2015 Agricultural Research Update

NDSU Williston Research Extension Center

Williston, ND

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MSU Eastern Agricultural Research Center

Sidney, MT

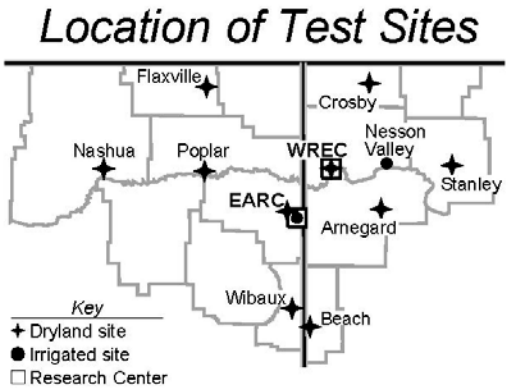
Serving the Mon-Dak Region

Regional Report No. 21 – December 2015

Off-Station Cooperators – Producers – CES Agents

MONTANA
Flaxville – Dave Roos – Agent Bobbie Roos
Nashua – Bill Lauckner – Agent Shelley Mills
Poplar – Mark Swank
Wibaux – Rick Miske– Agent Dave Bertelsen
SUGARBEET:
East Fairview – Phillip Hurley
East Fairview – Jeff Bieber

NORTH DAKOTA
Crosby – Harlan Johnson-- Agent Keith Brown
Beach—Tim Oech—Agent Ashley Ueckert
Arnegard—Beau Wisness-- Agent Karla Ryan
Stanley-Doug Kinnoin-- Agent Jim Hennessey



We would like to take this opportunity to thank the County Agents, the County Ag Improvement Associations and especially the farm operators who permit the location of off-station plots on their land. ***All are to be commended for their cooperative efforts in helping determine crops and variety performance in the MonDak region.***

Results from tillage, chemical fallow, and field scale no-till trials, as well as other management trials on dryland and irrigated crops can be obtained by visiting with Center personnel.

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Weather Information

Weather Summary Williston, ND

Month	Precipitation 2015	Precipitation Avg	Temperature 2015	Temperature Avg	*
	- inches -		- degrees F -		
Oct-Dec. 2014	0.43	1.73			
January-March	0.42	1.19			
April	0.30	1.15	47	46	0
May	1.85	2.27	55	57	0
June	2.63	2.71	68	65	8
July	2.10	2.24	73	72	17
August	1.22	1.56	72	71	17
September	2.41	1.34	63	60	5
April-July	6.88	8.37			
April-Sept	10.51	11.27			
Total-Oct 14-Sept 15	11.36	14.19			

*Number of Days over 89° F

Last Spring Frost – May 18, 2015 (29° F)

First Fall Frost – October 16, 2015 (30° F)

Weather Summary Sidney, MT

Month	Precipitation 2015	Precipitation Avg	Temperature 2015	Temperature Avg	*
	- inches -		- degrees F -		
Oct-Dec. 2014	0.73	1.89			
January-March	0.84	1.30			
April	0.25	1.14	46.4	44.6	0
May	1.27	2.17	53.7	56.0	0
June	4.04	2.78	66.7	64.5	5
July	1.93	2.09	71.1	70.1	10
August	1.28	1.48	69.3	68.8	13
September	2.38	1.25	61.9	58.0	4
April-July	7.49	8.18			
April-Sept	11.15	10.91			
Total- Oct 14-Sept 15	12.72	14.10			

*Number of Days over 89° F

Last Spring Frost – May 20, 2015 (31.5° F)

First Fall Frost – October 14, 2015 (31.8° F)

Off-Station Precipitation* North Dakota

Site	April	May	June	July	Aug	Total
Arnegard	0.44	1.43	4.06	1.54	1.46	8.93
Beach	0.63	1.69	3.24	2.28	1.60	9.44
Nesson Valley	0.36	0.90	1.87	2.90	1.23	7.26
Stanley	0.42	1.58	2.72	5.11	1.42	11.26

*Actual rainfall received at plot location may have been more or less.

Off-Station Precipitation* Montana

Site	April	May	June	July	Aug	Total
Flaxville	0.29	0.40	0.65	5.03	1.27	7.64
Nashua	0.50	1.06	1.69	1.69	0.41	5.35
Poplar	0.31	2.06	1.30	2.55	0.69	6.91
Wibaux	0.52	1.81	4.07	1.63	1.88	9.91

*Actual rainfall received at plot location may have been more or less.

HARD SPRING WHEAT VARIETY DESCRIPTIONS

Variety	Origin[1]	Year released	Height	Maturity	Resistance to[2]						Quality Factors	
					Lodging	Stem Rust	Leaf Rust	Foliar Disease	Head Scab	Sawfly	Test Weight	Grain Protein
Advance	SDSU	2012	M SHORT	M EARLY	MS	MR	MR	NA	MS	NA	M HIGH	M HIGH
Agawam (HWSW)	WB		SHORT	EARLY	MR	NA	A	NS	MS	R	M HIGH	M LOW
Alpine (HWSW)	AgriPro	2008	MEDIUM	MEDIUM	M	R	S	M	MR	S	MEDIUM	M LOW
Alsen	NDSU	2000	MEDIUM	M EARLY	MR	R	MR/MS	S	MR	S	MEDIUM	M HIGH
AP 604 CL*	AgriPro	2006	MEDIUM	M EARLY	MS	R	MS	MS	NA	S	HIGH	MEDIUM
Barlow	NDSU	2009	MEDIUM	M EARLY	M	R	MR/MS	MR	M	S	M HIGH	M HIGH
Bolles	MN	2015	SHORT	M LATE	MR	NA	MR	MR	MR	NA	MEDIUM	HIGH
Breaker	WB	2007	MEDIUM	MEDIUM	MR	R	MR	MS	M	S	M HIGH	M HIGH
Brennan	AgriPro	2009	SHORT	M EARLY	MR	R	MR	M	MS	S	MEDIUM	MEDIUM
Briggs	SDSU	2002	M TALL	M EARLY	MS	R/MR	MR/MS	MS	M	S	MEDIUM	MEDIUM
Buck Pronto	TS	2001	M SHORT	EARLY	R	R	MR	NA	NA	S	MEDIUM	MEDIUM
Choteau	MSU	2004	M SHORT	M LATE	MS	R	MR/MS	MR	S	R	MEDIUM	MEDIUM
Corbin	WB	2006	MEDIUM	MEDIUM	M	NA	NA	NA	NA	MR	MEDIUM	MEDIUM
Dapps	NDSU	2003	MEDIUM	MEDIUM	MR	R	M	NA	S	NA	MEDIUM	HIGH
Duclair	MSU	2011	MEDIUM	MEDIUM	R	R	NA	NA	NA	R	MEDIUM	MEDIUM
Egan[3]	MSU	2014	MEDIUM	M LATE	R	NA	NA	NA	NA	S	HIGH	M HIGH
Elgin-ND	NDSU	2012	TALL	MEDIUM	M	R	MS	NA	M	S	M LOW	LOW
Faller	NDSU	2007	M TALL	MEDIUM	M	R	S	MR	M	S	MEDIUM	LOW
Forefront	SDSU	2012	TALL	EARLY	M	MR	MR	NA	MR	S	M LOW	HIGH
Freyr	AgriPro	2004	MEDIUM	MEDIUM	M	R	MR/MS	MS	MR	S	MEDIUM	M LOW
Glenn	NDSU	2005	M TALL	M EARLY	MR	R	MR/MS	M	MR	S	HIGH	M HIGH
Howard	NDSU	2006	M TALL	MEDIUM	MS	R	MS	M	M	S	M LOW	M LOW
HRS 3419	CROPLAN	2014	M SHORT	LATE	MR	NA	MR	MR	MR	NA	M HIGH	MEDIUM
HRS 3530	CROPLAN	2015	TALL	LATE	MR	NA	NA	NA	NA	NA	M HIGH	HIGH
Jedd*	WB	2008	M SHORT	EARLY	R	NA	NA	NA	NA	S	HIGH	LOW
Jenna	AgriPro	2009	M SHORT	M LATE	MR	R	MR/MS	M	M	S	M LOW	M LOW
Kelby	AgriPro	2006	SHORT	MEDIUM	MR	MR	MR/MS	M	M	S	M HIGH	MEDIUM
LCS Albany	Limagrain	2008	M SHORT	LATE	M	MR	MR	MS	M	S	M HIGH	M LOW
LCS Breakaway	Limagrain	2011	M SHORT	M EARLY	M	NA	R	MS	M	S	M HIGH	MEDIUM
LCS Iguacu	Limagrain	2014	SHORT	LATE	R	NA	NA	MR	MR	S	M HIGH	M LOW
LCS Nitro	LIMAGRAIN	2015	SHORT	MEDIUM	MR	NA	NA	NA	NA	NA	M HIGH	MEDIUM
LCS Powerplay	Limagrain	2011	MEDIUM	MEDIUM	M	NA	MR	MS	M	S	LOW	M LOW
Linkert	MN	2013	M SHORT	M EARLY	R	R	MR	NA	M	NA	MEDIUM	HIGH
McNeal	MSU	1995	MEDIUM	MEDIUM	M	MS	MS	M	VS	S	M LOW	MEDIUM
Mott	NDSU	2009	TALL	M LATE	M	MR	S	MS	MS	R	MEDIUM	MEDIUM
ND901CL Plus*	NDSU	2010	TALL	MEDIUM	M	R/MR	MR	NA	M	S	M HIGH	HIGH
Norden	MN	2012	M SHORT	M LATE	MR	R	R/MR	M	M	NA	LOW	M HIGH
ONeal	WB	2008	MEDIUM	M LATE	R	NA	MS	MR	S	S	MEDIUM	M LOW
Prestige	Pulse USA	2015	MEDIUM	M EARLY	MR	NA	NA	NA	NA	S	MEDIUM	MEDIUM
Prevail	SDSU	2014	M SHORT	EARLY	M	NA	NA	NA	M	NA	HIGH	M HIGH
Prosper	NDSU	2011	MEDIUM	MEDIUM	MR	R	S	M	M	S	MEDIUM	M HIGH
RB07	MN	2007	M SHORT	M EARLY	M	R	R	MS	MR	S	M HIGH	MEDIUM
Redstone	Pulse USA	2015	SHORT	M LATE	R	NA	R	NA	MR	MA	M LOW	MEDIUM
Reeder	NDSU	1999	MEDIUM	MEDIUM	MR	R	MS	S	S	S	MEDIUM	MEDIUM
Rollag	MN	2011	MEDIUM	MEDIUM	MR	R	MS	MR	MR	NA	M HIGH	M LOW
Sabin	MN	2009	MEDIUM	MEDIUM	M	R	MR	MS	M	NA	M HIGH	MEDIUM
Samson	WB	2007	SHORT	MEDIUM	R	R	MR/MS	MS	S	S	LOW	LOW
Select	SDSU	2010	MEDIUM	M EARLY	M	R/MR	R/MR	R/MR	MR	NA	MEDIUM	MEDIUM
Steele-ND	NDSU	2004	MEDIUM	MEDIUM	MS	R	R	MS	M	S	MEDIUM	MEDIUM
SY Ingmar	Syngenta	2014	MEDIUM	MEDIUM	R	MR	MR	MS	MR	S	M HIGH	M HIGH
SY Rowyn	Syngenta	2013	M SHORT	M EARLY	R	MR	MR	NA	MR	S	M HIGH	M LOW
SY Soren	Syngenta	2011	M SHORT	M EARLY	R	R	MR	M	M	S	M HIGH	MEDIUM
SY Tyra	Syngenta	2011	M SHORT	MEDIUM	R	R	MR	MS	S	R	MEDIUM	M LOW
SY605CL*	Syngenta	2011	MEDIUM	M EARLY	MS	R/MR	MR/MS	MS	S	S	M LOW	HIGH
Vantage	WB	2007	M SHORT	LATE	R	MR	MR/MS	MS	MS	S	HIGH	HIGH
Velva	NDSU	2011	M SHORT	M LATE	R	R	MR/MS	M	MS	S	MEDIUM	MEDIUM
Vida	MSU	1998	MEDIUM	MEDIUM	MR	MS	MS	MR	S	MR	MEDIUM	MEDIUM
Volt	WB	2008	MEDIUM	M LATE	R	NA	MR	MR	MS	S	HIGH	LOW
WB9879CLP*	WB	2012	MEDIUM	MEDIUM	R	S	S	MR	MS	R	MEDIUM	HIGH
WB-Digger	WB	2009	MEDIUM	MEDIUM	M	MR	MR/MS	NA	MS	S	M LOW	LOW
WB Gunnison	WB	2013	MEDIUM	M EARLY	R	NA	S	S	S	T	M HIGH	MEDIUM
WB Mayville	WB	2011	SHORT	M EARLY	R	R	MR/MS	MS	S	S	M HIGH	M HIGH

[1] Refers to developer: MN = University of Minnesota**;** MSU = Montana State University; NDSU = North Dakota State University; SD = South Dakota State University; TS = Tigren Seed; WB = WestBred.

[2] R = resistant; MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible; NA = data not available.

[3] Resistant to orange wheat blossom midge.

***** Clearfield wheat with imidazolinone tolerance.

Dryland HRSW Variety Trial									WREC, Williston - 2015
Variety	Heading Date DAP[1]	Height (in)	Protein[2] 2015	Protein[2] 2yr avg	Protein[2] 3yr avg	Test Weight lb/bu	Yield 2015	Yield 2yr avg	Yield 3yr avg
			----------%----------				----------bu/a----------		
Prevail	58	30	12.4	13.4	13.2	57.3	35.3	39.1	41.0
LCS Powerplay	59	25	13.1	13.9	13.7	59.0	36.2	38.7	40.6
Vida	60	25	13.4	13.8	13.3	58.2	38.0	42.2	40.4
Velva	61	25	12.9	13.9	13.8	58.9	34.7	40.2	39.4
Forefront	58	32	13.5	13.9	13.6	57.9	34.6	40.1	38.9
Jenna	63	26	13.5	13.9	13.5	56.8	33.5	37.6	38.2
Breaker	61	28	13.7	14.3	13.8	60.7	36.6	38.3	36.7
Select	57	29	12.8	13.7	13.4	59.6	35.2	35.8	36.2
Linkert	60	27	14.2	15.0	14.6	58.1	32.9	37.1	36.1
Elgin-ND	62	26	13.7	14.5	14.3	58.5	30.8	36.0	36.0
Brennan	59	25	14.3	14.9	14.4	58.5	32.6	37.4	36.0
Sabin	59	24	12.8	13.5	13.3	58.2	33.6	37.4	35.8
Mott	63	27	14.1	14.7	14.3	58.0	35.7	37.4	35.6
SY Tyra	61	22	12.9	13.6	13.2	60.0	31.9	37.1	35.6
Duclair	59	27	12.4	13.5	13.1	56.9	32.9	36.0	35.6
RB07	59	25	13.0	14.0	13.7	58.2	30.6	37.0	35.6
Prosper	62	24	12.2	13.8	13.5	58.0	31.7	36.0	35.3
Freyr	60	27	13.5	14.0	13.7	59.0	30.7	36.5	35.0
LCS Albany	62	25	11.4	12.9	12.2	57.2	32.2	37.6	35.0
LCS Iguacu	61	25	12.5	13.3	12.8	58.2	34.0	37.0	34.8
Norden	60	24	12.5	13.5	13.2	59.8	30.4	35.4	34.7
Faller	62	27	12.2	13.3	13.1	57.7	31.4	35.9	34.7
LCS Breakaway	59	24	13.3	14.2	14.1	59.6	26.9	32.4	34.4
WB-Mayville	59	24	14.0	14.4	13.9	58.9	34.2	37.5	34.4
SY Rowyn	59	25	12.9	13.4	13.5	57.8	30.6	33.8	34.2
Reeder	60	25	13.5	14.1	13.5	58.7	29.8	36.9	34.1
Kelby	58	24	13.8	14.6	14.3	58.8	29.7	34.2	34.1
WB9879CLP	59	24	12.9	14.0	13.8	58.1	32.2	35.2	34.1
Choteau	60	25	13.5	14.7	14.5	57.9	30.6	33.8	33.9
Howard	59	25	12.8	13.8	13.4	58.3	34.3	37.2	33.7
Glenn	58	27	13.5	14.4	14.2	61.0	28.4	31.7	33.7
SY605CL	59	27	13.9	14.7	14.0	59.0	31.8	34.9	33.7
Briggs	59	28	13.1	14.2	13.7	58.1	32.8	35.4	33.3
SY Soren	59	24	13.5	14.5	14.3	58.3	30.4	33.8	33.2
Advance	59	26	12.5	13.7	13.0	59.2	33.1	35.5	33.1
ND 901CL+	58	26	13.6	15.2	15.3	59.4	31.7	34.5	32.7
Steele-ND	60	25	13.0	13.9	13.6	58.4	29.1	35.1	32.7
Agawam	58	24	11.3	12.3	12.2	59.4	31.2	33.7	32.3
Vantage	64	24	14.8	15.4	14.9	59.3	26.6	32.8	32.1
Barlow	58	26	13.0	14.2	13.9	60.1	26.3	31.5	31.7
Alpine	61	27	12.0	13.0	-	58.3	32.5	39.4	-
SY Ingmar	59	24	13.3	14.2	-	59.4	32.3	38.5	-

Dryland HRSW Variety Trial (continued)									WREC - Williston, ND - 2015
Variety	Heading Date	Height	Protein[2]			Test Weight	Yield		
			2015	2yr avg	3yr avg		2015	2yr avg	3yr avg
	DAP[1]	(in)	----------%----------			lb/bu	----------bu/a----------		
WB9507	60	25	12.5	13.9	-	57.0	31.0	37.0	-
Alsen	59	26	12.3	13.8	-	59.7	31.6	36.5	-
Rollag	59	26	13.1	14.2	-	58.7	29.3	34.9	-
LCS Nitro	62	24	13.1	13.8	-	56.1	32.1	32.1	-
Dapps	61	30	15.7	16.3	-	56.8	29.4	30.8	-
LCS Pro	59	28	12.8	13.6	-	58.7	35.5	30.7	-
WB9653	61	24	12.8	-	-	57.8	38.5	-	-
SY Valda	60	26	13.9	-	-	58.3	37.5	-	-
Croplan HRSW 3378	59	25	12.2	-	-	58.8	36.4	-	-
Croplan HRSW 3530	61	29	13.5	-	-	57.9	35.5	-	-
MS Chevelle	59	26	11.9	-	-	58.6	35.1	-	-
MS Stingray	65	25	11.2	-	-	57.2	34.4	-	-
Bolles	60	29	15.2	-	-	57.4	33.5	-	-
Focus	57	30	12.6	-	-	59.1	33.0	-	-
Croplan HRSW 3361	60	26	13.4	-	-	57.3	32.9	-	-
Prestige	58	24	12.9	-	-	57.6	32.3	-	-
Redstone	65	26	12.9	-	-	57.2	29.8	-	-
Croplan HRSW 3419	64	22	12.9	-	-	56.2	28.9	-	-
Mean	60	26	45.9	-	-	58.4	64.9	-	-
C.V.%	1.7	9.1	7.2	-	-	1.0	12.4	-	-
LSD 5%	1.4	3.3	1.5	-	-	0.8	5.6	-	-
LSD 10%	1.2	2.8	1.2	-	-	0.7	4.7	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft

Planted: 4/24/2015

Harvested: 8/12/2015

Previous crop: Soybeans

Applied fertilizer in lb/a: 10N : 47P2O5 : 0K2O

Soil test to 6" in ppm: 32P : 314K OM-2.2 pH-6.1

Soil test to 24" in lb/a: 39N

Soil type: Williams-Bowbells loam

Planting population = 1 million seeds/a

Chemical Applications: Prosaro 7oz/acre (6/30/15) and Wolverine/Tilt @ 1.6 qt/ac and 3oz/a (5/29/2015)

DAP[1] = Days after planting

Protein[2] = reported on a 12% moisture basis

Off-Station HRSW Variety Trial							WREC, McKenzie County - 2015
Variety	Protein[1]			Test Weight	Yield		
	2015	2yr avg	3yr avg	lb/bu	2015	2yr avg	3yr avg
	----------%----------				----------bu/a----------		
Reeder	15.1	15.0	14.6	58.8	36.0	52.0	52.7
Vida	14.6	14.7	14.2	56.0	31.2	52.4	52.4
Velva	14.4	14.3	14.0	57.4	33.8	54.8	51.9
Jenna	15.6	14.8	14.8	56.1	31.7	51.1	49.2
SY Soren	15.7	15.5	15.4	55.5	33.4	43.8	46.1
Brennan	15.8	15.4	15.0	58.0	35.4	40.3	46.0
Barlow	14.5	14.7	14.6	59.3	33.2	48.4	45.7
Elgin	14.8	14.8	14.9	55.4	30.8	47.7	45.5
Glenn	15.2	15.1	14.8	59.9	27.4	46.8	45.2
Prosper	14.5	14.4	14.4	54.4	25.4	46.0	43.2
Mott	14.9	15.1	14.8	57.4	31.8	46.6	42.4
Breaker	15.9	15.1	-	59.1	32.4	49.6	-
LCS Powerplay	14.5	-	-	57.4	32.5	-	-
Vantage	16.9	-	-	57.5	32.5	-	-
LCS Breakaway	15.5	-	-	58.1	31.5	-	-
Mean	15.2	-	-	57.4	31.9	-	-
C.V.%	4.1	-	-	2.7	10.1	-	-
LSD 5%	1.2	-	-	2.6	5.4	-	-
LSD 10%	1.0	-	-	2.1	4.5	-	-

Location of the McKenzie Offstation Plots: Latitude 47 48'; Longitude 103 25'W; Elevation 2265 ft

Planted: 4/30/2015

Harvested: 8/13/2015

Previous crop: Flax

Applied fertilizers in lb/a: 10N :47P2O5 : 0K2O

Soil test (0-6"): NO3-N=16lb/a; P=7 ppm; K=190 ppm; pH=7.4; OM=2.4 %

(6-24"): NO3-N=24 lb/a

Soil type: Dooley-Zahl complex

Planting population = 1 million seeds/a

Chemical Applications: Supremacy@ 5oz/acre, Discover @ 14oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 12% moisture basis

