geq 90^\circ$	2	12
Highest Date	Jul 31	July 11, 1936
Highest Temp	90	109
Last Spring Frost	May 10	May 19
First Fall Frost	Oct 3	Sep 18
Frost Free Days	145	122
GDD for Corn (May 20-Oct 20)	2078	1994
GDD for Wheat (May 2-Aug 12)	3282	4047
GDD for Sunflower (Jun 6-Nov 4)	2682	2764

Staff and Board of Visitors***Administration***

Dr. Shana Forster, Center Director, Interim District Director
 Cynthia Cross, Administrative Secretary
 Phil Koapke, Information Coordinator

Agronomy

Eric Eriksmoen, Research Agronomist
 Joseph Effertz, Ag Research Technician
 Austin Kraklau, Research Specialist
 Dr. Thomas Stefaniak, Assistant Pulse Crop Breeder
 (resigned Aug 2019)
 Hannah Worrall, Research Specialist

Extension Education

Dr. Chris Augustin, Area Extension Specialist/Soil Health, Interim District Director
 John Dhuyvetter, Area Extension Specialist/Livestock Systems (retired May 2019)
 Dr. Travis "TJ" Prochaska, Area Extension Specialist/Crop Protection
 Vacant, Area Extension Specialist/Cropping Systems

Part-time and Seasonal Employees

Garrett Anderson, Emily Beck, Julia Beck, Matt Bercier, Sarah Bogenrief, Nichole Brunner, Parker Bush, Caleb Cross, Isaac Dubovay, Melisa Eriksmoen, Jewel Faul, Lindsay Green, Heather Jenson, Holly Larson, Krista Peters, Riley Racine, Denise Wanner, Bailee Williams

Board of Visitors by County

Benson: Eric Jorgenson, Leeds & Gannon Larson, Leeds
 Bottineau: Joe Kjelshus, Souris & Tyler Neubauer, Bottineau
 Burke: Dennis Bauer, Bowbells & Greg Busch, Columbus
 Burleigh: Rodney Binstock, McKenzie
 McHenry: Trenton Bruner, Drake & Paul Thomas, Velva
 McLean: Rick Tweeten, Washburn
 Mountrail: Troy Coons, Donnybrook & Aaron Skarsgard, Stanley
 Pierce: Brad Fritel, Barton & Todd Lysne, Rugby
 Renville: Josh Cook, Kenmare & Brady Witteman, Mohall
 Rolette: Jon Casavant, Rugby & Joe Mongeon, Rolette
 Ward: Blake Inman, Berthold & Greg Marshall, Burlington
 Wells: Paul Anderson, Harvey & Glen Keller, Harvey

Foundation Seed Increase

Lee Novak, Seed Production Specialist
 Andrew Bertsch, Ag Research Technician

Weed Science

Dr. Brian Jenks, Weed Scientist
 Dana Piesik, Ag Research Technician
 Tiffany Walter, Research Specialist
 Gary Willoughby, Research Specialist