3yr avg = average of 2012, 2013, & 2015

2yr avg = average of 2013 & 2015

Off-Station HRSW Variety Trial							WREC, Mountrail County - 2015
Variety	Protein[1]			Test Weight	Yield		
	2015	2yr avg	3yr avg	lb/bu	2015	2yr avg	3yr avg
	----------%----------				----------bu/a----------		
Reeder	12.2	12.9	13.0	55.9	56.0	67.9	57.2
Vida	11.3	11.8	12.2	57.2	48.4	60.7	53.7
Velva	11.0	12.4	12.4	55.6	50.9	60.2	53.1
Jenna	13.0	12.6	13.1	56.9	55.1	62.3	52.9
SY Soren	13.9	13.7	13.8	57.0	51.2	58.6	51.4
Brennan	11.0	12.4	12.9	55.6	50.9	58.5	51.1
Barlow	11.9	12.6	13.2	57.9	51.1	56.4	50.8
Elgin	12.9	13.0	13.1	57.6	48.1	62.1	50.0
Glenn	11.0	12.1	12.4	57.1	42.5	57.3	49.5
Prosper	13.2	13.5	13.5	57.7	46.6	56.5	48.6
Mott	11.6	12.3	13.1	60.2	42.5	55.8	46.4
Breaker	10.9	11.5	-	59.5	48.2	62.8	-
LCS Powerplay	11.5	-	-	58.0	49.6	-	-
Vantage	12.3	-	-	58.6	47.7	-	-
LCS Breakaway	10.6	-	-	58.0	43.3	-	-
Mean	11.9	-	-	57.5	48.8	-	-
C.V.%	13.4	-	-	0.9	17.7	-	-
LSD 5%	NS	-	-	0.9	NS	-	-
LSD 10%	NS	-	-	0.9	NS	-	-

Location of Mountrail Plots: Latitude 48 9'N; Longitude 102 21'W; Elevation 2291 ft

Planted: 5/12/2015

Harvested: 8/27/2015

Previous crop: Flax

Applied fertilizers in lb/a: 38N :26P2O5 : 0K2O

Soil test (0-6"): NO3-N=21lb/a; P=10 ppm; K=334 ppm; pH=7.3; OM=4.4 %

(6-24"): NO3-N=21 lb/a

Soil type: Williams-Zahl Loam

Planting population = 1 million seeds/ac

Chemical Applications: Supremacy@ 5oz/acre, Discover @ 14oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 12% moisture basis

3yr avg = average of 2012, 2013, & 2015

2yr avg = average of 2013 & 2015

Irrigated HRSW Variety Trial												WREC - Nesson Valley 2015
	Plant			Protein[1]			Test			Yield		
	Height	2013	2014	2015	2yr avg	3yr avg	Weight	2013	2014	2015	2yr avg	3yr avg
Variety	inch	----------%----------					lb/bu	----------bu/a----------				
Velva	37	13.7	12.7	16.7	14.7	14.4	60.7	105.0	102.4	98.3	100.3	101.9
Jenna	35	13.2	12.6	16.1	14.4	14.0	61.3	100.1	98.9	89.8	94.4	96.3
LCS Albany	32	12.5	12.4	15.3	13.8	13.4	61.3	108.0	94.5	80.8	87.6	94.4
Prosper	34	13.5	12.8	16.9	14.9	14.4	61.3	100.6	92.7	85.3	89.0	92.9
Faller	35	13.6	12.5	15.5	14.0	13.9	60.9	101.7	97.3	79.5	88.4	92.8
LCS Powerplay	33	12.3	12.5	16.0	14.2	13.6	61.7	81.6	98.1	94.1	96.1	91.2
Barlow	36	14.6	13.2	16.8	15.0	14.9	62.3	88.6	98.7	85.9	92.3	91.1
Freyr	36	13.6	13.4	16.3	14.8	14.4	61.4	80.5	94.4	97.4	95.9	90.8
Elgin-ND	38	14.1	13.4	17.5	15.4	15.0	61.0	97.2	88.5	86.2	87.4	90.6
Rollag	32	13.5	13.6	17.1	15.4	14.7	62.4	98.6	88.3	81.6	85.0	89.5
Reeder	33	13.3	13.7	17.4	15.5	14.8	61.3	87.0	90.5	91.0	90.8	89.5
SY Soren	30	14.0	13.4	16.9	15.1	14.8	62.3	85.9	94.9	87.5	91.2	89.4
Vida	32	13.8	13.9	16.3	15.1	14.7	60.3	92.5	89.0	86.6	87.8	89.4
Linkert	31	14.7	14.4	17.3	15.8	15.5	61.4	94.2	94.9	78.1	86.5	89.0
Mott	37	15.1	14.0	17.0	15.5	15.4	61.3	86.3	96.4	83.6	90.0	88.8
RB07	33	14.0	13.1	17.3	15.2	14.8	60.8	96.0	88.8	81.1	84.9	88.6
Steele-ND	35	14.6	13.3	16.4	14.8	14.8	62.0	87.4	101.1	76.5	88.8	88.4
Briggs	36	14.0	14.0	17.0	15.5	15.0	61.6	85.2	92.7	84.6	88.7	87.5
Brennan	32	14.4	13.8	17.1	15.4	15.1	61.6	94.2	90.9	73.5	82.2	86.2
Glenn	37	14.2	13.6	17.9	15.7	15.2	63.3	82.2	94.6	81.2	87.9	86.0
Kelby	32	14.5	14.3	17.8	16.0	15.5	61.4	84.4	91.2	75.1	83.1	83.6
Vantage	33	15.2	15.5	17.3	16.4	16.0	62.8	89.1	76.3	81.0	78.7	82.1
LCS Iguacu	35	-	12.0	14.3	13.2	-	62.3	-	102.1	96.1	99.1	-
HRS 3530	39	-	-	16.0	-	-	61.0	-	-	98.9	-	-
LCS Nitro	33	-	-	14.1	-	-	61.1	-	-	94.1	-	-
Prevail	35	-	-	16.4	-	-	60.7	-	-	83.4	-	-
Mayville	29	-	-	17.4	-	-	61.3	-	-	82.4	-	-
Bolles	35	-	-	19.1	-	-	61.1	-	-	80.0	-	-
HRS 3419	34	-	-	14.0	-	-	60.5	-	-	77.1	-	-
Forefront	38	-	-	16.9	-	-	61.1	-	-	66.7	-	-
Mean	34.2	13.93	13.38	16.60	15.04	14.73	61.45	92.10	93.78	84.58	89.38	90.00
C.V.%	4.8	3.5	4.1	3.6	-	-	0.7	11.1	8.4	12.1	-	-
LSD 5%	3.3	-	-	1.17	-	-	0.89	-	-	20.43	-	-
LSD 10%	2.7	0.80	0.60	0.98	-	-	0.74	11.90	9.20	17.09	-	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/15/2015
Harvested: 8/4/2015
Plot size: 61.25 ft^2
Previous crop: Potato
Applied fertilizer in lbs/a broadcast: 392 lbs of 46-0-0 (4/10/2015)
Soil test to 6": 19 ppm P : 245 ppm K OM-2.3 pH-7.8
Soil test to 2' in lb/a: 49 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 90 bu/a
Planting population: 1.5 million seeds/a
Row spacing: 7.5 inch
Herbicides applied: Supremacy 5 oz/acre (6/4/2015)
Fungicides applied: Tilt 2 oz/a (6/4/2015), Prosaro 8.2 oz/a (6/30/2015)
Rainfall: 5.6 inches (4/16 - 8/3)
Irrigation: 7.7 inches (4/23 -8/3)
Protein[1] = reported on a 12% moisture basis

Dryland Fallow Spring Wheat			Poplar, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Reeder	52.4	61.8	60.3	15.9	15.3
Velva	47.7	61.8	59.8	15.7	14.9
Vida	50.2	60.5	59.3	15.3	14.6
Elgin	43.9	59.3	60.2	16.0	15.3
Brennan	55.9	57.4*	62.6	15.1	14.8*
SY Tyra	46.0	57.4	61.6	14.3	14.0
McNeal	43.9	56.7	59.3	15.2	15.3
Duclair	43.3	55.0	58.9	15.4	14.6
Choteau	37.5	53.8	59.7	15.9	15.2
Prosper	41.2	53.3	59.1	15.4	14.3
Egan	47.7	48.9*	58.3	17.0	16.2*
Barlow	44.5	48.0*	62.6	15.5	15.0*
WB9879CL	43.8	47.4*	60.2	15.8	15.3*
SY Soren	51.0	---	61.3	15.6	---
LSD 5%	9.5				

Planted: May 7 Harvested: August 12

*Not grown in 2013, 2 year average

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Spring Wheat			Nashua, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Elgin	22.5	42.3	62.3	10.5	13.4
Vida	26.3	41.6	62.5	10.2	12.4
SY Tyra	27.1	40.6	64.2	10.3	12.1
Velva	22.9	40.5	63.1	10.3	12.8
McNeal	19.5	38.4	62.0	11.4	13.0
Reeder	23.6	37.6	62.7	11.1	13.2
Prosper	17.6	36.9	61.3	11.3	12.6
Brennan	26.4	36.0*	62.7	12.2	13.5*
Choteau	24.3	35.0	62.3	11.2	13.6
Barlow	23.7	34.2*	63.9	10.7	12.1*
Duclair	18.8	30.9	61.8	10.5	13.2
Egan	16.7	30.3*	61.7	11.3	13.6*
WB9879CL	20.5	30.0*	62.4	11.2	13.1*
SY Soren	25.3	---	62.9	11.2	---
LSD 5%	5.6				

Planted: May 6 Harvested: August 13

* 2 year averages

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Spring Wheat		EARC-Sidney, MT 2014			
	Yield bu/a		TW lb/bu	Protein[1] %	
Cultivar	2014	3 yr	2014	2014	3 yr
Brennan	48.9	46.3	61.5	11.6	13.8
Reeder	46.0	45.4	62.5	10.9	13.5
Vida	49.6	45.2	61.0	10.1	13.4
SY Soren	46.6	44.7	60.5	10.9	13.9
Oneal	45.3	42.6	61.5	10.5	13.2
SY Tyra	42.1	41.1	62.0	9.8	12.6
Jedd	46.0	40.3	62.0	10.3	13.0
Choteau	39.2	39.9	60.5	11.8	13.6
Duclair	45.1	39.4	60.0	11.0	12.9
SY605 CL	39.5	39.1	62.0	11.3	14.5
Fortuna	42.6	38.2	61.0	11.9	13.8
Mott	39.1	37.9	61.5	11.6	14.0
McNeal	42.8	37.8	60.0	10.6	13.7
Prosper	37.3	37.4	61.0	10.3	13.5
Corbin	31.1	37.3	61.0	10.9	13.3
Volt	40.6	35.6	62.0	10.3	13.7
WB-Gunnison	28.3	33.8	61.0	10.9	13.0
Buck Pronto	21.5	31.2	58.5	12.1	14.8
Thatcher	33.5	31.1	59.0	11.2	13.6
SY Rowyn	51.4	--	60.0	11.0	--
SY Ingmar	44.9	--	61.5	11.6	--
Elgin	42.9	--	60.0	11.8	--
Powerplay	38.9	--	61.0	9.8	--
Iguacu	37.8	--	61.0	10.1	--
Velva	37.5	--	61.0	11.4	--
Barlow	34.2	--	63.0	11.8	--
Egan	33.7	--	60.5	12.2	--
WB9879CL	32.6	--	60.5	12.4	--
Redstone	32.5	--	59.0	11.0	--
Prestige	32.5	--	60.0	11.0	--
LSD 5%	7.3				

Planted: April 24 Harvested: August 13

This trial was not harvested in 2015 due to hail.

Protein[1] = reported on a 12.5% moisture basis

Dryland Recrop Spring Wheat			Wibaux, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	2 yr	2015	2015	2 yr
SY Tyra	27.2	46.6	61.1	13.0	12.8
Vida	33.8	43.6	59.2	14.5	12.9
Velva	25.9	42.1	59.8	12.7	12.6
McNeal	25.9	41.7	57.8	14.9	14.0
Choteau	28.6	40.9	58.0	14.7	13.4
Reeder	28.2	40.4	58.9	14.1	13.3
WB9879CL	23.8	40.1	58.3	14.8	14.6
Elgin	28.2	39.8	59.0	13.4	13.7
Barlow	25.5	39.8	61.8	13.5	13.6
Brennan	30.6	39.2	61.3	15.0	15.1
Egan	25.5	37.9	57.4	14.6	15.1
Duclair	23.0	36.4	57.6	14.7	13.4
Prosper	20.4	35.9	58.6	12.7	11.9
SY Soren	28.4	28.4	60.1	14.8	14.8
LSD 5%	7.1				

Planted: May 8 Harvested: August 27

Previous Crop: Wheat

Protein[1] = reported on a 12.5% moisture basis

Dryland Recrop Spring Wheat			Flaxville, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Velva	37.9	41.4	62.7	14.9	14.6
WB9879CL	30.6	40.4*	64.1	15.0	14.9*
McNeal	34.8	37.6	62.4	14.4	15.0
Reeder	31.4	37.0	63.3	15.1	15.0
SY Tyra	36.6	36.3	62.0	13.6	13.8
Vida	37.0	34.5	62.5	14.5	14.4
Elgin	30.7	34.0	63.3	15.2	15.0
Choteau	25.1	32.9	63.2	15.1	14.9
Duclair	28.0	32.9	62.7	14.6	14.4
Prosper	26.9	32.0	63.4	14.6	14.0
Brennan	26.5	30.8*	63.8	16.8	14.4*
Barlow	23.4	30.7*	64.7	14.7	14.6*
Egan	21.6	28.4*	61.2	16.1	15.8*
SY Soren	30.8	---	64.1	14.8	---
LSD 5%	16.9				

Planted: May 7 Harvested: August 19

Previous crop: Spring wheat

*Not grown in 2013, 2 year average

Protein[1] = reported on a 12.5% moisture basis

Sprinkler Irrigated Spring Wheat*	EARC-Sidney, MT 2015				
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
WB9879CLP^	58.5	81.4	62.3	13.8	14.1
SY Rowyn^	51.3	80.8	62.5	13.2	13.3
WB Gunnison	65.9	79.2	63.1	13.3	13.6
Reeder	51.0	78.8	62.8	15.1	14.9
Duclair	63.2	78.1	61.3	14.0	14.2
Egan^	52.4	76.7	60.9	15.4	15.6
SY Ingmar^	47.4	76.4	63.6	13.8	76.3
McNeal	63.6	75.9	61.6	13.5	14.4
Brennan	52.5	74.6	62.9	13.6	14.6
SY Tyra	53.3	74.3	63.2	12.5	13.1
Vida	49.9	73.5	60.6	15.0	14.3
Corbin	60.9	72.9	62.5	14.1	14.3
Choteau	59.7	72.7	61.4	14.3	14.6
SY Soren	45.0	68.3	63.0	15.0	14.7
Fortuna	47.0	59.9	61.6	14.4	14.7
Thatcher	38.2	54.5	61.0	15.1	14.9
SY Valda	56.2	---	63.2	14.5	---
LCS Breakaway	49.9	---	63.6	14.6	---
LSD 5%	8.9				

Planted: April 22 Harvested: August 10 &11

Previous Crop: Safflower

*Not harvested in 2013 due to hail, 2012 was used in the 3 year average

^Not grown in 2012, the average is 2 years

Protein[1] = reported on a 12.5% moisture basis

Dryland Recrop Spring Wheat	EARC-Sidney, MT 2014				
	Yield		TW	Protein[1]	
	- bu/a-		lb/bu	%	
Cultivar	2014	3 yr	2014	2014	3 yr
Vida	40.9	30.8	60.0	10.7	13.5
Reeder	36.9	29.7	61.5	12.3	14.1
SY Tyra	40.7	28.3	62.0	10.8	13.1
McNeal	32.4	27.5	58.5	12.3	13.9
Mott	37.6	27.5	60.0	13.7	15.5
Choteau	37.3	27.2	59.0	12.7	13.7
Duclair	35.6	26.9	59.0	11.1	13.3
Prosper	32.2	24.6	59.5	11.8	13.9
Brennen	41.6	---	61.0	12.9	--
WB9879CLP	41.4	--	60.0	12.6	--
Velva	38.5	--	60.0	12.5	--
Elgin	34.8	--	59.0	12.2	--
Egan	34.4	--	58.0	13.6	--
Barlow	27.9	--	62.5	13.4	--
LSD 5%	5.3				

Planted: April 23 Harvested: August 14

Previous Crop: Peas

This trial was not harvested in 2015 due to hail.

Protein[1] = reported on a 12.5% moisture basis

Wheat Variety Comparisons, Williston, ND 2015

The gross return per acre was calculated by multiplying 3 year average yield from dryland varietal trials and the market price obtained on 11/23/2015 from different grain elevators in and around Williston. The market price of each spring wheat variety was adjusted for protein premium by using a linear equation obtained by plotting wheat market prices against percent proteins. In the case of durum, the terminal rate was used.

Spring Wheat

Variety	Yield (2013–2015)	Protein	Gross Return	+ or - Barlow
	3 Yr Avg.			
	bu/a	%	$/a	$/a
LCS Powerplay	40.6	13.7	179.78	35.99
Linkert	36.1	14.6	177.40	33.60
Velva	39.4	13.8	176.59	32.80
ND 901CL+	32.7	15.3	173.05	29.26
Brennan	36.0	14.4	173.02	29.22
Elgin-ND	36.0	14.3	171.07	27.28
Forefront	38.9	13.6	170.15	26.36
Prevail	41.0	13.2	170.48	26.69
Vida	40.4	13.3	170.16	26.37
Mott	35.6	14.3	169.17	25.38
Choteau	33.9	14.5	164.75	20.96
Jenna	38.2	13.5	165.02	21.23
Breaker	36.7	13.8	164.49	20.70
Vantage	32.1	14.9	162.94	19.15
Kelby	34.1	14.3	162.04	18.25
LCS Breakaway	34.4	14.1	159.75	15.96
Glenn	33.7	14.2	158.32	14.53
SY Soren	33.2	14.3	157.77	13.98
RB07	35.6	13.7	157.64	13.85
WB-Mayville	34.4	13.9	156.04	12.25
Freyr	35.0	13.7	154.98	11.19
SY605CL	33.7	14.0	154.68	10.89
Select	36.2	13.4	154.43	10.64
WB9879CLP	34.1	13.8	152.84	9.05
Prosper	35.3	13.5	152.50	8.70
Sabin	35.8	13.3	150.79	7.00
SY Tyra	35.6	13.2	148.02	4.23
SY Rowyn	34.2	13.5	147.74	3.95
Briggs	33.3	13.7	147.45	3.66
Reeder	34.1	13.5	147.31	3.52
Duclair	35.6	13.1	146.10	2.31
Norden	34.7	13.2	144.28	0.49
Barlow	31.7	13.9	143.79	0.00
Howard	33.7	13.4	143.76	(0.03)
Steele-ND	32.7	13.6	143.03	(0.76)
Faller	34.7	13.1	142.41	(1.38)
LCS Iguacu	34.8	12.8	137.18	(6.61)
Advance	33.1	13.0	134.06	(9.74)
LCS Albany	35.0	12.2	126.63	(17.16)
Agawam	32.3	12.2	116.86	(26.93)

Durum

Variety	Yield (2013–2015)	Protein	Gross Return	+ or - Ben
	3 Yr Avg.			
	bu/a	%	$/a	$/a
Joppa	39.9	15.8	239.4	28.2
Tioga	39.8	15.2	238.8	27.6
VT Peak	38.7	16.2	232.2	21.0
Grenora	37.3	15.3	223.8	12.6
Mountrail	37.0	16.1	222.0	10.8
Alkabo	36.7	15.4	220.2	9.0
AC Commander	36.4	16.1	218.4	7.2
Pierce	36.4	16.0	218.4	7.2
Carpio	36.3	16.0	217.8	6.6
AC Navigator	35.5	15.8	213.0	1.8
Normanno	35.3	15.1	211.8	0.6
Ben	35.2	16.8	211.2	0.0
Divide	35.0	15.8	210.0	(1.2)
Alzada	34.1	15.8	204.6	(6.6)
Strongfield	33.7	16.0	202.2	(9.0)
CDC Verona	32.9	16.6	197.4	(13.8)
Lebsock	32.5	15.8	195.0	(16.2)
Rugby	32.0	17.1	192.0	(19.2)

DURUM VARIETY DESCRIPTIONS

VARIETY	ORIGIN[1]	YEAR RELEASED	HEIGHT	MATURITY	Resistance To[2]					Quality Factors			
					LODGING	LEAF RUST	FOLIAR DISEASE	ROOT ROT	SCAB	TEST WEIGHT	KERNEL SIZE[3]	GRAIN PROTEIN	OVERALL QUALITY
AC AVONLEA	CANADA	1997	MEDIUM	M EARLY	MS	R	MS	S	VS	MEDIUM	LARGE	M HIGH	GOOD
AC COMMANDER	CANADA	2002	M SHORT	LATE	M	R	MS	M	VS	MEDIUM	LARGE	M HIGH	GOOD
AC NAVIGATOR	CANADA	1999	M SHORT	M LATE	M	R	M	S	S	MEDIUM	V LARGE	MEDIUM	GOOD
ALKABO	NDSU	2005	MEDIUM	MEDIUM	R	R	M	M	MS	HIGH	LARGE	M LOW	GOOD
ALZADA	WB	2004	SHORT	EARLY	M	R	S	M	VS	MEDIUM	LARGE	MEDIUM	EXCELLENT
BEN	NDSU	1996	TALL	MEDIUM	MR	R	MR	M	S*	V HIGH	V LARGE	M HIGH	AVERAGE
CARPIO	NDSU	2012	TALL	M LATE	MS	R	M	NA	M	MEDIUM	LARGE	M HIGH	EXCELLENT
CDC VERONA	CANADA	2010	M TALL	M LATE	M	R	MR	NA	S	MEDIUM	LARGE	M HIGH	GOOD
DG MAX	DGP	2008	M TALL	MEDIUM	M	MR	MR	NA	MS	HIGH	MEDIUM	M HIGH	GOOD
DG STAR	DGP	2007	M TALL	M EARLY	M	R	M	NA	NA	MEDIUM	M SMALL	MEDIUM	GOOD
DILSE	NDSU	2002	M TALL	LATE	M	R	M	M	MS	HIGH	MEDIUM	HIGH	EXCELLENT
DIVIDE	NDSU	2005	M TALL	M LATE	M	R	M	M	MR	MEDIUM	MEDIUM	M HIGH	EXCELLENT
GRANDE D'ORO	WB/DGP	2005	M TALL	MEDIUM	MR	R	M	MS	NA	HIGH	M SMALL	MEDIUM	AVERAGE
GRENORA	NDSU	2005	MEDIUM	M EARLY	M	R	M	MR	MS	MEDIUM	MEDIUM	MEDIUM	GOOD
JOPPA	NDSU	2013	MEDIUM	MEDIUM	R	R	M	NA	M	MEDIUM	LARGE	MEDIUM	GOOD
KYLE	CANADA	1984	TALL	MEDIUM	S	MR	M	S	NA	MEDIUM	M LARGE	MEDIUM	GOOD
LEBSOCK	NDSU	1999	M TALL	MEDIUM	R	R	M	MS	MS	HIGH	LARGE	MEDIUM	AVERAGE
MAIER	NDSU	1998	M TALL	M LATE	M	R	M	M	S*	HIGH	MEDIUM	HIGH	AVERAGE
MONROE	NDSU	1985	TALL	EARLY	M	R	M	S	VS	MEDIUM	LARGE	M HIGH	GOOD
MOUNTRAIL	NDSU	1998	M TALL	M LATE	M	R	M	M	S*	MEDIUM	MEDIUM	MEDIUM	AVERAGE
PIERCE	NDSU	2001	M TALL	MEDIUM	M	R	MS	MR	S	V HIGH	MEDIUM	MEDIUM	EXCELLENT
RUGBY	NDSU	1973	TALL	M EARLY	R	R	MR	M	S	MEDIUM	MEDIUM	MEDIUM	POOR
SILVER	MSU	2012	SHORT	EARLY	R	NA	M	NA	S	M HIGH	SMALL	M HIGH	GOOD
STRONGFIELD**	CANADA	2004	M TALL	M LATE	M	R	MS	NA	S	MEDIUM	M LARGE	V HIGH	GOOD
TIOGA	NDSU	2010	TALL	M LATE	MR	R	M	NA	MS	M HIGH	MEDIUM	M HIGH	EXCELLENT
WESTHOPE	WB	2009	M TALL	MEDIUM	M	R	M	NA	S	M HIGH	M LARGE	MEDIUM	GOOD
VT PEAK	VITERRA	2010	M TALL	MEDIUM	MS	NA	NA	NA	NA	MEDIUM	M SMALL	M HIGH	GOOD

[1] Refers to developer: DGP = Dakota Growers Pasta; MSU = Montana State University; NDSU = North Dakota State University.

[2] R = resistant; MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible; NA = data not available. All varieties are resistant to current stem rust races. Foliar Disease = reaction to tan spot and septoria leaf spot complex.

[3] Number seeds/lb: small = less than 11,000; medium = 11,000-12,000; large = more than 12,000.

* Indicates yield and/or quality have been higher than would be expected based on visual head blight symptoms alone.

** Indicates low cadmium variety.

Dryland Durum Variety Trial										WREC, Williston - 2015
Variety	Heading Date DAP[1]	Height (in)	Stress %	Protein[2] 2015	Protein[2] 2yr avg	Protein[2] 3yr avg	Test Weight lb/bu	Yield* 2015	Yield* 2yr avg	Yield* 3yr avg
				----------%----------				----------bu/a----------		
Joppa	61	20	21.3	16.1	13.9	15.8	59.1	26.8	46.4	39.9
Tioga	63	24	2.5	15.2	14.5	15.2	59.2	28.5	45.4	39.8
VT Peak	60	24	6.3	18.0	14.8	16.2	59.4	29.9	43.1	38.7
Grenora	61	23	11.3	17.3	14.2	15.3	58.6	32.2	39.8	37.3
Mountrail	64	22	5.0	15.9	15.1	16.1	58.0	28.2	41.4	37.0
Alkabo	60	23	3.8	15.5	14.3	15.4	59.5	28.1	41.0	36.7
AC Commander	62	19	28.8	17.3	14.3	16.1	58.5	24.7	42.3	36.4
Pierce	62	24	13.8	16.5	14.6	16.0	58.9	26.0	41.6	36.4
Carpio	64	23	12.5	16.8	14.4	16.0	58.3	29.9	39.5	36.3
AC Navigator	61	20	10.0	15.6	14.9	15.8	59.8	27.4	39.6	35.5
Normanno	60	18	17.5	15.1	14.1	15.1	57.9	28.2	38.9	35.3
Ben	61	24	8.8	17.4	15.4	16.8	59.2	23.7	40.9	35.2
Divide	63	24	10.0	15.4	14.9	15.8	59.1	27.2	38.9	35.0
Alzada	59	21	16.3	15.9	14.7	15.8	58.4	26.5	37.9	34.1
Strongfield	61	23	13.8	16.2	14.8	16.0	59.1	25.3	37.9	33.7
CDC Verona	62	24	11.3	17.5	15.0	16.6	58.8	28.7	35.1	32.9
Lebsock	61	24	13.8	18.3	14.6	15.8	58.7	24.0	36.8	32.5
Rugby	61	23	21.3	18.0	15.4	17.1	58.4	22.1	37.0	32.0
Silver	59	21	5.0	15.9	15.4	-	57.6	22.9	30.7	-
DG Max	60	22	18.8	15.4	-	-	58.9	27.1	-	-
Maier	63	23	27.5	16.2	-	-	58.1	23.6	-	-
Mean	61	22	13.3	16.5	-	-	58.7	26.7	-	-
C.V.%	1.9	12.7	-	7.2	-	-	1.0	18.7	-	-
LSD 5%	1.6	4.0	-	1.9	-	-	0.8	7.1	-	-
LSD 10%	1.0	3.0	-	1.6	-	-	0.7	6.0	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft

Planted: 4/23/2015

Harvested: 8/5/2015

Previous crop: Soybeans

Applied fertilizer in lb/a: 10N : 47P2O5 : 0K2O

Soil test to 6" in ppm: 32P : 314K OM-2.2 pH-6.1

Soil test to 24" in lb/a: 39N

Soil type: Williams-Bowbells loam

Planting population = 1 million seeds/a

Chemical Applications: Prosaro 7oz/acre (6/30/15) and Wolverine/Tilt @ 1.6 qt/ac and 3oz/a (5/29/2015)

DAP[1] = Days after planting

Protein[2] = reported on a 12% moisture basis

*Plots with 30% stress or higher were averaged from other plots within the same variety

*Yields were adjusted for stands to 100%.

Off-Station Durum Variety Trial							WREC, McKenzie County - 2015
Variety	Protein[1]			Test Weight	Yield*		
	2015	2yr avg	3yr avg		2015	2yr avg	3yr avg
	----------%----------			lb/bu	----------bu/a----------		
Lebsock	15.8	14.6	14.5	55.2	32.1	43.6	46.5
Tioga	14.3	13.8	13.1	54.1	30.3	42.6	43.0
Carpio	14.1	13.8	13.7	55.5	22.1	39.2	40.4
Strongfield	15.6	15.4	14.5	55.0	28.4	39.1	39.9
Alkabo	14.6	13.5	12.9	54.1	30.7	41.3	39.8
AC Commander	15.7	14.5	14.1	52.8	22.3	39.8	39.5
Divide	14.1	14.2	14.1	54.9	21.5	37.5	38.4
Mountrail	15.3	14.1	14.2	52.5	20.7	42.6	37.5
Joppa	14.2	13.5	-	55.1	29.4	45.6	-
Mean	14.9	-	-	54.4	26.4	-	-
C.V.%	7.4	-	-	1.0	33.3	-	-
LSD 5%	NS	-	-	0.9	NS	-	-
LSD 10%	NS	-	-	0.8	NS	-	-

Location of the McKenzie Offstation Plots: Latitude 47 48'; Longitude 103 25'W; Elevation 2265 ft

Planted: 4/30/2015

Harvested: 8/13/2015

Previous crop: Flax

Applied fertilizers in lb/a: 10N :47P2O5 : 0K2O

Soil test (0-6"): NO3-N=16lb/a; P=7 ppm; K=190 ppm; pH=7.4; OM=2.4 %

(6-24"): NO3-N=24 lb/a

Soil type: Dooley-Zahl complex

Planting population = 1 million seeds/a

Chemical Applications: Supremacy@ 5oz/acre, Discover @ 14oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 12% moisture basis

3yr avg* = average of 2012, 2013, & 2015

2yr avg* = average of 2013, & 2015

Off-Station Durum Variety Trial							WREC, Mountrail County - 2015
Variety	Protein[1]			Test Weight	Yield*		
	2015	2yr avg	3yr avg	lb/bu	2015	2yr avg	3yr avg
	----------%----------				----------bu/a----------		
Divide	12.5	12.5	13.1	57.1	50.4	59.7	49.1
Mountrail	12.0	12.0	13.0	56.0	49.0	59.9	48.2
Joppa	11.2	11.4	12.1	57.1	53.4	55.8	48.0
Carpio	11.4	11.8	12.5	57.6	54.8	57.6	47.5
Lebsock	10.5	11.2	11.9	57.3	43.1	55.8	47.1
Strongfield	12.4	12.8	13.5	56.9	45.4	56.4	45.7
Alkabo	10.5	11.1	12.0	56.2	43.4	49.4	43.0
AC Commander	13.0	12.7	13.3	55.6	47.1	50.9	41.3
Tioga	10.9	11.5	12.2	56.3	41.5	47.2	39.0
Mean	11.6	-	-	56.7	47.6	-	-
C.V.%	12.7	-	-	0.6	8.5	-	-
LSD 5%	NS	-	-	0.6	6.9	-	-
LSD 10%	NS	-	-	0.5	5.7	-	-

Location of Mountrail Plots: Latitude 48 9'N; Longitude 102 21'W; Elevation 2291 ft

Planted: 5/12/2015

Harvested: 8/27/2015

Previous crop: Flax

Applied fertilizers in lb/a: 38N :26P2O5 : 0K2O

Soil test (0-6"): NO3-N=21lb/a; P=10 ppm; K=334 ppm; pH=7.3; OM=4.4 %

(6-24"): NO3-N=21 lb/a

Soil type: Williams-Zahl Loam

Planting population = 1 million seeds/a

Chemical Applications: Supremacy@ 5oz/acre, Discover @ 14oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 12% moisture basis

3yr avg* = average of 2012, 2013, & 2015

2yr avg* = average of 2013, & 2015

Irrigated Durum Variety Trial										WREC - Nesson Valley 2015
	Plant		Protein[1]			Test		Yield		
	Height	2013	2014	2015	3yr avg	Weight	2013	2014	2015	3yr avg
Variety	inch	----------%----------				lb/bu	----------bu/a----------			
Joppa	42	13.5	14.3	17.5	15.1	61.1	117.0	89.0	91.9	99.3
Mountrail	37	14.3	14.4	16.9	15.2	60.7	103.8	92.2	86.8	94.3
Carpio	40	13.8	14.9	17.8	15.5	61.2	106.5	90.2	84.4	93.7
Grenora	35	14.0	14.1	17.8	15.3	60.9	95.0	94.8	84.0	91.3
Tioga	40	13.2	13.7	17.5	14.8	61.0	90.2	92.8	89.5	90.8
CDC Verona	39	15.4	15.5	18.7	16.5	60.1	87.4	90.5	89.2	89.0
Pierce	38	13.8	14.6	17.1	15.2	62.1	79.5	96.0	83.9	86.5
Alkabo	37	13.8	14.7	17.0	15.2	62.3	83.8	90.1	83.5	85.8
DG Max	40	13.9	15.3	17.5	15.6	61.1	79.1	90.4	85.4	85.0
Ben	39	14.6	14.7	18.3	15.9	61.2	87.3	87.8	77.7	84.3
AC Navigator	34	14.0	14.6	17.2	15.3	60.8	87.3	79.5	84.0	83.6
VT Peak	37	14.7	14.7	18.4	15.9	62.0	89.6	84.1	77.0	83.6
AC Commander	31	13.9	14.7	17.5	15.4	59.6	83.9	85.8	80.4	83.4
Divide	39	13.8	14.9	17.4	15.4	61.4	80.1	80.2	87.7	82.7
Maier	37	14.1	15.6	18.8	16.2	61.3	85.1	78.9	81.2	81.7
Lebsock	37	13.9	14.8	17.6	15.4	61.4	79.5	85.0	79.7	81.4
Rugby	41	14.8	15.6	18.0	16.1	61.5	85.4	79.7	77.4	80.8
Strongfield	37	15.7	15.5	18.5	16.6	60.3	64.8	91.5	83.3	79.9
Silver	32	13.8	14.8	18.3	15.6	59.3	77.8	80.0	71.0	76.3
Alzada	32	13.9	15.3	18.1	15.8	59.3	70.9	76.5	77.7	75.0
Normanno	28	13.8	15.6	17.9	15.8	57.6	66.1	74.0	66.9	69.0
Mean	36.6	14.13	14.87	17.80	15.60	60.77	85.72	86.14	82.03	84.63
C.V.%	4.7	2.8	4.2	4.3	-	0.8	16.2	8.1	11.5	-
LSD 5%	0.8	-	-	0.38	-	0.25	-	-	18.89	-
LSD 10%	1.0	0.70	0.70	0.45	-	0.30	16.30	8.20	15.77	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/15/2015
Harvested: 8/4/2015
Plot size: 61.25 ft^2
Previous crop: potato
Applied fertilizer in lbs/a broadcast: 392 lbs of 46-0-0 (4/10/2015)
Applied fertilizer with seed in lbs/a: none
Soil test to 6": 19 ppm P : 245 ppm K OM-2.3 pH-7.8
Soil test to 2' in lb/a: 49 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 90 bu/a
Planting population: 1.5 million seeds/acre
Row spacing: 7.5 inch
Herbicides applied: Supremacy 5 oz/acre (6/4/2015)
Fungicides applied: Tilt 2 oz/a (6/4/2015), Prosaro 8.2 oz/a (6/30/2015)
Rainfall: 5.6 inches (4/16 - 8/3)
Irrigation: 7.7 inches (4/23 -8/3)
Protein[1] = reported on a 12% moisture basis

Dryland Recrop Durum			Wibaux, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	2 yr	2015	2015	2 yr
Mountrail	31.4	45.3	58.8	14.1	13.4
Grenora	25.8	42.1	59.9	12.8	12.8
Carpio	25.4	41.9	60.3	13.0	12.7
Joppa	26.1	41.6	59.5	12.2	12.4
Strongfield	22.0	38.5	60.7	13.3	13.9
Tioga	29.9	37.7	60.8	12.3	12.4
Alkabo	25.8	37.7	61.3	13.2	13.0
Divide	27.2	36.2	60.0	13.9	13.2
Silver	22.4	34.7	58.0	13.5	13.1
LSD 5%	4.2				

Planted: May 8 Harvested: August 27

Previous Crop: Spring Wheat

Protein[1] = reported on a 12.5% moisture basis

Dryland Recrop Durum			Flaxville, MT 2015		
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Joppa	26.8	40.1	62.9	13.5	13.3
Mountrail	26.2	36.2	62.0	16.5	13.2
Tioga	32.2	31.9	63.7	14.6	12.0
Carpio	22.8	31.4	62.3	14.2	12.2
Alkabo	23.6	30.5	64.0	15.5	12.5
Grenora	18.0	29.8	63.3	15.2	12.9
Strongfield	18.0	28.6	61.9	17.7	14.4
Divide	17.7	25.3	63.0	16.3	13.3
Silver	4.2	19.8	58.9	19.0	15.1
LSD 5%	9.1				

Planted: May 7 Harvested: August 19

Previous Crop: Spring wheat

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Regional Durum	EARC-Sidney, MT 2014				
	Yield		TW	Protein[1]	
	bu/a		lb/bu	%	
Cultivar	2014	3 yr	2014	2014	3 yr
Tioga	44.5	38.2	62.0	10.2	12.2
Divide	43.0	35.7	60.5	9.0	11.8
Joppa	41.2	35.7	61.0	9.0	11.1
Mountrail	44.7	34.7	59.5	11.6	13.1
Alkabo	43.7	33.9	61.0	10.6	12.4
Carpio	39.7	33.7	61.0	9.5	12.5
Strongfield	38.3	--	61.5	10.3	--
LSD 5%	4.1				

Planted: April 25 Harvested: August 14

This trial was not harvest in 2015 due to hail.

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Durum	Poplar, MT 2015				
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Tioga	42.0	53.3	60.5	16.2	15.2
Alkabo	42.0	52.6	61.4	15.1	14.7
Mountrail	40.6	51.7	59.9	15.4	15.4
Carpio	39.9	51.5	58.4	16.0	15.7
Grenora	38.6	51.0	60.6	15.1	15.3
Strongfield	35.6	48.1	59.7	16.9	16.1
Divide	38.8	47.1	60.6	16.1	15.9
Silver	37.6	45.4	59.3	15.2	15.2
Joppa	42.0	41.8	60.4	15.3	15.3
LSD 5%	7.5				

Planted: May 7 Harvested: August 12

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Durum	Nashua, MT 2015				
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr	2015	2015	3 yr
Mountrail	26.3	37.3	62.6	10.6	13.2
Strongfield	24.5	36.0	62.6	12.4	14.7
Alkabo	28.4	35.3	62.6	10.8	13.4
Silver	16.9	35.3	61.7	11.9	14.5
Grenora	20.3	35.2	61.7	12.3	12.6
Tioga	27.9	34.3	62.6	12.3	13.1
Carpio	21.8	32.4	61.3	13.2	13.5
Divide	21.2	28.2	62.8	10.9	14.0
Joppa*	20.4	27.6	62.1	13.5	15.1
LSD 5%	8.8				

Planted: May 6 Harvested: August 13

*averages for 2 years

Protein[1] = reported on a 12.5% moisture basis

Sprinkler Irrigated Durum	EARC-Sidney, MT 2015				
	Yield		TW	Protein[1]	
	- bu/a -		lb/bu	-- % --	
Cultivar	2015	3 yr*	2015	2015	3 yr*
Mountrail	73.2	91.3	62.3	13.6	13.7
Grenora	70.2	86.4	61.9	13.4	13.2
Silver	69.5	80.8	60.7	12.7	13.6
Carpio	67.8	85.7	63.4	12.8	12.7
Joppa	66.4	89.4	62.7	13.7	12.9
Tioga	63.0	77.9	62.3	12.8	12.9
Divide	59.8	82.6	62.3	13.1	13.8
Alkabo	57.9	82.9	62.6	13.3	13.1
LSD 5%	15.2				

Planted: April 22 Harvested: August 10

Previous Crop: Safflower

Protein[1] = reported on a 12.5% moisure basis

*Not harvested in 2013 due to hail, 2012 was used in the 3 year average

Dryland Recrop Durum	EARC-Sidney, MT 2014				
	Yield		TW	Protein[1]	
	bu/a		lb/bu	%	
Cultivar	2014	3 yr	2014	2014	3 yr
Alkabo	35.8	27.5	60.5	10.9	13.2
Divide	34.3	26.0	60.0	10.7	13.1
Mountrail	29.6	24.4	59.5	10.9	13.9
Grenora	32.0	24.4	59.5	11.0	13.5
Tioga	32.7	24.1	59.5	12.3	14.2
Strongfield	30.1	24.0	60.0	11.6	14.7
Alzada	31.5	23.3	60.5	12.0	13.7
Silver	21.3	21.4	59.0	12.9	15.0
Joppa	31.6	--	60.5	11.5	--
Carpio	30.4	--	60.0	11.9	--
LSD 5%	5.8				

Planted: April 23 Harvested: August 14

Previous Crop: Peas

Protein[1] = reported on a 12.5% moisure basis

This trial was not harvested in 2015 due to hail.

Hard Red Winter Wheat Variety Descriptions

Variety	Origin[1]	Year released	Height	Maturity	Winter Hardiness[3]	Resistance To[2]				Quality Factors	
						Lodging	Stem Rust	Leaf Rust	Foliar Disease	Test Weight	Grain Protein
AC Broadview	Canada	2009	medium	medium	good	R	R	R	NA	medium	medium
Art	AgriPro	2008	m short	m early	fair	R	R	R	MS	high	m high
Boomer	WB	2009	medium	medium	good	R	R	MR	S	high	medium
CDC Accipiter	Canada	2008	short	medium	good	R	R	MS	S	medium	medium
CDC Falcon	Canada	2000	m short	medium	good	M	R	MS	MS	medium	m low
Colter	MSU	2013	medium	medium	good	MR	R	S	NA	medium	medium
Darrell	SDSU	2006	medium	medium	good	R	R	S	MR	m high	medium
Decade	MSU/NDSU	2010	medium	m early	good	R	R	S	M	medium	medium
Expedition	SDSU	2002	medium	medium	fair	R	R	MS	MS	low	medium
Flourish	Canada	2010	short	early	good	R	MR	R	NA	medium	m low
Genou*	MSU	2004	medium	medium	poor	MS	MS	S	NA	M low	medium
Ideal	SDSU	2011	short	medium	good	R	MR	MR	MS	medium	medium
Jerry	NDSU	2001	medium	medium	good	MR	R	MR	M	medium	m high
Judy*	MSU	2011	medium	medium	fair	R	S	S	NA	medium	m high
Lyman	SDSU	2008	medium	medium	fair	M	R	R	MR	m high	m high
McGill	NE	2010	m tall	m early	v good	MS	NA	MR	NA	medium	m low
Moats	Canada	2010	medium	medium	good	MS	R	MR	NA	m high	medium
Overland	NE	2006	m tall	medium	fair	MS	MS	MR	NA	m high	medium
Peregrine	Canada	2008	medium	m late	v good	MR	R	MR	NA	m high	m low
Radiant	Canada	2001	tall	late	good	R	S	S	NA	medium	m low
Rampart*	MSU	1996	medium	m late	fair	R	R	S	MR	medium	high
Robidoux	NE	2010	m short	m early	poor	MR	NA	MS	NA	medium	m low
Sunrise	Canada	2008	medium	medium	good	MS	MR	MS	R	medium	low
SY Wolf	AgriPro	2010	m short	medium	poor	R	R	MR	MR	high	m low
Warhorse	MSU	2013	short	m late	fair	MR	R	S	NA	medium	medium
WB-Grainfield	WB	2013	short	m late	good	MR	NA	MR	MS	m low	medium
WB-Matlock	WB	2010	medium	medium	good	MR	R	MS	MS	medium	medium
WB-Quake*	WB	2011	medium	late	fair	MR	NA	MR	NA	m low	m low
Wesley	NE	2000	short	early	v good	R	R	MR	MR	high	medium
Yellowstone	MSU	2005	medium	medium	good	M	S	MS	M	low	m high

[1] Refers to developer: MSU = Montana State University; NDSU = North Dakota State University; NE = University of Nebraska; SDSU = South Dakota State University; WB = WestBred.