Grape Program

Chris Asmundson, Ag Research Technician

North Dakota Hard Red Spring Wheat Variety Descriptions, Agronomic Traits, 2019

Variety	Agent or Origin ¹	Year Released	Height (inches)	Reaction to Disease ⁴							
				Straw Strength ²	Days to Head ³	Stem Rust ⁵	Leaf Rust	Stripe Rust	Tan Spot	Bact. Leaf Streak	Head Scab
Ambush	DynaGro	2016	29	5	58	1	4	3	NA	6	5
Barlow	ND	2009	30	6	58	1	6	4	6	4	4
Bolles	MN	2015	29	4	62	2	3	5	4	7	5
Boost	SD	2016	30	5	62	1	4	3	8	2	5
Commander	DynaGro	2019	28	6	59	NA	4	NA	NA	4	5
CP3504	Croplan	2015	27	3	61	1	1	6	8	4	6
CP3530	Croplan	2015	31	5	61	1	2	8	6	5	5
CP3616	Croplan	2016	29	4	60	1	5	5	4	6	6
CP3888	Croplan	2017	28	4	60	NA	1	NA	NA	6	6
CP3910	Croplan	2019	27	5	58	NA	1	NA	NA	8	6
CP3915	Croplan	2019	28	4	59	NA	1	NA	NA	4	5
CP3939	Croplan	2019	29	4	59	NA	3	NA	NA	6	6
Elgin-ND	ND	2012	31	5	59	1	6	5	6	6	4
Faller	ND	2007	30	5	61	1	7	8	7	5	4
Glenn	ND	2005	30	4	58	1	6	4	6	4	4
Lang-MN	MN	2017	30	5	61	1	2	1	7	3	4
Lanning	MT	2017	26	3	60	NA	NA	NA	NA	8	6
LCS Breakaway	Limagrain	2011	26	5	58	1	3	6	4	6	6
LCS Cannon	Limagrain	2018	27	4	57	NA	7	NA	NA	7	6
LCS Rebel	Limagrain	2017	30	5	58	1	7	4	8	4	5
LCS Trigger	Limagrain	2016	29	5	64	1	1	2	6	3	4
Linkert	MN	2013	26	2	60	1	3	1	4	6	5
MN-Washburn	MN	2019	27	3	60	NA	1	NA	NA	5	5
Mott ⁶	ND	2009	32	3	60	1	6	6	6	5	6
MS Barracuda	Meridian	2018	27	3	57	NA	2	NA	NA	7	6
MS Camaro	Meridian	2016	26	5	59	1	1	2	8	7	6
MS Chevelle	Meridian	2014	28	5	59	1	4	3	6	7	6
ND VitPro	ND	2016	29	3	59	1	4	3	7	3	4
Shelly	MN	2016	27	5	61	2	6	5	3	7	5
Surpass	SD	2016	28	5	58	1	4	6	8	4	5
SY 611CL2	Syngenta/AgriPro	2019	27	5	59	NA	NA	NA	NA	6	5
SY Ingmar	Syngenta/AgriPro	2014	28	3	60	1	3	6	6	5	5
SY Longmire⁶	Syngenta/AgriPro	2019	28	5	60	NA	7	NA	NA	6	7
SY McCloud	Syngenta/AgriPro	2019	28	4	58	NA	5	NA	NA	6	5
SY Rockford	Syngenta/AgriPro	2017	30	3	61	NA	NA	NA	NA	8	6
SY Soren	Syngenta/AgriPro	2011	27	3	60	1	2	7	2	7	7
SY Valda	Syngenta/AgriPro	2015	27	4	60	1	2	7	6	6	5
TCG-Climax	21st Century Genetics	2017	29	2	64	1	6	3	8	5	5
TCG-Heartland	21st Century Genetics	2019	27	5	58	NA	2	NA	NA	7	6
TCG-Spitfire	21st Century Genetics	2015	29	4	62	1	5	4	8	4	6
TCG-Stalwart⁶	21st Century Genetics	2019	28	4	59	NA	8	NA	NA	9	7

¹ Refers to agent or developer: MN = University of Minnesota; MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University. Bold varieties recently released, data is limited and rating values may change.

² Straw Strength = 1 to 9 scale, 1 the strongest, 9 the weakest. Values based on recent data & may change as more data becomes available

³ Days to Head = number of days from planting to head emergence from boot, averaged based on data from several locations in 2019

⁴ Disease reaction scores from 1 to 9, with 1 = resistant and 9 = very susceptible, NA = not available.

⁵ Fargo stem rust nursery inoculated with *Puccinia graminis* f. sp. *Tritici* races TPMK, TMLK, RTQQ, QFCQ and QTHJ.