[2] R = resistant, MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; NA = data not available.

[3] Varieties with fair to poor winter hardiness should not be seeded on bare soil.

* Sawfly resistant.

Hard White Winter Wheat Variety Descriptions

Variety	Origin[1]	Year Released	Height	Maturity	Winter Hardiness[3]	Resistance To[2]				Quality Factors	
						Lodging	Stem Rust	Leaf Rust	Foliar Disease	Test Weight	Grain Protein
Alice	SDSU	2006	short	early	fair	MR	MR	S	NA	M high	M low
Gary	ID	2001	med	M late	fair	MR	NA	NA	NA	med	low
Hyalite*	MSU/WB	2005	M short	M early	fair	MR	R	S	NA	med	med
NuDakota	AgriPro	2007	short	M	poor	R	MR	MR	NA	med	med
NuFrontier	GM/AgriPro	NA	M short	early	fair	R	NA	NA	NA	M high	low
NuHorizon	GM/AgriPro	NA	short	early	poor	R	NA	NA	NA	high	M low
NuSky	MSU	2001	med	M late	good	R	MR	S	MR	med	med
NuWest	MSU/GM	1994	med	M	good	R	MR	S	MR	M low	med
Wendy	SDSU	2004	short	early	good	NA	NA	NA	NA	med	med

[1]Refers to developer: GM = General Mills; ID = University of Idaho; MSU = Montana State University; SDSU = South Dakota State University; WB = WestBred.

[2]R = resistant, MR = moderately resistant; S = susceptible; NA = data not available.

[3]Varieties with fair to poor winter hardiness should not be seeded on bare soil.

* Clearfield wheat with imidazolinone tolerance.

Irrigated HR Winter Wheat Variety Trial				WREC-Nesson Valley 2015
	Plant Height	Protein[1]	Test Weight	Yield
Variety	inch	%	lb/bu	bu/a
Yellowstone	34	11.9	57.6	113.1
Colter	33	11.7	58.5	104.3
Jerry	37	12.5	59.4	100.2
Decade	34	13.0	58.9	96.9
SY Wolf	29	12.0	60.6	90.1
Broadview	32	11.5	60.5	89.3
WB Quake	33	11.6	59.1	86.3
Mean	33.0	12.03	59.23	97.16
C.V. %	4.6	5.1	1.8	18.9
LSD 5%	2.7	1.13	1.86	NS
LSD 10%	2.2	0.92	1.50	26.70

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 9/11/2014
Harvested: 7/22/2015
Plot size: 61.25 ft^2
Previous crop: Durum
Applied fertilizer in lbs/a broadcast: 392 lbs of 46-0-0
Soil test to 6": 25 ppm P : 210 ppm K OM-2.3 pH-7.9
Soil test to 2' in lb/a: 28 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 80 bu/a
Planting population: 1.25 million seeds/a
Row spacing: 7.5 inch
Herbicides applied: Widematch 1.33 pt/a (5/29/2015)
Rainfall: 5.4 in (4/1 - 7/22)
Irrigation: 7.7 in (4/23 - 7/22)
Protein[1] = Protein reported on a 12% moisture basis

Dryland HR Winter Wheat Varietal Trial **WREC, Williston 2015**

Variety	Winter survival	Protein[1]		Test Weight	Yield	
	2015	2015	3 yr	2015	2015	3 yr
	%	---------%---------		lb/bu	-------bu/a--------	
Jerry	95	13.0	12.8	59.9	55.4	56.1
Broadview	93	11.3	11.6	59.9	54.5	55.7
Ideal	65	12.9	11.7	61.3	46.0	52.3
WB-Matlock	86	13.5	13.3	61.0	52.1	49.3
CDC Falcon	86	12.5	11.2	59.7	49.3	48.9
Overland	91	12.5	12.7	61.0	45.7	47.4
Decade	86	13.4	13.0	61.9	47.6	46.1
Lyman	79	14.1	13.9	60.7	49.8	42.8
SY Wolf	58	12.9	11.9	61.5	38.5	41.7
AAC Gateway	85	13.1	-	60.7	43.5	-
Accipiter	88	12.6	-	60.0	50.4	-
CDC Chase	91	11.6	-	60.8	46.5	-
Colter	88	12.9	-	58.3	50.5	-
Emerson	88	15.1	-	60.3	47.3	-
Flourish	30	13.6	-	59.5	32.6	-
Moats	85	14.1	-	59.7	46.0	-
Northern	85	13.6	-	60.3	52.6	-
Peregrine	85	12.3	-	59.8	45.9	-
Redfield	83	13.3	-	61.1	46.5	-
WB4616	90	13.3	-	60.5	52.4	-
Mean	81.8	13.1	-	60.4	47.6	-
C.V.%	13.9	5.3	-	1.1	12.6	-
LSD 5%	15.7	1.0	-	0.9	8.3	-
LSD 10%	13.2	0.8	-	0.8	7.0	-

Location of the WREC: Latitude 48° 8' N; Longitude 103° 44' W; Elevation 2105 ft

Planted: 09-18-2014

Harvested: 07-24-2015

Previous crop: Green peas

Applied fertilizers in lb/a: N = 8; P2O5 = 36

Soil test (0-6"): NO_3-N= 15 lb/a; P= 24 ppm; K= 335 ppm; pH=6.4; OM= 1.8 %

(6-24"): NO_3-N= 60 lb/a

Soil type: Williams-Bowbells loam

Protein[1] = Reported on a 12% moisture basis

Barley Variety Descriptions

Variety	Origin[1]	Use[2]	Year released	Height	Maturity	Lodging	Resistance to[3]				Quality Factors	
							Stem Rust	Loose Smut	Net Blotch	Spot Blotch	Test Weight	Grain Protein
Two-Row												
AC Metcalfe*	Canada	M	1997	medium	late	M	S	MR	MS	MS	medium	medium
B Merit	BARI	F/M	2002	M tall	late	MS	MS	S	MS	S	low	medium
CDC Copeland*	Canada	M	1999	tall	M late	MS	MR	S	MS	VS	low	medium
Champion	WB	F	1997	medium	medium	MR	R	S	MR	NA	M low	medium
Conlon*	NDSU	F/M	1996	M short	early	MS	S	S	MR	MS	M high	M low
Conrad*	BARI	M	2007	M tall	M late	MR	NA	S	NA	NA	M high	M low
Craft*	MSU	F/M		tall	medium	MR	NA	S	S	NA	M high	M high
Eslick	MSU	F	2003	medium	M late	MS	S	NA	NA	MS	medium	M low
Geraldine	MSU	F/M		M short	M late	MR	NA	S	NA	NA	M high	M high
Harrington*	Canada	F/M	1981	M short	late	S	S	S	MS	S	medium	M low
Haxby	MSU	F	2003	medium	medium	MS	S	S	S	MS	V high	medium
Hockett*	MSU	F/M	2008	medium	medium	MS	S	S	NA	NA	medium	M high
Lilly	Germany	F	NA	short	medium	MR	S	NA	S	MR	medium	medium
ND Genesis	NDSU	F/M	2015	medium	M late	MR	S	NA	MR	MR	high	low
Pinnacle*	NDSU	F/M	2006	medium	M late	MR	S	S	MS	MR	high	low
Rawson	NDSU	F	2005	medium	medium	MR	S	S	MR	MR	high	M low
Six-Row												
Celebration*	BARI	F/M	2008	M short	medium	R	S	S	MS/S	MR/R	medium	medium
Innovation	BARI	M	2009	M short	medium	MR	S	S	MS/S	MR/R	medium	medium
Lacey *	MN	F/M	1999	M short	medium	MR	S	S	MS/S	MR/R	medium	medium
Legacy*	BARI	F/M	2000	medium	M late	MR	S	S	MS/S	MR/R	medium	medium
Quest*	MN	M	2010	M short	medium	MS	S	S	MR	MR/R	M low	medium
Robust*	MN	F/M	1983	tall	medium	MS	S	S	MS/S	MR/R	medium	M high
Stellar-ND*	NDSU	F/M	2005	M short	medium	R	S	S	MS/S	MR/R	medium	M low
Tradition*	BARI	F/M	2003	M short	medium	R	S	S	MS/S	MR/R	medium	M low
Specialty												
CDC Cowboy	Canada	H	NA	V tall	medium	S	MR	S	M	M	medium	M high
Haybet	MSU	H	1989	tall	medium	S	NA	S	NA	NA	low	medium
Hays	MSU	H	2003	M tall	medium	MS	NA	NA	NA	NA	low	medium

[1] Refers to developer: BARI = Busch Ag Resources; Inc.; MN = University of Minnesota; MSU = Montana State University; NDSU = North Dakota State University; WB = WestBred.
[2] F = feed; M = malt.
[3] R = resistant; MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible. NA = data not available.
* Recommended as malting in Western U.S.

Dryland Barley Variety Trial **WREC, Williston - 2015**

Variety	Heading Date DAP[1]	Height (in)	Lodging 0-9 scale	Plump % >6/64	Protein[2] 2015	Protein[2] 2yr avg	Protein[2] 3yr avg	Test Weight lb/bu	Yield 2015	Yield 2yr avg	Yield 3yr avg
					----------%----------				----------bu/a----------		
Two Row											
Pinnacle	54	22	6	94.5	12.7	13.6	13.2	49.5	61.1	66.1	72.9
Rawson	55	21	7	94.3	14.4	14.5	14.1	48.5	42.0	58.6	66.2
Hockett	58	19	5	89.5	15.0	14.8	14.6	49.9	50.7	60.7	65.9
Conrad	58	20	7	88.0	15.5	15.6	15.4	48.4	52.0	55.7	63.9
ND Genesis	56	20	6	94.0	13.4	13.5	13.3	48.3	42.4	55.6	63.6
Conlon	53	20	6	94.8	14.5	14.8	14.7	48.9	36.0	57.2	62.8
CDC Copeland	60	22	8	82.5	15.0	15.0	14.7	47.5	48.7	53.3	61.5
AC Metcalfe	58	19	6	88.3	15.4	15.9	15.4	49.7	43.5	51.7	61.5
CDC Meredith	59	21	6	84.5	15.5	15.5	-	47.8	45.6	-	-
Six Row											
Tradition	53	22	5	81.8	15.3	15.1	15.0	48.6	48.6	63.1	66.9
Innovation	54	22	5	76.0	15.2	14.8	14.8	46.1	46.0	55.3	63.6
Celebration	56	23	6	73.3	15.8	15.8	15.7	46.9	39.4	58.6	63.2
Quest	54	23	7	79.8	15.5	15.6	15.2	48.2	48.8	61.6	62.9
Stellar-ND	53	21	7	70.3	15.7	15.2	15.0	45.5	48.9	54.5	62.5
Lacey	53	21	6	75.8	15.5	15.4	15.3	48.1	42.6	56.7	61.8
Robust	55	25	5	77.3	15.4	15.7	15.3	48.5	37.1	51.2	58.3
Mean	55	22	6	78.5	15.5	-	-	47.7	44.5	-	-
C.V.%	2.1	11.1	30.5	6.9	3.8	-	-	1.6	18.6	-	-
LSD 5%	1.7	3.4	-	8.2	0.8	-	-	1.1	12.4	-	-
LSD 10%	1.4	2.8	-	6.8	0.7	-	-	0.9	10.4	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Soil type: Williams-Bowbells loam
Planted: 4/22/2015
Planting population = 1 million seeds/a
Harvested: 8/4/2015
Chemical Applications: Prosaro 7oz/acre (6/30/15) and Wolverine/Tilt @ 1.6 qt/ac and 3oz/a (5/29/2015)
Previous crop: Soybeans
DAP[1] = Days after planting
Applied fertilizer in lb/a: 10N : 47P2O5 : 0K2O
Protein[2] = reported on a 0% moisture basis
Soil test to 6" in ppm: 32P : 314K OM-2.2 pH-6.1
Soil test to 24" in lb/a: 39N

Off-Station Barley Variety Trial				WREC, McKenzie County - 2015	
Variety	Lodging 0-9 scale	Plump % >6/64	Protein[1] 2015 %	Test Weight lb/bu	Yield 2015 bu/a
Two Row					
Pinnacle	5	88.1	12.8	46.6	45.7
Conrad	2	76.1	17.2	46.2	41.5
Hockett	2	84.5	15.9	48.5	37.3
ND Genesis	2	84.4	14.7	44.3	35.5
Conlon	8	93.7	15.6	46.5	33.1
Six Row					
Celebration	5	82.0	16.7	45.3	48.3
Tradition	3	89.6	15.0	46.9	41.4
Lacey	3	67.5	15.7	46.5	40.7
Innovation	2	91.1	15.1	45.3	37.8
Mean	4	84.1	15.4	46.2	40.1
C.V.%	65.9	10.8	6.2	2.6	14.3
LSD 5%	NS	NS	1.60	2.10	NS
LSD 10%	NS	NS	1.30	1.70	NS

Location of the McKenzie Offstation Plots: Latitude 47 48'; Longitude 103 25'W; Elevation 2265 ft

Planted: 4/30/2015

Harvested: 8/13/2015

Previous crop: Flax

Applied fertilizers in lb/a: 10N :47P2O5 : 0K2O

Soil test (0-6"): NO3-N=16lb/a; P=7 ppm; K=190 ppm; pH=7.4; OM=2.4 %

(6-24"): NO3-N=24 lb/a

Soil type: Dooley-Zahl complex

Planting population = 1 million seeds/a

Chemical Applications: Supremacy@ 5oz/acre, Axial @ 16oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 0% moisture basis

2yr and 3yr averages not available

Off-Station Barley Variety Trial									WREC, Mountrail County - 2015
		Plump	Protein[1]			Test	Yield*		
	Lodging	%	2015	2yr avg	3yr avg	Weight	2015	2yr avg	3yr avg
Variety	0-9 scale	>6/64	----------%----------			lb/bu	----------bu/a----------		
Two Row									
Conrad	2	95.7	8.8	11.1	11.4	46.4	70.5	74.5	75.2
Pinnacle	3	96.9	7.7	10.5	10.8	46.6	66.9	73.9	71.6
Conlon	4	98.5	10.9	11.9	12.2	47.2	52.3	66.6	64.1
ND Genesis	2	96.2	9.7	9.7	-	45.5	70.9	70.9	-
Hockett	2	94.7	10.0	10.0	-	47.5	68.3	68.3	-
Six Row									
Innovation	1	95.7	10.6	11.9	12.2	45.1	62.0	75.1	75.1
Lacey	3	92.8	10.6	11.9	12.3	46.3	64.8	76.5	71.8
Tradition	1	94.5	11.3	12.5	12.9	46.1	67.1	69.2	67.6
Celebration	1	91.8	10.7	11.6	12.1	45.4	63.1	68.5	67.3
Mean	2	95.2	10.0	-	-	46.2	65.1	-	-
C.V.%	41.4	1.70	12.3	-	-	1.9	14.8	-	-
LSD 5%	1.50	2.70	NS	-	-	-	NS	-	-
LSD 10%	1.30	2.20	NS	-	-	-	NS	-	-

Location of Mountrail Plots: Latitude 48 9'N; Longitude 102 21'W; Elevation 2291 ft

Planted: 5/12/2015

Harvested: 8/27/2015

Previous crop: Flax

Applied fertilizers in lb/a: 38N :26P2O5 : 0K2O

Soil test (0-6"): NO3-N=21lb/a; P=10 ppm; K=334 ppm; pH=7.3; OM=4.4 %

(6-24"): NO3-N=21 lb/a

Soil type: Williams-Zahl Loam

Planting population = 1 million seeds/a

Chemical Applications: Supremacy@ 5oz/acre, Axial @ 14oz/acre, Tilt @ 3oz/acre (6/16/15)

Protein[1] = reported on a 0% moisture basis

3yr avg* = average of 2012, 2013, & 2015

2yr avg* = average of 2013, & 2015

Irrigated Barley Variety Trial												WREC - Nesson Valley 2015
	Plant	Protein[1]				Test	Plump	Thin	Yield			
	Height	2013	2014	2015	3yr avg	Weight	>6/64	<5/64	2013	2014	2015	3yr avg
Variety	inch	----------%----------				lb/bu	-------%-------		----------bu/a----------			
TWO ROW												
Conrad	28	11.4	13.5	16.1	13.7	50.4	90.9	9.1	71.1	120.9	138.0	110.0
Pinnacle	32	9.9	11.0	12.4	11.1	51.1	97.2	2.8	61.6	124.1	137.8	107.8
Hockett	29	11.3	12.5	14.1	12.6	51.7	95.1	4.9	68.0	123.6	127.5	106.4
Rawson	33	12.3	12.5	13.7	12.8	49.7	98.4	1.7	77.7	108.3	127.4	104.4
AC Metcalfe	34	11.5	13.7	15.2	13.5	51.9	96.6	3.4	72.5	112.7	115.5	100.2
Conlon	30	12.5	13.0	15.8	13.8	51.5	96.7	3.3	72.9	114.7	86.4	91.4
CDC Copeland	35	-	-	13.4	-	51.2	96.6	3.4	-	-	137.1	-
ND Genesis	31	-	-	13.3	-	50.4	95.8	4.2	-	-	130.0	-
SIX ROW												
Quest	33	11.9	12.4	14.4	12.9	49.9	92.6	7.4	80.3	132.6	118.8	110.5
Innovation	29	12.2	12.0	13.8	12.7	48.7	96.5	3.5	79.2	131.3	120.9	110.5
Tradition	32	12.4	12.6	14.7	13.2	49.5	92.3	7.7	70.2	135.9	118.2	108.1
Celebration	34	11.9	13.1	15.5	13.5	49.6	94.7	5.3	74.6	131.0	107.5	104.4
Lacey	33	12.7	12.6	14.8	13.4	51.1	95.5	4.5	64.1	131.5	114.7	103.4
Stellar-ND	31	12.6	12.5	14.4	13.2	49.1	95.4	4.6	56.3	129.5	116.3	100.7
Mean	32	11.88	12.60	14.40	13.02	50.41	95.26	4.74	70.71	124.67	119.08	104.82
C.V.%	5.4	4.1	3.1	4.4	-	1.1	1.5	47.9	17.2	7.7	6.8	-
LSD 5%	2.4	1.20	-	0.90	-	0.77	4.06	1.05	17.20	-	11.74	-
LSD 10%	2.0	0.90	0.60	0.75	-	0.64	3.38	0.87	14.40	3.50	9.78	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/16/2015
Harvested: 8/3/2015
Plot size: 61.25 ft^2
Previous crop: sugarbeet
Applied fertilizer in lbs/a broadcast: 300 lbs of 46-0-0 on (4/9/15)
Soil test to 6": 18 ppm P : 280 ppm K OM-2.1 pH-7.9
Soil test to 2' in lb/a: 3 lbs of N
Soil type: Lihen Loamy Fine Sand
Yield goal: 120 bu/a
Planting population: 1.25 million seeds/a
Herbicides applied: Supremacy 5 oz/a (6/4)
Fungicides applied: Tilt 2 oz/a (6/4)
Rainfall: 6.0 inches (4/16 - 8/3)
Irrigation: 7.7 inches (4/23 -8/3)
Protein[1] = Reported on a 12% moisture basis

Sprinkler Irrigated Hulless Barley EARC-Sidney, MT 2015

Cultivar	Yield bu/a 2015	TW lb/bu 2015	Plump --%-- 2015	Protein[1] -- % -- 2015
Goose2	20.7	56.2	27.5	16.2
Goose6	18.7	55.9	25.3	16.1
Goose4	18.2	55.9	28.8	15.8
Goose5	16.5	56.2	18.5	15.8
Goose1	16.2	55.9	21.2	16.3
LSD 5%	4.4			

Planted: April 21 Harvested: August 7

Previous Crop: Safflower

Protein[1] = reported on a 12.5% moisture basis

Dryland Recrop Barley **EARC-Sidney, MT 2014**

Cultivar	Yield bu/a 2014	Yield bu/a 3 yr	TW lb/bu 2014	Protein[1] % 2014	Protein[1] % 3 yr
Conrad	42.8	31.4	48.5	12.2	12.4
Haxby	32.4	31.4	52.0	10.6	11.0
Harrington	44.5	31.2	47.5	12.4	11.2
Hockett	42.1	30.8	50.0	11.2	11.3
Tradition	44.5	29.9	48.5	12.6	10.8
Gallatin	36.0	29.7	49.5	12.4	11.2
Metcalfe	36.8	29.6	49.5	12.5	12.2
Geraldine	35.1	27.0	49.5	12.1	11.8
Champion	47.9	--	49.5	11.5	--
Eslick	35.1	--	47.5	11.6	--
Cowboy	31.6	--	50.5	12.6	--
Craft	22.5	--	49.5	12.4	--
LSD 5%	6.1				

Planted: April 23 Harvested: August 14

Previous Crop: Peas

This trial was not harvested in 2015 due to hail.

Protein[1] = reported on a 12.5% moisture basis

Dryland Fallow Barley **EARC-Sidney, MT 2014**

Cultivar	Yield bu/a 2014	Yield bu/a 3 yr	TW lb/bu 2014	Plump % 2014	Protein[1] % 2014	Protein[1] % 3 yr
Champion	91.7	64.6	48.5	87.0	10.2	12.1
Craft	86.9	57.4	50.0	98.0	10.5	12.2
Eslick	83.4	55.3	49.0	91.0	9.1	12.2
Hockett	82.3	54.0	50.0	98.0	11.3	11.8
Conrad	76.5	53.5	47.5	95.0	11.0	13.8
Haxby	76.5	53.2	50.0	92.0	10.5	12.0
Tradition	77.8	51.6	47.5	85.0	11.6	12.6
Harrington	75.7	49.1	47.0	95.0	10.8	12.5
Pinnacle	79.6	47.7	49.0	99.0	9.8	11.5
Metcalfe	75.3	47.5	48.5	89.0	11.3	12.4
Hays*	78.9	--	47.0	87.0	10.9	--
LSD 5%	12.8					

Planted: April 24 Harvested: August 11

*forage barley

This trial was not harvested in 2015 due to hail.

Protein[1] = reported on a 12.5% moisture basis

OAT VARIETY DESCRIPTIONS

						Resistance To[2]			Quality Factors	
Variety	Origin[1]	Grain Color	Height	Maturity	Lodging	Stem Rust	Crown Rust	Barley Yellow Dwarf	Test Weight	Grain Protein
AC Pinnacle	Canada	white	tall	late	MS	R	R	S	medium	low
Beach	NDSU	white	tall	m late	MR	S	MR/MS	MS	medium	m high
CDC Dancer	Canada	white	tall	late	MR	S	MS	S	high	medium
CDC Minstrel	Canada	white	tall	late	MR	S	S	S	m high	medium
Furlong	Canada	red	tall	late	MR	S	S	T	high	medium
HiFi	NDSU	white	tall	late	MR	MR	R	T	m high	medium
Horsepower	SDSU	white	medium	E medium	R	MS	MR	MR	medium	medium
Hytest	SDSU	white	tall	early	MS	S	MS	S	v high	high
Jury	NDSU	white	tall	late	MS	R	R	MT	m high	medium
Killdeer	NDSU	white	med	med	MR	S	MS	MT	m high	medium
Leggett	Canada	white	tall	late	MR	MR	R	S	medium	medium
Morton	NDSU	white	tall	late	R	S	S	MT	high	medium
Newburg	NDSU	white	tall	late	MS	R	R	MT	medium	medium
Otana	MT	white	tall	late	S	S	S	S	high	medium
Paul	NDSU	hulless	V tall	late	MS	R	MR	T	v high	high
Rockford	NDSU	white	tall	late	R	S	R	MT	m high	medium
Souris	NDSU	white	med	med	R	MS	R	MS	high	medium
Stallion	SDSU	white	tall	late	M	S	MR	NA	high	medium

[1] Refers to developer: NDSU = North Dakota State University; SDSU = South Dakota State University.

[2] R = resistant; MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible; T = tolerant; MT = moderately tolerant; NA = data not available.

Dryland Oat Variety Trial						WREC, Williston - 2015
Variety	Heading Date DAP[1]	Heading Height (in)	Test Weight lb/bu	Yield 2015	Yield 2yr avg	Yield 3yr avg
				----------bu/a----------		
AC Pinnacle	61	30	42.3	63.4	84.7	90.5
Otana	61	32	40.3	62.0	77.0	81.0
CDC Dancer	60	31	39.2	72.0	75.7	80.1
Minstrel CDC	59	28	38.7	59.6	71.1	77.3
Newburg	62	28	41.4	61.6	71.2	77.3
Killdeer	60	25	38.7	65.2	66.4	76.0
Horsepower	55	26	40.4	60.5	68.4	73.7
Souris	60	30	42.2	62.8	67.4	72.9
Jury	60	32	40.6	63.1	70.7	72.5
HiFi	61	29	39.8	59.7	62.2	71.8
Furlong	62	30	39.8	55.4	60.8	70.3
Leggett	61	30	41.6	60.5	63.4	68.8
Rockford	60	25	39.9	54.8	63.7	68.7
Beach	58	30	40.7	52.7	53.4	61.2
Stallion	62	31	50.5	37.1	48.4	59.4
Hytest	58	33	42.8	53.1	52.9	57.4
Deon	61	31	41.0	66.9	74.0	-
Paul	62	29	41.8	60.6	47.0	-
Goliath	60	35	42.1	61.6	-	-
Mean	60	30	41.3	59.6	-	-
C.V.%	1.5	6.5	2.2	11.7	-	-
LSD 5%	1.2	2.7	1.3	9.7	-	-
LSD 10%	1.0	2.3	1.1	8.1	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft

Planted: 4/29/2015

Harvested: 8/4/2015

Previous crop: Soybeans

Applied fertilizer in lb/a: 10N : 47P2O5 : 0K2O

Soil test to 6" in ppm: 32P : 314K OM-2.2 pH-6.1

Soil test to 24" in lb/a: 39N

Soil type: Williams-Bowbells loam

Planting population = 1 million seeds/a

Chemical Applications: Prosaro 7oz/acre (6/30/15)

DAP[1] = Days after planting

Irrigated Oat Variety Trial			WREC-Nesson Valley 2015
	Height	Test Weight	Yield
Variety	inch	lb/bu	bu/a
Goliath	45	43.5	199.9
AC Pinnacle	41	41.6	198.7
Souris	40	42.2	188.4
Jury	43	42.9	182.6
Horsepower	34	42.5	181.9
Leggett	44	42.5	180.6
HiFi	43	42.0	175.3
Newberg (ND030365)	47	42.2	174.3
Rockford	44	42.4	161.4
Minstrel CDC	35	39.3	154.0
Mean	41.5	42.11	179.71
C.V.%	7.0	0.9	7.5
LSD 5%	6.1	0.82	28.14
LSD 10%	5.0	0.68	23.25

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/15/2015
Harvested: 8/4/2015
Plot size: 61.25 ft^2
Previous crop: Potato
Applied fertilizer in lbs/a broadcast: 392 lbs of 46-0-0 (4/10/2015)
Soil test to 6": 19 ppm P : 245 ppm K OM-2.3 pH-7.8
Soil test to 2' in lb/a: 49 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 175 bu/a
Planting population: 1 million seeds/a
Herbicides applied: Supremacy 5 oz/acre (6/4/2015)
Fungicides applied: Tilt 2 oz/a (6/4/2015)
Rainfall: 5.6 inches (4/16 - 8/3)
Irrigation: 7.7 inches (4/23 -8/3)
Protein[1] = Reported on a 0% moisture basis

Flax Variety Descriptions

Variety[1]	Origin[2]	PVP[3]	Relative Maturity	Seed Color	Plant Height	Resistance To Wilt	Relative Yield
AC Lightning	Canada	NO	LATE	BROWN	M TALL	R	V GOOD
Carter	NDSU	YES	MID	YELLOW	MEDIUM	MR	V GOOD
CDC Arras	Canada	NO	MID	BROWN	MEDIUM	MR	GOOD
CDC Bethume	Canada	NO	M LATE	BROWN	M TALL	MR	V GOOD
CDC Glas	Canada		M LATE	BROWN	M TALL	MR	V GOOD
CDC Sanctuary	Canada		MID	BROWN	M TALL	MR	V GOOD
CDC Sorrel	Canada	NO	M LATE	BROWN	M TALL	MR	V GOOD
Hanley	Canada	NO	M EARLY	BROWN	MEDIUM	R	V GOOD
Linott	Canada		M EARLY	BROWN	MEDIUM	MS/MR	V GOOD
McGregor	Canada		LATE	BROWN	MEDIUM	MR	GOOD
Neche	NDSU	NO	MID	BROWN	MEDIUM	R	GOOD
Nekoma	NDSU	NO	LATE	BROWN	MEDIUM	MR	V GOOD
Omega	NDSU	NO	MID	YELLOW	MEDIUM	MS	GOOD
Pembina	NDSU	NO	MID	BROWN	MEDIUM	MR	GOOD
Prairie Blue	Canada	NO	M LATE	BROWN	MEDIUM	NA	GOOD
Prairie Grande	Canada	NO	M EARLY	BROWN	MEDIUM	MR	V GOOD
Prairie Sapphire	Canada		MID	BROWN	MEDIUM	MR	GOOD
Prairie Thunder	Canada	NO	MEDIUM	BROWN	SHORT	NA	GOOD
Rahab 94	SDSU		MID	BROWN	MEDIUM	MR	V GOOD
Shape	Canada		MID	BROWN	MEDIUM	R	GOOD
Webster	SDSU	NO	LATE	BROWN	TALL	MR	GOOD
York	NDSU	NO	LATE	BROWN	MEDIUM	R	V GOOD

[1] All varieties have resistance to prevalent races of rust; all have good oil yield and oil quality.

[2] Refers to developer: NDSU = North Dakota State University; SD = South Dakota State University.

[3] PVP = Plant Variety Protection.

Flax Variety Trial										WREC, Williston - 2015
	Stand	Days to Flower	Days to Mature	Plant Height	Oil[2] -----%-----		Test Weight	Yield bu/a		
Variety	%	DAP[1]	DAP[1]	inch	2015	3yr avg	lb/bu	2015	2yr avg	3yr avg
Yellow Seeded										
Gold ND	93	57	84	23	38.9	39.6	54.2	29.8	24.7	25.6
Carter	94	55	82	22	37.8	38.7	54.2	30.1	24.3	25.0
Omega	94	57	82	21	37.5	38.6	54.5	27.4	24.1	23.4
Brown Seeded										
CDC Sorrel	93	56	80	25	38.8	39.4	53.5	29.5	24.5	27.0
Prairie Blue	95	55	81	23	38.6	39.7	53.7	28.6	24.4	25.7
CDC Glas	91	57	82	22	38.7	39.4	52.7	30.4	24.6	24.9
Neche	95	56	81	24	37.4	38.4	53.9	25.4	23.0	24.6
Rahab 94	94	56	80	20	38.1	39.2	52.8	27.6	23.6	24.5
CDC Sanctuary	95	56	82	24	38.4	39.0	53.3	28.1	23.3	24.3
York	93	56	82	24	37.5	38.3	53.7	26.6	22.7	24.1
CDC Arras	94	56	81	23	37.6	38.4	53.6	26.0	22.4	24.0
Nekoma	93	56	83	22	38.2	39.2	54.2	27.2	23.6	23.9
Lightning	89	57	82	23	38.1	38.9	53.5	25.9	22.6	23.9
Hanley	94	55	79	22	37.8	38.4	53.7	27.7	23.1	23.7
Linott	94	57	82	24	37.0	37.7	53.3	25.8	22.3	23.6
McGregor	94	57	82	22	37.8	38.6	53.7	28.1	22.9	23.6
CDC Bethume	88	57	84	22	37.7	38.5	53.9	27.8	23.0	23.5
Prairie Thunder	95	57	82	24	37.2	38.1	53.9	27.4	22.9	23.0
Prairie Grande	93	56	81	22	38.2	38.8	53.7	27.1	22.3	22.9
Pembina	95	57	82	23	38.4	39.0	53.7	27.7	22.2	22.8
Webster	91	56	82	24	38.4	39.3	53.8	27.5	21.8	22.8
Prairie Sapphire	93	57	82	26	39.3	40.4	52.6	26.9	22.1	22.7
Shape	93	57	82	22	39.3	40.3	53.3	26.2	21.8	22.0
Neela	95	54	79	22	38.6	-	53.2	31.5	24.8	-
Bison	94	55	81	22	37.8	-	53.5	26.2	21.9	-
Mean	92.9	56.3	81.8	22.8	38.17	-	53.56	27.51	-	-
C.V.%	3.2	1.6	2.8	6.3	1.1	-	0.5	9.2	-	-
LSD 5%	4.1	1.3	3.2	2.0	0.61	-	0.38	3.55	-	-
LSD 10%	3.5	1.1	2.7	1.7	0.51	-	0.32	2.97	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 4/28/15
Harvested: 9/16/15
Harvested area: 56 ft^2
Previous crop: spring wheat
Applied fertilizer in lb/a: 3 N : 16 P2O5 : 0 K2O
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied), Intensity at 8fl.oz/A with Trophy Gold NIS at 1qt/A (6/9)
DAP[1] = Days after planting
Oil[2] = Oil content adjusted to 9% moisture

Irrigated Flax Variety Trial					WREC-Nesson Valley 2015	
	Days to Flower	Days to Mature	Plant Height	Oil	Test Weight	Yield
Variety	DAP[1]	DAP[1]	inch	%	lb/bu	bu/a
Yellow Seeded						
Carter	56	106	23	36.8	54.1	32.6
Brown Seeded						
CDC Glas	55	102	23	38.5	53.2	48.7
Webster	55	104	25	38.1	54.0	41.4
Prairie Blue	56	100	22	38.2	53.4	39.8
Hanley	55	106	23	37.3	53.8	38.4
CDC Sanctuary	56	104	23	37.5	53.2	37.4
CDC Bethume	55	102	23	37.6	54.1	36.1
Neche	56	102	24	37.1	53.8	34.4
Mean	55.5	103.1	23.2	37.7	53.70	38.60
C.V.%	1.9	3.2	10.5	0.9	0.6	12.9
LSD 5%	NS	4.9	NS	0.53	0.51	7.32
LSD 10%	NS	4.0	NS	0.44	0.42	6.05

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 5/1/2015
Harvested: 8/20/2015
Plot size: 61.25 ft^2
Previous crop: barley
Applied fertilizer in lbs/a broadcast: 215 lbs of 46-0-0 (6/4/2015)
Soil test to 6": 28 ppm P : 236 ppm K OM-2.1 pH-7.7
Soil test to 2' in lb/a: 35 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 50 bu/a
Planting population: 30 lbs/a
Herbicides applied: Section 2EC 6 oz/a + Destiny 1% v/v (6/4/2015),
Moxy 1 pt/a (6/16/2015)
Rainfall: 5.9 in (5/1 - 8/20)
Irrigation: 7.5 in (4/21-8/20)
DAP[1] = Days After Planting

Safflower Variety Descriptions

Variety	Origin[1]	PVP[2]	Hull Type[3]	Oil Type[4]	Irrigated Yield[5]	Dryland Yield[5]	TWT[5]	Oil[5]	Maturity	Tolerance[6]	
										Alt	BB
Cardinal	MSU/NDSU	YES	N	HIGH LINO	V GOOD	V GOOD	HIGH	FAIR	MED	T	MT
Finch	MSU/NDSU	NO	N	LINO	GOOD	V GOOD	V HIGH	FAIR	M EARLY	MS	T
Hybrid 1601	STI	YES	STP	HIGH OLEIC	V GOOD	V GOOD	MED	GOOD	M LATE	MT	MT
Hybrid 9049	STI	YES	N	HIGH OLEIC	V GOOD	V GOOD	V HIGH	FAIR	MED	MT	MT
MonDak	MSU/NDSU	YES	N	HIGH OLEIC	GOOD	V GOOD	HIGH	FAIR	M EARLY	T	MT
Montola 2000	MSU/NDSU	YES	N	HIGH OLEIC	M GOOD	GOOD	MED	GOOD	EARLY	MS	MS
Montola 2001	MSU/NDSU	YES	STP	HIGH OLEIC	GOOD	FAIR	MED	GOOD	MED	MT	MT
Montola 2003	MT/NDSU	YES	N	HIGH OLEIC	V GOOD	V GOOD	M HIGH	GOOD	M EARLY	MT	MT
Montola 2004	MSU/NDSU	YES	N	HIGH OLEIC	GOOD	GOOD	M HIGH	GOOD	M EARLY	MS	MT
Morlin	MSU/NDSU	YES	STP	HIGH LINO	V GOOD	GOOD	MED	GOOD	M LATE	T	T
Nutrasaff	MSU/NDSU	YES	RED	LINO	GOOD	GOOD	MED	HIGH	MED	T	MT

[1] Refers to developer: MSU = Montana State University; NDSU = North Dakota State University; STI = Safflower Technologies International.

[2] PVP = Plant Variety Protection. "YES" indicates that the variety is protected and the seed may be sold for planting purposes only as a class of certified seed (Title V option).

[3] STP = striped, N = normal, RED = reduced.

[4] Lino = linoleic.

[5] Relative ratings of yield, test weight, and oil will vary under conditions of moderate-severe disease infestation.

[6] Alt = Alternaria leaf spot disease, BB = bacterial blight, S = susceptible, MS = moderately susceptible, MT = moderately tolerant, T = tolerant.

Safflower Variety Trial **WREC, Williston - 2015**

Variety	Stand %	Days to First Flower[1] DAP[2]	Plant Height inch	Oil -----%----- 2015	Oil 3yr avg	Test Weight lb/bu	Yield -----lb/a----- 2015	Yield 2yr avg	Yield 3yr avg
Hybrid 200	90	45	25	33.3	34.4	43.9	2170	1955	2085
Hybrid 1601	80	49	25	37.1	38.9	40.4	2742	1962	1942
MonDak	73	50	22	36.5	36.6	43.1	2183	1747	1923
Cardinal	80	52	23	37.3	35.5	44.1	1895	1613	1884
Hybrid 446	78	45	25	33.6	33.3	43.5	2461	1894	1839
Montola 2003	95	51	22	38.1	38.6	42.1	1963	1590	1746
Hybrid 9049	75	48	22	32.1	31.6	42.7	1784	1609	1647
STI 1201	88	47	21	43.0	43.8	38.8	1630	1402	1537
Hybrid 621	78	47	23	40.3	40.6	38.3	1710	1458	1511
Hybrid 528	78	46	23	43.2	43.3	34.9	1775	1374	1499
Morlin	75	51	22	37.9	37.0	41.6	1877	1487	1446
Finch	85	50	22	37.2	36.2	43.7	1552	1263	1440
NutraSaff	88	49	23	47.6	46.7	39.7	1520	1214	1369
Montola 2000	60	48	19	36.9	-	43.4	1419	-	-
Mean	79.9	47.8	22.7	38.43	-	40.75	1866.1	-	-
C.V.%	15.8	4.7	4.7	1.2	-	1.2	9.0	-	-
LSD 5%	25.7	4.5	2.2	0.92	-	1.02	343.3	-	-
LSD 10%	21.4	3.8	1.8	0.76	-	0.85	285.5	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/5/15
Harvested: 9/14/15
Harvested area: 56 ft^2
Previous crop: spring wheat
Applied fertilizer in lb/a: 9 N : 42 P_2O_5 : 0 K_2O
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P : 430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Prowl H_2O at 3 pints/A (preplant spring applied), Harmony GT at 0.3oz/A with AMS powder (6/5), Equation SC Fungicide at 10oz/A (7/13), Gramoxone SL at 1 quart/A with LI700 at 1 quart/1000 gallons (preharvest dessication 9/9)
First Flower[1] = 50% of flowers from primary head
DAP[2] = Days after Planting

Irrigated Safflower Variety Trial									WREC-Nesson Valley 2015	
	Days to		Oil[2]			Test		Yield		
	Flower	2013	2014	2015	3yr avg.	Weight	2013	2014	2015	3yr avg.
Variety	DAP[1]	----------%----------				lb/bu	----------lb/a----------			
Hybrid 200	90	32.3	27.4	30.9	30.2	38.8	1883	1681	1595	1720
MonDak	92	32.6	31.0	32.2	31.9	37.1	1711	1593	1577	1627
Hybrid 1601	90	36.9	32.4	33.1	34.1	35.9	1573	1074	2195	1614
Montola 2003	93	36.4	30.1	32.5	33.0	37.0	1752	1747	1278	1592
Hybrid 9049	89	29.1	26.3	27.2	27.5	36.4	1629	1572	1540	1580
Hybrid 446	91	30.4	28.1	28.6	29.0	35.7	1632	1444	1603	1560
Cardinal	93	33.0	28.1	32.6	31.2	37.8	1607	1427	1231	1422
Finch	91	32.9	31.4	34.2	32.8	38.7	1354	1238	1522	1371
Hybrid 528	91	42.3	37.8	40.4	40.2	33.1	1262	1162	1601	1342
NutraSaff	93	47.5	40.3	44.2	44.0	35.7	1119	788	968	958
STI 1201	92	39.0	-	39.5	39.3	35.8	1450	-	1450	-
MEAN	91.2	35.67	31.29	34.13	33.94	36.54	1542.9	1372.6	1505.5	1478.6
C.V.	1.0	3.1	7.0	2.3	-	3.0	14.3	20.7	14.6	-
LSD 5%	1.5	-	-	1.35	-	1.84	-	-	368.4	-
LSD 10%	1.3	2.20	7.00	1.11	-	1.52	299.0	436.0	304.6	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/15/2015
Harvested: 9/10/2015
Plot size: 60 ft^2
Previous crop: barley
Applied fertilizer in lbs/a broadcast: 194 lbs of 46-0-0 (4/10/2015)
Soil test to 6": 29 ppm P : 300 ppm K OM-2.2 pH-8.0
Soil test to 2' in lb/a: 64 lbs N
Soil type: Lihen Loamy Fine Sand
Planting population: Conventional 20 lbs PLS, Hybrid 18 lbs PLS
Herbicides applied: Prowl H2O 3pt/a (4/24/2015), Section 2EC 6 oz/a + Destiny 1% v/v (6/4/2015)
Fungicide applied: Endura 10 oz/a + Quadris 10 oz/a (7/14/2015)
Rainfall: 9.1 in (4/15 -9/10)
Irrigation: 7.5 in (4/15-9/10)
DAP[1] = Days After Planting
Oil[2] = Oil content reported on an oven dried basis