⁶ Solid stemmed or semisolid stem, imparting resistance to sawfly

-NDSU Publication A574-19 available at www.ag.ndsu.edu/publications

Hard Red Spring Wheat Variety Trial at Minot

Variety	Days	Plant Height	Lodging	Test Weight	Protein	Grain Yield				
	to Head					0-9*	lbs/bu	%	2017	2018
DAP ¹	inches									
						-----bu/A-----				
Faller	63	29	0	61.0	14.2	49.9	101.7	58.0	79.9	69.9
SY Rockford	62	28	0	60.5	15.8	50.6	102.0	50.9	76.4	67.8
LCS Trigger	66	26	0	62.4	13.0	49.2	97.3	54.9	76.1	67.1
TCG Spitfire	64	27	0	62.7	15.1	64.0	85.6	49.8	67.7	66.5
CP3530	62	28	0	61.3	15.6	51.3	92.3	47.0	69.6	63.5
Shelly	63	25	0	61.7	15.8	47.1	97.7	42.4	70.1	62.4
CP3504	62	23	0	61.3	15.4	43.6	93.3	49.7	71.5	62.2
Boost	63	28	0	62.0	15.9	49.3	86.1	50.9	68.5	62.1
Elgin ND	61	29	0	62.2	15.7	50.8	82.8	50.6	66.7	61.4
SY Soren	62	25	0	62.8	16.1	50.8	84.6	48.6	66.6	61.3
DG Ambush	59	27	0	63.6	16.3	48.1	87.7	44.6	66.2	60.1
MS Chevelle	60	26	0	62.2	14.4	45.2	85.1	49.0	67.1	59.8
TCG Climax	65	27	0	62.9	16.6	48.8	84.5	45.5	65.0	59.6
MS Camaro	60	25	0	61.9	16.1	46.9	85.3	44.9	65.1	59.0
SY Valda	62	25	0	63.3	15.0	43.7	88.7	44.6	66.7	59.0
Barlow	59	28	0	63.9	16.1	48.2	82.4	46.2	64.3	58.9
Bolles	63	28	0	61.1	17.9	48.6	81.8	45.6	63.7	58.7
Lang-MN	63	29	0	62.7	15.7	46.9	77.6	50.6	64.1	58.4
CP3616	60	27	0	61.3	16.9	48.3	81.2	45.3	63.3	58.3
Glenn	59	26	0	63.5	16.1	50.6	82.2	39.2	60.7	57.3
LCS Rebel	61	29	0	63.2	15.5	46.8	74.5	48.3	61.4	56.5
Mott**	63	30	0	61.3	15.6	42.9	76.0	49.2	62.6	56.0
SY Ingmar	61	25	0	63.4	17.2	47.7	82.3	37.0	59.6	55.7
Linkert	61	24	0	61.7	17.6	39.2	84.5	42.4	63.4	55.4
Surpass	59	25	0	61.2	15.8	40.7	78.4	39.0	58.7	52.7
LCS Breakaway	59	25	0	63.4	16.8	34.9	76.5	42.5	59.5	51.3
ND VitPro	60	26	0	62.8	16.7	35.2	77.1	39.1	58.1	50.5
MS Barracuda	59	26	0	62.2	15.8	--	94.6	51.8	73.2	--
Lanning	61	25	0	61.7	16.6	--	94.3	47.9	71.1	--
AAC Penhold	61	25	0	62.3	16.2	--	89.5	48.5	69.0	--
SY611CL2	61	25	0	64.2	16.1	--	90.8	47.1	69.0	--
CP3888	61	26	0	61.4	16.6	--	90.2	43.6	66.9	--
SY McCloud	60	27	0	63.1	17.0	--	90.8	41.0	65.9	--
AAC Brandon	61	28	0	62.0	16.8	--	83.1	46.9	65.0	--
SY Longmire**	61	25	0	62.7	16.4	--	81.0	47.0	64.0	--
MN Washburn	62	24	0	62.1	15.2	--	80.4	47.3	63.8	--
LCS Cannon	59	25	0	63.7	16.2	--	84.5	43.1	63.8	--
AAC Goodwin	62	27	0	63.0	15.8	--	78.0	49.1	63.5	--
DG Commander	61	26	0	63.0	15.3	--	--	55.7	--	--
CP3915	61	26	0	63.2	15.1	--	--	50.3	--	--
TCG Heartland	59	26	0	63.5	16.6	--	--	49.5	--	--
CP3910	60	26	0	63.6	16.0	--	--	48.5	--	--
TCG Stalwart**	61	26	0	60.8	16.2	--	--	48.2	--	--
Duclair**	60	26	0	61.1	15.3	--	--	47.2	--	--
CP3939	61	27	0	61.5	16.3	--	--	44.9	--	--
Trial Mean	61	27	0	62.4	16.0	48.1	86.1	47.0	--	--
C.V.%	1.4	5.2	0	0.6	3.9	12.7	10.2	13.7	--	--
LSD 5%	1	2	NS	0.6	1.0	9.9	14.3	10.4	--	--
LSD 10%	1	2	NS	0.5	0.8	8.3	11.9	8.7	--	--

¹ DAP = Days after planting.

*Lodging: 0 = none, 9 = lying flat on the ground.

** Wheat Stem Sawfly tolerant.

NS = no statistical differences between varieties.

No-till planted on April 23 with a seeding rate of 1.25 million PLS/A and harvested on August 19.

Previous Crop: 2016 = canola, 2017 & 2018 = soybean.

Soil Type: Williams Loam