Off-Station Safflower Variety Trial	WREC, McKenzie County - 2015				
	Oil		Test	Yield	
	-----%-----		Weight	-----lb/a-----	
Variety	2015	2yr avg	lb/bu	2015	2yr avg
Cardinal	37.4	32.8	43.5	1408	1458
Hybrid 1601	35.4	34.8	42.1	1832	1280
Montola 2003	36.8	33.4	43.0	1384	1265
MonDak	34.5	31.6	42.9	1227	1169
Finch	37.7	33.9	43.6	1205	1090
Hybrid 9049	30.8	27.0	42.4	1214	1052
NutraSaff	49.1	46.0	37.6	976	853
Hybrid 200	31.6	-	43.6	1297	-
Hybrid 621	41.4	-	37.4	1240	-
Hybrid 446	32.6	-	42.5	1157	-
Mean	36.72	-	41.85	1294.0	-
C.V.%	1.7	-	1.7	25.2	-
LSD 5%	1.09	-	1.21	559.9	-
LSD 10%	0.90	-	1.00	462.1	-

Location: Latitude 47 48'N; Longitude 103 25'W; Elevation 2265 ft
Planted: 4/30/15
Harvested: 9/15/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: 41 N : 26 P_2O_5 : 0 K_2O
Soil type: Dooley-Zahl complex
Soil test to 6" in ppm: 7 P : 190 K OM-2.4 pH-7.4
Soil test to 24" in lb/a: 40N

Off-Station Safflower Variety Trial		WREC, Golden Valley County - 2015	
	Oil	Test	Yield
	-----%-----	Weight	-----lb/a-----
Variety	2015	lb/bu	2015
Hybrid 1601	36.9	41.1	2394
Hybrid 446	33.9	42.8	1945
Hybrid 200	33.6	43.5	1873
Cardinal	36.7	44.8	1611
Hybrid 9049	31.9	42.3	1598
Montola 2003	38.1	43.3	1594
Hybrid 621	42.0	37.4	1531
Finch	37.2	43.8	1369
MonDak	35.8	42.3	1108
NutraSaff	49.1	37.2	1031
Mean	37.51	41.85	1605.3
C.V.%	1.0	1.6	18.4
LSD 5%	0.64	1.17	507.2
LSD 10%	0.53	0.97	418.6

Location: Latitude 46 50'; Longitude 103 59'W; Elevation 2890 ft
Planted: 5/5/15
Harvested: 9/25/15
Harvested area: 56 ft2
Previous crop: durum
Applied fertilizer in lb/a: 41 N : 26 P2O5 : 0 K2O
Soil type: Grail-Grassna complex
Soil test to 6" in ppm: 13 P : 351 K OM-3.5 pH-6.9
Soil test to 24" in lb/a: 33N

Canola Conventional Variety Trial									WREC, Williston - 2015
Variety	Brand/Company	Stand %	Days to Flower DAP[1]	Flower Duration days	Days to Mature DAP[1]	Plant Height inch	Shatter %	Oil[2] % 2015	Yield lb/a 2015
InVigor L140P (LL)	Bayer Crop Science	94	54	12	100	35	3	36.7	1468
InVigor L130 (LL)	Bayer Crop Science	90	54	11	99	40	11	38.1	1218
C1516 (SU)	Cibus	91	58	17	107	41	6	36.3	1209
C1511 (SU)	Cibus	85	54	17	100	41	10	34.9	1159
InVigor L120 (LL)	Bayer Crop Science	84	55	13	99	38	9	37.9	1139
Mean		88.8	54.8	13.8	100.8	39.1	7.8	36.77	1238.5
C.V.%		7.5	2.2	13.8	1.9	9.1	64.2	0.8	9.6
LSD 5%		NS	1.8	2.9	3.0	5.5	7.7	0.46	182.6
LSD 10%		8.4	1.5	2.4	2.4	4.5	6.3	0.38	149.4

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 4/24/15
Harvested: 8/11/15
Harvested area: 56 ft2
Previous crop: green peas
Applied fertilizer in lb/a: 6 N : 26 P2O5 : 0 K2O
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 21P : 317K OM-1.8 pH-6.5
Soil test to 24" in lb/a: 35N
Previous Crop Credit: 40N
Chemical Applications: Tombstone Helios 2.5fl.oz/a for flea beetle control (5/28 & 6/9)
LL = Liberty Link, SU = sulfonylurea trait with tolerance to Draft herbicide
DAP[1] = Days after planting
Oil[2] = Oil content adjusted to 8.5% moisture
Lodging & Shatter = 7/28/15 - had sustained westerly winds of 20-40mph nearly all day with gusts over 50mph with 0.27 inch rainfall so all varieties lodged significantly to the east. When harvested 8/11/15, stands had straightened back up, so did not take individual ratings. Did take shatter ratings just prior to harvest (8/11/15) because the windy and rainy day caused pods that were more mature to split open. The varieties that were not as far along when the windy day occurred faired better in regards to pod/seed shatter.

Canola Roundup Ready Variety Trial — **WREC, Williston - 2015**

Variety	Brand/Company	Stand %	Days to Flower DAP[1]	Flower Duration days	Days to Mature DAP[1]	Plant Height inch	Shatter %	Oil[2] -----%----- 2015	Oil[2] 3yr avg	Yield -----lb/a----- 2015	Yield 2yr avg	Yield 3yr avg
6070 RR	BrettYoung	90	53	12	96	41	11	41.5	44.5	1054	1345	1478
Star 402	Star Specialty Seed	91	53	11	95	41	24	44.1	46.5	1057	1266	1412
V12-1	Cargill	93	56	10	94	40	34	40.5	-	838	1025	-
6064 RR	BrettYoung	90	59	8	98	45	6	41.4	-	1146	-	-
6074 RR	BrettYoung	86	59	9	97	44	6	40.3	-	1054	-	-
V22-1	Cargill	93	58	10	95	44	28	40.5	-	815	-	-
Mean		89.1	56.2	9.8	95.4	42.1	22.7	40.92	-	961.3	-	-
C.V.%		5.0	2.7	18.6	0.8	6.6	49.4	1.3	-	14.0	-	-
LSD 5%		NS	2.2	2.7	1.2	4.1	16.5	0.80	-	197.5	-	-
LSD 10%		5.5	1.2	2.2	1.0	3.4	13.6	0.66	-	163.5	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 4/24/15
Harvested: 8/11/15
Harvested area: 56 ft2
Previous crop: green peas
Applied fertilizer in lb/a: 6 N : 26 P2O5 : 0 K2O
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 21P : 317K OM-1.8 pH-6.5
Soil test to 24" in lb/a: 35N
Previous Crop Credit: 40N
Chemical Applications: Tombstone Helios 2.5fl.oz/a for flea beetle control (5/28 & 6/9), Roundup Weathermax 12fl.oz/a for weed control (6/5)
DAP[1] = Days after planting
Oil[2] = Oil content adjusted to 8.5% moisture
Lodging & Shatter = 7/28/15 - had sustained westerly winds of 20-40mph nearly all day with gusts over 50mph with 0.27 inch rainfall so all varieties lodged significantly to the east. When harvested 8/11/15, stands had straightened back up, so did not take individual ratings. Did take shatter ratings just prior to harvest (8/11/15) because the windy and rainy day caused pods that were more mature to split open. The varieties that were not as far along when the windy day occurred faired better in regards to pod/seed shatter.

Irrigated Canola Variety Trial — **WREC-Nesson Valley 2015**

Variety	Brand/Company	Flower Date DAP[1]	Flower Duration days	Days to Mature DAP[1]	Plant Height inch	Oil[2] %	Yield lb/a
Star 402	Star Specialty Seed	49	15	96	47	42.7	4914.3
6074 RR	BrettYoung	51	16	97	46	39.1	4668.7
6070 RR	BrettYoung	49	15	100	46	40.6	4561.6
V-22-1	Cargill	51	15	95	44	40.0	3908.8
Mean		50.7	15.3	97.1	45.4	39.90	4379.70
C.V.%		1.9	12.9	1.4	7.9	1.7	17.9
LSD 5%		NS	NS	2.6	NS	1.37	NS
LSD 10%		NS	NS	2.1	NS	1.09	NS

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 5/1/2015
Harvested: 8/14/2015
Plot size: 52.5 ft^2
Previous crop: barley
Applied fertilizer in lbs/a broadcast: 215 lbs of 46-0-0
Soil test to 6": 28 ppm P : 236 ppm K OM-2.1 pH-7.7
Soil test to 2' in lb/a: 35 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 2500 lbs/a
Planting population = 600,000 seeds/a
Row spacing: 7.5 inch
Herbicides applied: Section 2EC 6 oz/a + Destiny 1% v/v (6/4/2015)
Rainfall: 5.9 in (5/1 - 8/14)
Irrigation: 7.5 in (5/1 - 8/14)
DAP[1] = Days After Planting
Oil[2] = Oil content adjusted to 8.5% moisture

Soybean Roundup Ready Dryland Variety Trial — **WREC, Williston - 2015**

Variety	Company/Brand	Maturity Group[1]	Stand %	Maturity Date (date)	Plant Height inch	Oil[2] -----%----- 2015	Oil[2] -----%----- 2yr avg	Protein[3] -----%----- 2015	Protein[3] -----%----- 2yr avg	Test Weight lb/bu	Yield -----bu/a----- 2015	Yield -----bu/a----- 2yr avg
LS-0334 RR2	Legacy Seeds	0.3	91	9/15	16	15.8	15.1	31.6	31.6	57.4	29.4	29.5
S04RY55	Dyna-Gro Seed	0.4	91	9/13	18	15.2	14.8	33.6	33.3	57.1	28.0	28.8
S04-D3	Syngenta	0.4	90	9/10	17	15.5	15.2	32.3	32.4	57.6	26.9	28.2
S02RY74	Dyna-Gro Seed	0.2	88	9/9	17	15.1	14.9	33.7	32.8	57.1	25.8	26.7
7063 G2 Genetics	G2 Genetics	0.6	84	9/9	14	15.9	15.9	30.8	30.3	57.1	20.5	26.2
LS-0214 RR2	Legacy Seeds	0.2	88	9/9	17	15.8	15.5	32.4	32.0	56.8	23.3	25.6
20090 R2Y	Integra	00.9	92	9/7	15	16.5	16.0	29.1	30.2	57.2	21.3	25.4
6036 G2 Genetics	G2 Genetics	0.3	85	9/16	15	16.0	15.6	31.8	31.5	57.8	25.1	23.9
S02-B4	Syngenta	0.2	90	9/7	15	16.2	15.9	29.6	30.4	57.1	19.6	23.0
S007-Y4	Syngenta	00.7	86	9/7	15	16.5	16.2	30.2	31.0	57.4	15.2	20.0
55G14	REA Hybrids	00.5	81	9/7	15	16.3	15.7	30.9	32.2	56.0	15.0	19.7
66G14	REA Hybrids	0.6	89	9/15	15	14.8	-	32.4	-	57.2	29.8	-
64G94	REA Hybrids	0.4	89	9/8	17	16.1	-	31.5	-	56.5	28.9	-
20300 R2Y	Integra	0.3	91	9/15	16	15.5	-	31.1	-	57.4	27.1	-
Astro	Thunder Seed	0.0	93	9/8	16	15.3	-	32.3	-	57.7	25.6	-
S03RY36	Dyna-Gro Seed	0.3	91	9/11	14	14.9	-	34.9	-	57.7	25.2	-
20215 R2Y	Integra	0.1	90	9/9	16	15.5	-	32.0	-	57.2	24.7	-
3601	Thunder Seed	0.1	91	9/8	19	15.9	-	33.2	-	57.1	24.3	-
LS-0135 RR2	Legacy Seeds	0.1	86	9/8	21	16.4	-	31.2	-	57.1	23.5	-
S02-R2	Syngenta	0.2	90	9/11	15	15.3	-	31.7	-	57.4	23.1	-
LS-00835N RR2	Legacy Seeds	00.8	86	9/9	18	15.6	-	32.2	-	57.1	20.8	-
20084N R2Y	Integra	00.8	86	9/7	17	15.9	-	31.0	-	56.7	19.7	-
3503	Thunder Seed	0.3	87	9/11	14	15.0	-	32.9	-	57.2	19.3	-
6008R2 G2 Genetics	G2 Genetics	00.8	88	9/7	15	16.2	-	30.5	-	57.5	15.8	-
Mean			88.4	9/10	15.9	15.70	-	31.78	-	57.18	23.23	-
C.V.%			4.5	1.3	8.6	2.1	-	3.7	-	0.6	11.3	-
LSD 5%			5.7	2.0	1.9	0.46	-	1.6	-	0.49	3.70	-
LSD 10%			4.7	1.7	1.6	0.39	-	1.4	-	0.41	3.09	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/26/15
Harvested: 9/29/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with liquid inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied)
Maturity Group[1] = provided by company
Oil[2] = Oil content adjusted to 13% moisture
Protein[3] = Protein content adjusted to 13% moisture

Soybean Conventional Dryland Variety Trial **WREC, Williston - 2015**

Variety	Company/Brand	Maturity Group[1]	Stand %	Maturity Date (date)	Plant Height inch	Oil[2] -----%----- 2015	Oil[2] -----%----- 3yr avg*	Protein[3] -----%----- 2015	Protein[3] -----%----- 3yr avg*	Test Weight lb/bu	Yield -----bu/a----- 2015	Yield -----bu/a----- 2yr avg*	Yield -----bu/a----- 3yr avg*
Sheyenne	NDSU	0.7	90	9/13	18	15.0	18.5	32.4	33.8	58.1	28.2	27.3	23.0
Ashtabula	NDSU	0.4	84	9/9	18	15.5	18.9	33.0	34.0	57.6	21.1	23.9	20.2
Traill	NDSU	00.0	81	9/7	18	14.7	18.1	36.8	36.0	58.6	21.5	21.6	17.8
ND Henson	NDSU	0.0	94	9/8	15	14.9	-	34.6	-	58.1	22.6	-	-
Mean			88.6	9/11	16.8	15.06	-	33.55	-	57.70	24.49	-	-
C.V.%			4.4	1.2	9.2	2.4	-	4.3	-	0.6	9.5	-	-
LSD 5%			5.6	1.8	2.2	0.50	-	2.03	-	0.51	3.30	-	-
LSD 10%			4.6	1.5	1.8	0.42	-	1.70	-	0.42	2.76	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/26/15
Harvested: 10/1/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with liquid inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied)
Maturity Group[1] = provided by company
Oil[2] = Oil content adjusted to 13% moisture
Protein[3] = Protein content adjusted to 13% moisture
2yr* = average of 2013 & 2015
3yr* = average of 2012, 2013, & 2015

Irrigated Roundup Ready Soybean Variety Trial — **WREC-Nesson Valley 2015**

Variety	Brand/ Company	Maturity Group	Days to Mature DAP[1]	Plant Height inch	Protein[2] %: 2014	Protein[2] %: 2015	Protein[2] %: 2 yr avg	Oil[3] %: 2013	Oil[3] %: 2014	Oil[3] %: 2015	TW lb/bu	Yield bu/a: 2013[4]	Yield bu/a: 2014[5]	Yield bu/a: 2015	Yield bu/a: 2 yr avg	Yield bu/a: 3 yr avg
S04-D3	Syngenta/NK	0.4	119	31	34.4	35.0	34.7	15.6	13.3	15.5	56.4	53.4	42.9	54.4	48.6	50.2
20090 R2Y	Integra	00.9	119	35	32.1	35.1	33.6	16.6	13.6	15.8	56.5	46.9	43.1	51.5	47.3	47.2
S02-B4	Syngenta/NK	0.2	115	33	33.8	35.4	34.6	16.5	13.5	16.2	56.9	40.6	49.8	47.4	48.6	45.9
7063	NuTech/G2 Genetics	0.6	123	29	33.2	34.0	33.6	16.4	13.4	16.2	56.4	29.2	44.8	52.6	48.7	42.2
20215 R2Y	Integra	0.1	116	29	35.9	35.8	35.9	15.7	13.2	15.4	56.7	25.8	49.1	49.6	49.4	41.5
20300 R2Y	Integra	0.3	121	31	36.1	36.0	36.1	15.2	14.0	15.4	56.6	27.2	38.5	58.7	48.6	41.5
S007-Y4	Syngenta/NK	00.7	103	28	34.6	36.4	35.5	-	13.3	15.9	56.4	-	56.4	64.6	60.5	-
61G24	REA Hybrids	0.1	121	24	36.5	35.8	36.2	-	13.8	15.6	57.1	-	45.0	52.7	48.8	-
S02RY74	Dyna-Gro Seed	0.2	119	29	36.1	36.6	36.3	-	13.5	15.1	56.7	-	49.1	42.8	46.0	-
LS-0334 RR2	Legacy Seeds, Inc.	0.3	124	33	36.3	36.3	36.3	-	13.7	15.3	56.2	-	35.5	56.2	45.8	-
6036	NuTech/G2 Genetics	0.3	123	31	35.3	35.1	35.2	-	13.8	16.1	56.2	-	34.3	50.6	42.4	-
3503	Thunder	0.3	121	31	-	37.8	-	-	-	15.5	57.0	-	-	63.4	-	-
S04RY55	Dyna-Gro Seed	0.4	122	32	-	36.2	-	-	-	15.6	56.9	-	-	63.2	-	-
LS-0214 RR2	Legacy Seeds, Inc.	0.2	119	34	-	36.2	-	-	-	15.7	56.1	-	-	57.5	-	-
S03RY36	Dyna-Gro Seed	0.3	119	29	-	37.6	-	-	-	15.5	56.8	-	-	57.5	-	-
LS-0135 RR2	Legacy Seeds, Inc.	0.1	117	37	-	35.3	-	-	-	16.5	56.6	-	-	56.6	-	-
S02-R2	Syngenta/NK	0.2	117	30	-	35.8	-	-	-	15.7	57.0	-	-	54.9	-	-
20084N R2Y	Integra	00.8	119	31	-	35.7	-	-	-	16.0	56.4	-	-	54.6	-	-
3601	Thunder	0.1	115	34	-	35.4	-	-	-	16.5	56.3	-	-	54.6	-	-
LS-00835N RR2	Legacy Seeds, Inc.	00.8	117	31	-	35.6	-	-	-	16.1	56.4	-	-	47.8	-	-
R0216	REA Hybrids	0.2	114	36	-	35.7	-	-	-	16.5	56.5	-	-	47.7	-	-
Astro	Thunder	0.0	116	33	-	36.1	-	-	-	15.4	56.5	-	-	44.3	-	-
6008R2	NuTech/G2 Genetics	00.8	109	32	-	32.9	-	-	-	16.7	56.4	-	-	43.0	-	-
Mean			117.7	31.5	34.9	35.73	35.27	16.00	13.55	15.83	56.57	37.18	44.41	53.30	48.61	44.75
C.V.%			2.3	7.0	1.9	2.2	-	2.7	4.4	1.7	0.9	12.1	8.2	28.9	-	-
LSD 5%			3.8	3.1	-	1.10	-	-	-	0.39	0.25	-	-	NS	-	-
LSD 10%			3.1	2.6	0.90	0.92	-	0.60	NS	0.33	0.30	4.10	4.90	18.20	-	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 5/19/2015
Harvested: 10/9/2015
Plot size: 61.25 ft^2
Previous crop: barley
Soil type: Lihen Loamy Fine Sand
Yield goal: 50 bu/a
Planting population: 200,000 seeds/a
Row spacing: 7.5 inch
Herbicides applied: Roundup 24oz/a + Veracity 3qt/ 100 gal (6/17/2015), (7/7/2015)
Rainfall: 8.5 in (5/19 - 10/1)
Irrigation: 7.5 in (4/21 - 7/27)
DAP[1] = Days After Planting
Protein[2] = Protein adjusted to 13% moisture
Oil[3] = Oil content adjusted to 13% moisture
2013[4] = Sclerotinia severly affected trial
2014[5] = Hail damaged trial in August

Irrigated Conventional Soybean Variety Trial — **WREC-Nesson Valley 2015**

Variety	Brand/Company	Maturity Group	Days to Mature DAP[1]	Height inch	Protein[2] 2014 %	Protein[2] 2015 %	Protein[2] 2 yr avg %	Oil[3] 2014 %	Oil[3] 2015 %	Oil[3] 2 yr avg %	Test Weight lb/bu	Yield 2014[4] bu/a	Yield 2015 bu/a	Yield 2 yr avg bu/a
Sheyenne	NDSU	0.7	125	29	31.1	34.1	32.6	13.9	16.8	15.4	57.1	26.2	60.3	43.3
Ashtabula	NDSU	0.4	123	28	32.2	33.9	33.1	14.3	17.2	15.8	56.8	31.1	51.9	41.5
Traill	NDSU	0.0	118	26	33.9	37.5	37.3	13.8	16.6	15.2	58.2	28.3	41.2	34.7
ND-Henson	NDSU	0.0	117	21	-	35.1	35.1	-	17.7	17.7	57.7	-	49.3	-
Mean			119.3	24.9	33.05	35.50	35.15	14.05	17.17	16.22	57.53	29.70	47.47	38.12
C.V.%			1.3	9.3	2.3	1.3	-	1.2	3.0	-	0.5	11.2	9.3	-
LSD 5%			2.5	3.9	-	0.73	-	-	0.83	-	0.50	-	7.40	-
LSD 10%			2.0	3.1	1.10	0.59	-	NS	0.67	-	0.41	4.30	6.00	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 5/19/2015
Harvested: 10/9/2015
Plot size: 61.25 ft^2
Previous crop: barley
Soil type: Lihen Loamy Fine Sand
Yield goal: 50 bu/a
Planting population: 200,000 seeds/a
Herbicides applied: Section 2EC 6oz/a + Destiny 1% v/v (6/26/2015), Raptor 4oz/a + Trophy Gold 2pt/a + 28% 2pt/a (6/26/2015)
Rainfall: 8.5 in (5/19 - 10/1)
Irrigation: 7.5 in (4/21 - 7/27)
DAP[1] = Days After Planting
Protein[2] = Protein adjusted to 13% moisture
Oil[3] = Oil content adjusted to 13% moisture
2014[4] = Hail damaged trial in August

Off-station Soybean Conventional Variety Trial **WREC, McKenzie County - 2015**

Variety	Company/Brand	Maturity Group[1]	Stand %	Oil[2] % 2015	Protein[3] % 2015	Test Weight[4] lb/bu	Yield[5] bu/a 2015
Sheyenne	NDSU	0.8	83	15.5	33.8	55.4	32.4
Ashtabula	NDSU	0.4	80	15.5	35.4	55.2	27.6
Traill	NDSU	00.0	80	14.7	38.5	57.4	24.1
Henson	NDSU	0.0	85	15.4	35.8	56.7	24.0
Cavalier	NDSU	00.9	78	14.7	37.9	56.6	20.2
Mean			81.3	15.17	36.27	56.25	25.68
C.V.%			7.1	1.5	2.9	1.0	10.2
LSD 5%			NS	0.43	2.01	1.05	4.95
LSD 10%			NS	0.35	1.62	0.84	3.99

Location: Latitude 47 48'N; Longitude 103 25'W; Elevation 2265 ft
Planted: 5/21/15
Harvested: 10/08/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with liquid inoculant at planting
Soil type: Dooley-Zahl complex
Soil test to 6" in ppm: 7 P : 190 K OM-2.4 pH-7.4
Soil test to 24" in lb/a: 40N
Maturity Group[1] = provided by company
Oil[2] = Oil content adjusted to 13% moisture
Protein[3] = Protein content adjusted to 13% moisture
Test Weight[4] = Test Weight content adjusted to 13% moisture
Yield[5] = Yield content adjusted to 13% moisture

Off-station Soybean Roundup Ready Variety Trial **WREC, McKenzie County - 2015**

Variety	Company/Brand	Maturity Group[1]	Stand %	Oil[2] % 2015	Protein[3] % 2015	Test Weight lb/bu	Yield bu/a 2015
7063 G2 Genetics	G2 Genetics	0.6	90	15.2	35.3	55.9	38.7
20090 R2Y	Integra	00.9	83	14.3	37.0	55.6	35.0
20300 R2Y	Integra	0.3	93	14.7	37.3	55.8	34.2
61G24	REA Hybrids	0.1	95	14.3	38.2	57.1	32.4
20215 R2Y	Integra	0.1	87	14.4	38.0	55.7	31.5
Astro	Thunder Seed	0.0	95	14.3	38.0	54.9	30.1
55G14	REA Hybrids	00.5	80	14.3	37.9	56.4	27.0
6008R2 G2 Genetics	G2 Genetics	00.8	85	14.6	38.1	55.9	26.5
20084N R2Y	Integra	00.8	73	14.4	38.7	54.2	25.3
Mean			86.9	14.49	37.62	55.70	31.18
C.V.%			9.2	2.0	1.2	1.0	14.1
LSD 5%			13.9	0.51	0.78	0.96	7.60
LSD 10%			11.4	0.42	0.64	0.79	6.26

Location: Latitude 47 48'N; Longitude 103 25'W; Elevation 2265 ft
Planted: 5/21/15
Harvested: 10/08/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with liquid inoculant at planting
Soil type: Dooley-Zahl complex
Soil test to 6" in ppm: 7 P : 190 K OM-2.4 pH-7.4
Soil test to 24" in lb/a: 40N
Maturity Group[1] = provided by company
Oil[2] = Oil content adjusted to 13% moisture
Protein[3] = Protein content adjusted to 13% moisture

Corn Variety Trial **WREC, Williston - 2015**

Variety	Company	Maturity[1]	Days to Silk DAP[2]	Ear Height inch	Green Snap %	Ear Drop %	Harvest Moisture %	Test Weight[3] lb/bu	Yield[4] -----bu/a----- 2015	2yr avg	3yr avg
Conventional											
06B21	Blue River Hybrids	76	66	23	23	5	17.2	55.4	42.9	-	-
Roundup Ready											
5F-775	NuTech/G2 Genetics	75	64	24	14	4	15.0	54.4	52.9	56.2	72.0
5N-183	NuTech	83	70	25	10	3	19.7	54.7	68.6	64.5	67.9
N09V-3010	Syngenta	79	69	26	22	6	16.5	57.9	48.8	51.3	63.3
N07H-3010	Syngenta	77	69	26	16	22	16.9	56.7	45.5	43.5	54.9
8001 VT2P RIB	Nuseed/Legend Seed	80	66	24	11	5	19.6	56.8	57.1	67.0	-
L-2314 VT2PRO	Legacy Seeds	83	68	25	13	9	20.4	55.5	65.8	65.7	-
5F-379	NuTech/G2 Genetics	79	66	22	16	7	17.0	55.4	52.2	63.9	-
5F-781	NuTech/G2 Genetics	81	67	26	13	4	17.8	56.4	60.0	63.3	-
09R19	Blue River Hybrids	79	70	22	13	7	20.4	56.2	52.7	58.3	-
L-2213 VT2PRO	Legacy Seeds	80	67	24	10	4	18.1	57.7	57.1	57.3	-
N06P-3110	Syngenta	76	68	24	8	11	16.4	55.5	54.5	57.2	-
9301VT2PRIB	Integra/Wilbur Ellis	80	68	23	16	3	20.1	55.9	54.4	56.8	-
2803VT2PRIB	Integra/Wilbur Ellis	78	70	25	20	10	18.7	55.6	49.8	56.0	-
3142VT3PRIB	Integra/Wilbur Ellis	81	69	27	8	11	19.5	57.4	54.6	55.8	-
L-1814 VT2PRO	Legacy Seeds	79	69	26	6	16	18.8	58.2	52.9	51.5	-
3537VT2PRIB	Integra/Wilbur Ellis	85	71	27	12	11	24.5	55.7	62.3	-	-
5Z-783	NuTech/G2 Genetics	83	67	28	10	5	19.0	54.1	61.7	-	-
1182 GTCBLL	Proseed	82	70	24	8	9	20.7	55.0	59.3	-	-
N15J-3110	Syngenta	82	71	26	16	4	20.6	56.4	58.5	-	-
1280 VT2P	Proseed	80	68	25	11	6	20.6	57.0	57.3	-	-
4383VT2PRIB	Thunder Seed	83	66	23	15	5	18.8	58.0	55.5	-	-
5181RR	Thunder Seed	81	70	27	21	9	20.5	58.3	49.4	-	-
L-2415 VT2PRO	Legacy Seeds	83	69	24	17	11	19.2	56.2	49.0	-	-
1B730-RIB	REA Hybrids	73	65	25	9	13	17.7	60.2	47.3	-	-
1B820-RIB	REA Hybrids	82	68	25	22	12	21.3	57.0	46.0	-	-
Mean			68.0	24.7	13.7	8.0	19.02	56.44	54.45	-	-
C.V.%			1.9	8.5	43.4	88.9	3.7	1.0	13.0	-	-
LSD 5%			1.8	3.0	8.4	10.0	0.98	0.83	9.97	-	-
LSD 10%			1.5	2.5	7.0	8.3	0.82	0.69	8.34	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/27/15
Harvested: 10/31/15
Harvested area: 130 ft2
Previous crop: peas
Applied fertilizer in lb/a: 11 N : 0 P2O5 : 0 K2O : 12S
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 24P : 335K OM-1.8 pH-6.4
Soil test to 24" in lb/a: 75N
Previous Crop Credit: 40N
Chemical Applications: Fierce at 3fl.oz/A (preplant spring applied)

Maturity[1] = provided by company

DAP[2] = Days after planting

Test Weight[3] = Test Weight adjusted to 15.5% moisture

Yield[4] = Yield adjusted to 15.5% moisture

Green Snap: % of plants that exhibited stem breakage caused by severe wind = 7/28/15 - had sustained westerly winds of 20-40mph nearly all day with gusts over 50mph with 0.27 inch rainfall so all varieties lodged significantly to the east. Within a few days, a portion of stands had straightened up, but % green snap indicates amount that remained lodged so severly so that

Ear Drop: % of plants that have lost the main ear prior to harvest = 10/11/15 - had sustained westerly winds of 20-30mph nearly all day with gusts over 55mph causing the already weakened plants from 7/28 storm to lose their ear resulting in yield loss.

Irrigated Corn Variety Trial

Variety	Brand/ Company	Relative Maturity	Days to Silk[1]	Ear Height[3]	Harvest Moisture	Test Weight	Yield 2014	Yield 2015[4]	2 yr avg
			DAP[2]	inch	%	lb/bu	----------bu/a----------		
3537VT2PRIB	Integra	85	78	38	21.9	58.8	182.3	159.1	170.7
L-1814 VT2PRO	Legacy Seeds Inc.	79	76	41	17.2	59.3	184.2	123.0	153.6
L-2213 VT2PRO	Legacy Seeds Inc.	80	73	34	17.3	59.8	181.2	124.7	153.0
1B820-RIB	REA Hybrids	82	74	38	18.4	59.3	175.9	126.0	151.0
L-2314 VT2PRO	Legacy Seeds Inc.	83	73	44	16.9	58.4	166.1	133.2	149.7
5N-183	NuTech/G2 Genetics	83	78	43	17.8	58.2	166.8	132.2	149.5
3142VT3PRIB	Integra	81	72	42	16.8	60.3	166.6	114.3	140.5
9301VT2PRIB	Integra	80	72	39	17.4	59.7	163.7	116.6	140.2
1B790-RIB	REA Hybrids	79	77	39	19.7	58.5	-	144.0	-
5Z-783	NuTech/G2 Genetics	83	78	47	18.0	57.6	-	139.7	-
N15J-3110	Syngenta	82	78	42	17.7	58.2	-	138.2	-
5F-781	NuTech/G2 Genetics	81	73	41	18.2	58.5	-	133.6	-
N06P-3110	Syngenta	76	74	41	16.1	59.3	-	132.2	-
2803VT2PRIB	Integra	78	76	39	17.7	58.4	-	131.1	-
N07H-3010	Syngenta	77	75	37	17.1	59.5	-	123.9	-
N09V-3010	Syngenta	79	77	41	17.5	60.3	-	122.4	-
5F-775	NuTech/G2 Genetics	75	71	37	16.6	56.9	-	117.1	-
2823 GTCBLL	NuSeed/ Legend Seed	82	76	39	16.9	58.9	-	116.3	-
4383VT2PRIB	Thunder	83	71	36	18.2	59.6	-	114.2	-
2B840-RIB	REA Hybrids	84	72	43	15.5	59.7	-	102.8	-
1B731-RIB	REA Hybrids	73	68	41	15.0	61.2	-	96.5	-
5181RR	Thunder	81	77	38	17.9	59.2	-	96.4	-
5F-379	NuTech/G2 Genetics	79	72	39	17.4	58.2	-	89.4	-
Mean			74.4	39.8	17.53	59.03	173.35	122.91	150.99
C.V.%			2.5	11.4	6.8	1.1	-	15.6	-
LSD 5%			2.59	6.37	1.67	0.93	-	26.89	-
LSD 10%			2.16	5.32	1.40	0.78	18.90	22.47	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 5/12/2015
Harvested: 10/22/2015
Plot size: 100ft^2
Previous crop: Potato
Applied fertilizer in lbs/a broadcast: 392 lbs of 46-0-0 (4/10/2015)
Soil test to 6": 19 ppm P : 245 ppm K OM-2.3 pH-7.8
Soil test to 2' in lb/a: 49 lbs N
Soil type: Lihen Loamy Fine Sand
Yield goal: 190 bu/a
Planting population: 38,000 seeds/a
Row spacing: 30 inch
Herbicide applied: Roundup 24oz/a + Veracity 3qt/ 100 gal (6/23/2015)
Rainfall: 9.5 inches (5/12 - 10/22)
Irrigation: 7.7 inches (4/23 -8/3)
Days to Silk[1]= The number of days from planting until 1 inch silk has emerged
DAP[2]= Days after planting
Ear Height[3]= The height of the main ear measured from the ground to the shank of the ear
2015[4]= Yields reduced because of wind damage 7/28 (62mph) green snap & 10/11 (54mph) ear loss

Irrigated Pinto Bean Variety Trial						WREC-Nesson Valley 2015
Variety	Days to Mature DAP[1]	Canopy Height[2] inch	TW lb/bu	250 Kwt gram	Seeds / Pound lb	Yield[3] lb/a
Lariat	97	12	60.7	92.1	1233	3903
23ST27	96	14	61.8	88.5	1283	3640
Stampede	91	17	60.0	87.2	1301	3421
LaPaz	95	18	62.9	78.4	1447	3457
Maverick	93	13	60.5	92.8	1223	3381
ND020351-R	90	16	58.8	85.8	1325	2937
SF103-8	96	14	58.8	83.6	1359	2929
Windbreaker	88	11	58.3	87.7	1294	2664
ND-307	93	18	57.4	95.2	1194	2549
Mean	93.1	14.9	59.90	87.92	1295.3	3209.0
C.V.%	3.9	16.7	1.1	3.7	3.7	17.8
LSD 5%	6.5	3.6	0.93	4.78	69.2	834.8
LSD 10%	5.4	3.0	0.77	3.97	57.4	692.0

Irrigated Misc Bean Variety Trial							WREC-Nesson Valley 2015
Variety	Market Class	Days to Mature DAP[1]	Canopy Height[2] inch	TW lb/bu	250 Kwt gram	Seeds / Pound lb	Yield[3] lb/a
Rosie	KB	104	17	61.8	111.6	1016	3364
Rio Rojo	SR	92	19	63.6	67.3	1691	3323
Loreto	BL	97	17	65.0	48.3	2348	3172
Merlot	SR	96	20	62.0	84.9	1337	3051
Eclipse	BL	93	19	63.6	44.8	2533	2803
Zorro	BL	95	21	65.0	47.9	2368	2781
Montcalm	KB	104	16	59.2	126.4	897	2342
Pink Panther	KB	97	15	58.0	140.4	808	2312
Talon	KB	103	14	59.8	120.1	945	2309
Mean		97.7	17.7	62.00	87.97	1549.2	2828.6
C.V.%		2.2	10.3	0.6	2.8	3.5	18.4
LSD 5%		3.1	2.7	0.58	3.63	78.4	652.4
LSD 10%		2.6	2.2	0.48	3.01	65.0	540.9

KB= Kidney Bean, SR= Small Red, BL= Black Bean

Irrigated Navy Bean Variety Trial						WREC-Nesson Valley 2015
Variety	Days to Mature DAP[1]	Canopy Height[2] inch	TW lb/bu	250 Kwt gram	Seeds / Pound lb	Yield[3] lb/a
T9905	99	14	65.6	51.8	2191	3302
HMS Medalist	102	16	64.7	48.5	2340	2851
Avalanche	95	16	65.1	45.6	2490	2821
Vista	100	16	64.9	46.5	2445	2783
Ensign	102	13	64.8	50.8	2235	2744
Mean	99.4	15.1	65.02	48.64	2340.0	2900.3
C.V.%	3.0	12.6	0.8	2.6	2.7	20.4
LSD 5%	4.7	NS	NS	1.98	97.8	NS
LSD 10%	3.8	NS	0.69	1.61	79.8	NS

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 6/8/2015
Harvested: 10/16/2015
Plot size: 52.5 ft^2
Previous crop: barley
Solid seeded with 7.5 inch row spacing
Applied fertilizer in lbs/a broadcast: 215 lbs of 46-0-0 (6/4/2015)
Soil test to 6": 16 ppm P : 220 ppm K OM-2.0 pH-8.0
Soil test to 2' in lb/a: 41 lbs N
Soil type: Lihen Loamy Fine Sand

Yield goal: 2500 lbs/a
Planting population: 125,000 seeds/a
Row spacing: 7.5 inch
Herbicides applied: Section 2EC 6oz/a + Destiny 1% v/v (6/26/2015), Raptor 4oz/a + Trophy Gold 2pt/a + 28% 2pt/a (6/26/2015)
Rainfall: 7.3 in (6/8 - 10/1)
Irrigation: 7.5 in (4/21 - 7/27)
DAP[1] = Days After Planting
Canopy Height[2] = Height taken as is at harvest
Yield[3] = Dry beans direct harvested

Sprinkler Irrigated Dry Bean				EARC-Sidney, MT-2015		
	Bean Type	Yield cwt/a	Yield 2 yr	Test Weight lb/bu	100 Seed Weight	Disease Rating*
Centennial	Pinto	41.4	---	61.1	42.2	2.2
Othello	Pinto	34.5	37.8^	61.2	39.8	5.0
Mist	Navy	28.7	---	64.5	21.6	1.0
Zenith	Black	28.5	---	63.4	20.9	3.3
Fathom	Navy	28.1	---	64.6	21.9	2.0
Desert Song	FDJ	24.1	---	60.8	30.1	4.7
Rosie	LRK	22.3	28.8	59.3	44.0	2.3
Powderhorn	GN	21.8	34.6	52.2	36.8	5.8
Gypsy Rose	FDM	21.3	29.6	64.4	22.9	1.7
Alpena	Navy	20.7	---	62.6	36.1	3.3
Eldorado	Pinto	20.7	30.3	59.1	33.7	3.0
Yeti	WK	20.5	29.9	61.3	48.0	2.7
Inferno	LRK	17.9	26.6	58.6	46.7	3.3
Talon	DRK	17.8	27.7	58.6	46.3	3.0
Dynasty	DRK	13.5	---	52.5	38.6	3.0
Majesty	DRK	11.5	28.3^	56.6	46.9	4.7
CELRK	LRK	9.9	---	52.7	47.6	6.3
Snowdon	WK	9.4	18.9	53.0	51.2	5.8
Mean		21.8		59.9	37.5	3.9
P-values		<0.0001		<0.0001		<0.0001
LSD		9.8		0.6		1.4

*scale of 1-9, where 1=no disease and 9=dead

FDJ=Flor de Junio, FDM=Flor de Mayo, GN=Great Northern, DRK=dark red kidney, LRK=light red kidney, WK=white kidney

^ 3 year average

Sunflower Variety Trial **WREC, Williston - 2015**

Variety	Company	Hybrid Type	Oil Type	Downy Mildew Resistant	Plants per Acre	Days to Flower DAP[1]	Days to Mature DAP[1]	Plant Height inch	Lodging 0-9	Oil[2] -----%----- 2015	Oil[2] 3yr avg	Test Weight lb/bu	Yield -----lb/a----- 2015	Yield 2yr avg	Yield 3yr avg
Camaro II	Nuseed	Clearfield	NuSun	Yes	18094	66	113	44	2	34.9	35.6	32.9	1752	1691	1709
Talon	Nuseed	Express	NuSun	No	16586	67	114	46	5	31.4	33.2	29.5	1400	1694	1694
Hornet	Nuseed	Clearfield	High Oleic	Yes	16251	69	113	43	2	35.2	36.5	30.3	1452	1652	1694
12G20	Genosys	Clearfield	High Oleic	No	20607	68	113	46	5	33.8	35.5	31.3	1411	1339	1694
Cobalt II	Nuseed	Clearfield	High Oleic	Yes	23958	69	112	45	3	33.3	35.9	31.2	1389	1533	1675
69M2	NuTech	Express	High Oleic	Yes	20440	68	118	44	6	34.9	-	32.0	1501	1703	-
68H7	NuTech	Express	High Oleic	Yes	19937	68	118	48	5	34.9	-	32.5	1346	1485	-
12G25	Genosys	Clearfield	High Oleic	No	20998	68	115	43	2	37.0	-	34.2	1328	1451	-
11N94	Thunder Seed	Clearfield	NuSun	Yes	19937	67	114	42	3	34.6	-	33.0	1499	-	-
N4HM354	Nuseed	Clearfield	High Oleic	Yes	16419	67	113	46	4	34.2	-	31.9	1481	-	-
N4HM355	Nuseed	Clearfield	NuSun	Yes	18764	68	114	43	5	34.4	-	31.6	1475	-	-
42H94	Thunder Seed	Clearfield	High Oleic	Yes	17424	70	113	44	3	34.6	-	30.2	1456	-	-
35H92	Thunder Seed	Clearfield	High Oleic	Yes	17201	67	112	43	2	34.4	-	31.4	1399	-	-
12G28	Genosys	Conventional	High Oleic	No	19937	70	116	44	4	32.6	-	33.4	1363	-	-
12G04	Genosys	Conventional	High Oleic	No	20272	70	118	46	2	36.4	-	32.2	1273	-	-
Mean					19121.7	67.9	114.2	44.3	3.4	34.44	-	31.83	1435.0	-	-
C.V.%					14.8	2.9	1.4	6.9	57.8	2.2	-	1.7	15.3	-	-
LSD 5%					4028.9	2.8	2.3	4.4	2.8	1.07	-	0.77	313.8	-	-
LSD 10%					3357.9	2.3	1.9	3.6	2.3	0.89	-	0.64	261.5	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/29/15
Harvested: 10/23/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied)
DAP[1] = Days after planting
Oil[2] = Oil content adjusted to 10% moisture

LENTIL VARIETY DESCRIPTIONS

Variety	Origin[1]	Seed Color	Relative Maturity	Relative Height	Seed Size	Resistance To	
						Ascochyta	Anthracnose
Avondale	USDA	GREEN	MEDIUM	TALL	MEDIUM	NA	NA
CDC Greenland	Canada	GREEN	EARLY	MEDIUM	V LARGE	R	S
CDC Imigreen*	Canada	GREEN	MEDIUM	MEDIUM	LARGE	R	S
CDC Impala*	Canada	RED	EARLY	SHORT	EXTRA SMALL	R	R
CDC Impact*	Canada	RED	LATE	SHORT	SMALL	NA	NA
CDC Impress*	Canada	GREEN	M LATE	SHORT	LARGE	R	NA
CDC Imvincible	Canada	GREEN	EARLY	MEDIUM	SHORT	R	R
CDC LeMay	Canada	GREEN	EARLY	SHORT	SMALL	MS	S
CDC Maxim*	Canada	RED	M EARLY	MEDIUM	SMALL	R	R
CDC Redberry	Canada	RED	MEDIUM	MEDIUM	SMALL	R	R
CDC Redcoat	Canada	RED	M LATE	TALL	LARGE	R	R
CDC Red Rider	Canada	RED	M EARLY	MEDIUM	SMALL	MR	MS
CDC Richlea	Canada	GREEN	M LATE	MEDIUM	MEDIUM	S	S
CDC Rosetown	Canada	RED	EARLY	SHORT	SMALL	MR	MR
CDC Rouleau	Canada	RED	MEDIUM	MEDIUM	SMALL	MR	MS
CDC Viceroy	Canada	GREEN	M EARLY	MEDIUM	SMALL	R	MR
Crimson	USDA	RED	EARLY	M SHORT	SMALL	S	S
Essex	USDA	GREEN	MEDIUM	M TALL	MEDIUM	NA	S
Eston	Canada	GREEN	EARLY	MEDIUM	SMALL	S	S
Merritt	USDA	GREEN	M LATE	MEDIUM	LARGE	NA	NA
Morena	USDA	BROWN	EARLY	TALL	SMALL	NA	S
Pardina	Spain	BROWN	EARLY	SHORT	SMALL		NA
Pennell	USDA	GREEN	MEDIUM	MEDIUM	LARGE	NA	S
Riveland	USDA	GREEN	M LATE	TALL	V LARGE	NA	S

[1] Refers to developer: USDA = United States Department of Agriculture.

***** Clearfield lentil with imidazolinone tolerance.

Lentil Statewide Conventional VT												WREC, Williston - 2015	
	Stand	Days to	Days to	Vine	Canopy	Height	Lodging	Protein[2]	1000 Seed	Test	Yield		
	%	Flower	Mature	Length	Height	Index	0-9	%	Weight	Weight	-----lb/a-----		
Variety		DAP[1]	DAP[1]	inch	inch	%			g	lb/bu	2015	2yr avg	3yr avg
Large Green													
Pennell	95	58	91	14	12	84	0	26.9	61	57.2	1595	1405	1624
CDC Greenland	93	62	97	13	12	89	1	27.4	60	56.8	1305	1264	1513
Riveland	94	62	97	16	14	84	1	26.8	68	55.7	1367	1243	1436
Medium Green													
CDC Richlea	93	59	91	15	13	88	1	25.7	47	58.9	1798	1514	1716
Avondale	93	59	94	15	12	80	1	25.0	49	58.5	1730	1460	1612
Merrit	90	62	96	13	10	76	1	27.6	66	56.1	1219	1094	-
Small Green													
Essex	94	60	92	14	11	80	2	25.9	44	59.1	1757	1556	1766
CDC Viceroy	94	59	89	13	12	88	1	28.0	31	60.3	1533	1321	1548
Eston	90	60	90	12	11	88	1	26.7	36	60.1	1745	1441	1495
Small Red													
CDC Red Rider	89	62	95	14	11	79	1	25.7	43	59.7	1631	1467	1701
CDC Redberry	94	60	90	13	10	78	0	26.2	42	59.1	1501	1343	1586
CDC Rouleau	90	61	90	15	13	84	1	22.8	39	59.4	1563	1437	1561
CDC Rosetown	93	61	90	13	11	85	0	28.4	28	60.4	1478	1288	1537
CDC Redcoat	91	58	88	12	10	87	1	24.1	39	60.4	1620	1442	-
Crimson	85	58	87	12	10	83	3	26.3	35	60.2	1538	1255	-
French Green													
CDC Lemay	95	59	86	12	11	86	2	25.8	31	60.5	1561	1366	1560
Spanish Brown													
Morena	93	61	92	15	12	83	1	25.1	40	60.5	1536	1382	1561
Pardina	88	60	86	11	9	83	2	23.8	39	60.9	1759	1486	-
Mean	92.2	60.4	91.7	13.3	11.1	83.9	0.9	25.88	47.6	58.95	1532.8	-	-
C.V.%	2.8	2.9	1.7	8.3	9.7	6.7	50.7	1.8	2.6	0.4	10.0	-	-
LSD 5%	3.7	2.4	2.2	1.5	1.5	7.8	0.6	0.66	1.7	0.32	214.9	-	-
LSD 10%	3.1	2.0	1.8	1.3	1.3	6.6	0.5	0.55	1.4	0.27	179.7	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 4/29/15
Harvested: 8/18/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Prowl H2O at 3 pints/A (preplant spring applied), Intensity at 8fl.oz/A with Trophy Gold NIS at 1 quart/A (6/9), Gramoxone SL at 1 pint/A with LI700 at 1 quart/100 gallons (preharvest dessication 8/10)

DAP[1] = Days after planting

Protein[2] = Protein content adjusted to 0% moisture

Irrigated Lentil Variety Trial						WREC-Nesson Valley 2015
	Flower Date	Days to Mature	Height[2]	Protein[3]	TW	Yield
Variety	DAP[1]	DAP[1]	inch	%	lb/bu	lb/a
Large Green						
CDC Greenland	54	90	12	28.3	57.0	1529
Pennell	54	89	12	29.6	56.5	1269
Medium Green						
Avondale	53	85	12	27.0	59.3	2380
CDC Richlea	54	90	12	27.7	58.4	1947
Small Green						
CDC Viceroy	53	89	12	29.9	62.2	2616
Essex	54	88	12	26.9	59.2	1708
Small Red						
CDC Redberry	53	86	12	29.2	61.0	2805
CDC Red Rider	53	87	12	28.5	59.8	2013
Mean	53.5	88.4	11.8	28.23	58.77	1908.0
C.V.%	2.2	5.4	10.1	2.5	0.9	18.1
LSD 5%	NS	NS	NS	1.06	0.41	541.59
LSD 10%	NS	NS	NS	0.88	0.34	448.1

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft

Planted: 5/4/2015

Harvested: 8/10/2015

Plot size: 61.25 ft^2

Previous crop: barley

Applied fertilizer in lbs/a broadcast: 215 lbs of 46-0-0 (6/4/2015)

Soil test to 6": 28 ppm P : 236 ppm K OM-2.1 pH-7.7

Soil test to 2' in lb/a: 35 lbs N

Soil type: Lihen Loamy Fine Sand

Yield goal: 2500 lbs/a

Planting population: 750,000 seeds/a

Row spacing: 7.5 inch

Herbicides Applied: Sharpen 0.375 oz/a (5/5/2015), Section 2EC 6 oz/a + Destiny 1% v/v (6/4/2015), Gramaxone 2 pt/a + NIS 2 pt/100 gal (8/4/2015)

Rainfall: 5.6 in (5/4 - 8/4)

Irrigation: 7.5 in (4/21 - 8/4)

DAP[1] = Days After Planting

Canopy Height[2] = Height of the canopy as is at harvest

Protein[3] = Protein content adjusted to 0% moisture

Off-Station Lentil Variety Trial				WREC, Golden Valley County - 2015		
	Lodging 0-9	Protein[1] %	1000 Seed Weight	Test Weight	Yield -----lb/a-----	
Variety		2015	g	lb/bu	2015	3yr avg
Large Green						
CDC Greenland	7	26.3	60	54.6	1657	1898
Pennell	8	27.6	58	57.2	2026	2089
Merrit	8	28.9	60	55.7	1670	-
Medium Green						
Avondale	8	25.0	46	58.8	2434	-
CDC Richlea	7	25.4	52	58.6	2773	2589
Small Green						
Essex	8	25.7	41	59.6	2279	2312
CDC Viceroy	8	28.7	29	60.0	2232	2351
Small Red						
CDC Red Rider	8	25.9	41	59.8	2244	2434
CDC Redberry	1	26.0	38	59.1	1619	2122
French Green						
CDC Lemay	9	26.3	31	59.9	1275	1997
Mean	7.3	26.6	45.7	58.32	2020.9	-
C.V.%	11.2	2.6	4.8	0.5	13.3	-
LSD 5%	1.4	1.2	3.8	0.55	462.7	-
LSD 10%	1.2	1.0	3.1	0.45	381.9	-

Location: Latitude 46 50'; Longitude 103 59'W; Elevation 2890 ft
Planted: 5/5/15
Harvested: 9/2/15
Harvested area: 56 ft2
Previous crop: durum
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Grail-Grassna complex
Soil test to 6" in ppm: 13 P : 351 K OM-3.5 pH-6.9
Soil test to 24" in lb/a: 33N
Chemical Applications: Roundup at 1 quart/A with Vida at 1fl.oz/A (preplant spring applied), Gramoxone SL at 1 pint/A (preharvest dessication, 7/27)

Protein[1] = Protein content adjusted to 0% moisture

Clearfield Lentil Variety Trial **WREC, Williston - 2015**

Variety	Stand %	Days to Flower DAP[1]	Days to Mature DAP[1]	Vine Length inch	Canopy Height inch	Height Index %	Protein[2] %	1000 Seed Weight g	Test Weight lb/bu	Yield -----lb/a----- 2015	2yr avg	3yr avg
Medium Green												
CDC Imigreen CL	94	62	97	16	12	77	28.7	57	58.1	1094	680	1028
Small Green												
CDC Imvincible CL	90	60	91	12	8	74	28.8	35	60.2	1273	-	-
Small Red												
CDC Maxim CL	89	59	91	13	9	74	25.2	42	60.1	1615	1147	1278
Extra Small Red												
CDC Impala CL	94	60	88	10	8	84	29.4	32	60.8	1348	949	1296
Mean	91.6	60.1	91.6	12.4	9.5	77.3	27.99	41.6	59.78	1332.3	-	-
C.V.%	3.9	3.2	2.2	5.7	8.9	6.0	1.9	2.6	0.4	11.6	-	-
LSD 5%	NS	NS	3.2	1.1	1.4	7.5	0.83	1.7	0.42	246.8	-	-
LSD 10%	4.6	2.5	2.6	0.9	1.1	6.1	0.67	1.4	0.34	200.0	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 4/29/15
Harvested: 8/17/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Prowl H2O at 3 pints/A (preplant spring applied), Raptor at 4fl.oz/A with Trophy Gold NIS at 1 quart/A and Actamaster AMS at 12lb/100 gallons (6/9), Gramoxone SL at 1 pint/A with LI700 at 1 quart/100 gallons (preharvest dessication 8/10)

DAP[1] = Days after planting

Protein[2] = Protein content adjusted to 0% moisture

Off-Station Clearfield Lentil Variety Trial			WREC, Golden Valley County - 2015			
	Lodging 0-9	Protein[1] %	1000 Seed Weight	Test Weight	Yield -----lb/a-----	
Variety		2015	g	lb/bu	2015	2yr avg
Medium Green						
CDC Imigreen CL	3	29.6	59	57.3	1530	1351
Small Green						
CDC Imvincible CL	9	30.3	34	60.1	2532	-
Small Red						
CDC Maxim CL	1	26.1	40	60.3	2694	2004
Extra Small Red						
CDC Impala CL	8	30.1	33	60.8	2875	2063
Mean	4.9	29.00	41.5	59.63	2407.8	-
C.V.%	13.6	1.7	1.7	0.5	11.6	-
LSD 5%	1.1	0.77	1.1	0.49	447.8	-
LSD 10%	0.9	0.63	0.9	0.40	362.9	-

Location: Latitude 46 50'; Longitude 103 59'W; Elevation 2890 ft
Planted: 5/5/15
Harvested: 9/2/15
Harvested area: 56 ft2
Previous crop: durum
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Grail-Grassna complex
Soil test to 6" in ppm: 13 P : 351 K OM-3.5 pH-6.9
Soil test to 24" in lb/a: 33N
Chemical Applications: Roundup at 1 quart/A with Vida at 1fl.oz/A (preplant spring applied), Gramoxone SL at 1 pint/A (preharvest dessication, 7/27)

Protein[1] = Protein content adjusted to 0% moisture

Dryland Fallow Lentil				EARC-Sidney, MT 2014		
		Yield lb/a		Test Weight	100-seed wt gm	
Cultivar	Type	2014	3 yr	lb/bu	2014	3 yr
Essex	green	1056	1173	64.4	4.2	4.3
Avondale	green	981	1157	63.5	4.7	4.8
CDC Richlea	green	1169	1138	62.6	4.8	5.0
CDC Greenland	green	975	1097	62.5	6.0	6.2
CDC Redberry	red	866	1043	64.3	4.1	4.0
Morena	brown	867	1029	65.0	3.6	3.7
Eston	green	968	998	64.8	3.5	3.4
Riveland	green	821	958	60.6	6.4	6.7
CDC Impact	red	1088	856	65.0	3.2	3.4
Merrit	green	704	840	61.8	5.1	5.8
Crimson	red	946	812	64.4	3.4	3.4
Viceroy	green	1058	--	64.8	3.3	--
Pardina	brown	971	--	64.8	3.6	--
Impress CL	green	966	--	63.1	4.8	--
Red Coats	red	839	--	64.3	3.9	--
Imi-green	green	737	--	62.9	5.8	--
LSD 5%		136		0.7		

This trial was not harvested in 2015 due to hail.

Sprinkler Irrigated Lentil Trial
Sidney, MT- 2015

Variety	Type	Yield^ lb/ac	TW lb/bu	250 seed weight
CDC Invincible	green	3301	63	9
CDC Viceroy	green	3252	64	9
CDC Impala CL	red	2848	63	8
Avondale	green	2745	61	12
CDC Richlea	green	2671	59	13
CDC Maxim	red	2344	62	10
CDC Redcoats	red	2108	62	10
CDC Imigreen	green	1724	59	14
Mean		2624	61.7	10.8
CV		19	1.1	4.37
LSD		721.47	0.99	0.69

Planted: April 22 Harvested: August 21
^ adjusted to 13%
Previous crop: sugarbeet

Dryland Recrop Statewide Lentil Variety Trial
Richland, MT-2015

Variety	Type	Yield^ lb/ac	TW lb/bu	250 seed weight
CDC Richlea	green	1138	61	14
CDC Maxim	red	1134	64	11
CDC Imigreen	green	1082	62	16
Avondale	green	1075	62	15
CDC Invincible	green	986	64	9
Viceroy	green	928	65	9
CDC Impala CL	red	828	64	9
CDC Redcoats	red	746	65	10
Mean		990	63	11

No means, P values and LSD since only one rep harvested
^ yield adjusted to 13% moisture

FIELD PEA VARIETY DESCRIPTIONS

VARIETY	ORIGIN	VINE HABIT[1]	GROWTH HABIT[2]	VINE LENGTH	RELATIVE MATURITY	SEED SIZE	RESISTANCE TO POWDERY MILDEW
YELLOW COTYLEDON							
AC AGASSIZ	AC	SL	SD	TALL	MEDIUM	MEDIUM	R
AC EARLYSTAR	AC	SL	SD	TALL	EARLY	MEDIUM	R
BRIDGER	LEGUME LOGIC	SL	SD	MEDIUM	MEDIUM	MEDIUM	MS
CDC AMARILLO	CDC	SL	SD	MEDIUM	MEDIUM	MEDIUM	R
CDC LEROY	CDC	SL	SD	M SHORT	MED LATE	SMALL	R
CDC MEADOW	CDC	SL	SD	MEDIUM	EARLY	MEDIUM	R
CDC SAFFRON	CDC	SL	SD	MEDIUM	MEDIUM	MEDIUM	R
CDC TREASURE	CDC	SL	SD	MEDIUM	EARLY	SMALL	R
DELTA	LIMAGRAIN	SL	SD	MEDIUM	MEDIUM	MEDIUM	MR
DS ADMIRAL	DANISCO	SL	SD	TALL	MEDIUM	LARGE	R
JETSET	MERIDIAN	SL	SD	MEDIUM	MEDIUM	M SMALL	R
KORANDO	PULSE USA	SL	SD	MEDIUM	EARLY	MEDIUM	R
MONTECH 4152	MONTECH	SL	SD	MEDIUM	EARLY	LARGE	NA
MYSTIQUE	PULSE USA	SL	SD	M SHORT	M LATE	M SMALL	MR
SPIDER	NICKERSON	SL	SD	MEDIUM	MEDIUM	LARGE	R
SW MIDAS	SWEDEN	SL	SD	SHORT	M LATE	SMALL	R
SW TRAPEZE	SWEDEN	SL	SD	M SHORT	MEDIUM	MEDIUM	NA
VEGAS	PULSE USA	SL	SD	SHORT	M LATE	LARGE	NA
GREEN COTYLEDON							
ARAGORN	PROGENE	SL	SD	M SHORT	M EARLY	M LARGE	NA
ARCADIA	PULSE USA	SL	SD	MEDIUM	EARLY	SMALL	MS
CDC STRIKER	CANADA	SL	SD	MEDIUM	MEDIUM	M LARGE	S
CRUISER	WA	SL	SD	MEDIUM	MEDIUM	M SMALL	S
DAYTONA	MERIDIAN	SL	SD	MEDIUM	LATE	MEDIUM	R
K-2	LEGUME LOGIC	SL	SD	MEDIUM	EARLY	M SMALLL	S
MAJORET	SWEDEN	SL	SD	MEDIUM	M LATE	MEDIUM	S
STIRLING	WA	SL	SD	SHORT	EARLY	MEDIUM	R
VIPER	PULSE USA	SL	SD	M SHORT	M EARLY	MEDIUM	MR

[1] SL=semi-leafless. [2] SD=semi-dwarf.

Field Pea Variety Trial										WREC, Williston - 2015
	Days to Flower	Days to Mature	Canopy Height	Protein[2] -----%-----		1000 Seed Weight	Test Weight	Yield -----bu/a-----		
Variety	DAP[1]	DAP[1]	inch	2015	3yr avg	g	lb/bu	2015	2yr avg	3yr avg
Yellow Cotyledon Type										
CM3404	58	87	27	24.4	24.6	278	62.4	39.8	44.9	50.9
CDC Meadow	52	84	22	26.0	25.3	226	61.5	39.9	46.1	50.8
LN4228	52	86	19	26.1	26.6	267	61.0	33.0	44.2	47.9
Agassiz	54	84	19	26.3	25.7	242	60.1	36.7	43.8	47.0
DS Admiral	53	83	23	26.5	25.7	252	60.9	32.9	42.1	46.3
Bridger	52	87	21	27.3	26.7	239	62.0	30.6	38.1	44.4
Nette	52	87	24	27.3	25.7	294	62.2	25.7	38.5	44.0
Trapeze	52	86	21	27.7	26.5	271	59.7	32.2	38.1	44.2
Mystique	55	87	20	28.2	27.2	318	60.9	28.2	35.6	43.6
Abarth	52	87	24	26.7	25.5	295	60.6	28.8	37.8	43.2
Korando	51	86	22	28.4	27.9	317	61.4	29.4	38.6	42.0
Gunner	54	87	26	26.6	25.9	272	61.1	31.4	38.8	41.4
Hyline	54	82	23	25.6	-	248	60.9	36.2	41.0	-
LN4236	53	85	19	27.7	-	281	60.0	30.5	40.8	-
Durwood	52	86	24	26.1	-	262	61.1	34.9	40.6	-
LGPN4901	57	86	25	26.6	-	258	61.8	36.2	-	-
LGPN4903	52	85	23	25.3	-	260	61.3	35.2	-	-
LGPN4244	52	85	22	27.4	-	257	60.2	32.5	-	-
PUSA 0514	54	87	22	27.3	-	292	60.2	31.2	-	-
CDC Amarillo	58	87	23	26.7	-	252	60.5	30.9	-	-
CDC Saffron	55	85	20	26.9	-	268	61.5	30.2	-	-
LGPN4902	52	87	23	27.6	-	268	60.6	28.3	-	-
LGPN4243	52	87	21	28.4	-	305	61.3	20.1	-	-
Green Cotyledon Type										
LN1123	57	86	21	24.3	24.3	271	61.6	34.5	40.6	47.2
CDC Striker	52	85	17	24.5	25.1	218	61.0	38.0	41.5	46.7
Arcadia	53	85	18	25.3	25.6	231	60.4	34.1	42.2	46.5
Greenwood	52	86	21	23.4	22.6	225	61.2	33.7	39.1	44.0
Majoret	54	87	21	28.1	27.4	251	61.3	27.7	35.5	41.1
Cruiser	53	87	23	26.6	26.0	221	60.6	28.6	37.0	40.8
Aragorn	52	85	20	27.5	26.6	231	59.6	29.3	35.4	39.2
Ginny	52	87	22	24.7	-	223	61.2	31.9	43.6	-
PUSA 1114	52	87	21	26.2	-	279	62.4	32.6	-	-
LGPN1902	53	87	22	27.8	-	287	60.4	28.2	-	-
Mean	53.2	85.9	21.7	26.53	-	262.3	60.98	31.91	-	-
C.V.%	2.1	2.4	12.9	3.2	-	5.0	1.0	11.8	-	-
LSD 5%	1.5	2.8	3.9	1.20	-	18.4	0.88	5.31	-	-
LSD 10%	1.3	2.4	3.3	1.01	-	15.4	0.74	4.44	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/1/15
Harvested: 8/3/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valor at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied), Raptor at 4fl.oz/A with Basagran 6fl.oz/A and Trophy Gold NIS at 1qt/A (6/9)

DAP[1] = Days after planting

Protein[2] = Protein content adjusted to a 0% moisture

Irrigated Field Pea Variety Trial										WREC - Nesson Valley 2015
	Canopy		Protein[2]			Test		Yield		
	Height[1]	2013	2014	2015	3yr avg	Weight	2013	2014[3]	2015	3yr avg
Variety	inch	----------%----------				lb/bu	----------bu/a----------			
Yellow Cotyledon										
CDC Meadow	21	24.0	28.6	23.9	25.5	65.8	60.1	46.0	77.3	61.1
DS Admiral	24	25.3	27.1	25.3	25.9	65.7	54.6	45.6	75.8	58.6
Agassiz	20	24.8	28.9	25.4	26.4	64.8	53.5	44.0	73.5	57.0
Nette	20	-	-	24.6	-	65.9	-	-	71.5	-
Green Cotyledon										
CDC Striker	20	26.8	31.0	23.2	27.0	65.7	52.2	48.5	83.7	61.5
Majoret	20	25.8	29.5	25.9	27.1	64.9	48.4	42.1	77.5	56.0
Cruiser	20	24.8	28.6	23.3	25.6	64.9	57.3	40.5	64.8	54.2
Aragorn	16	-	-	25.0	-	63.8	-	-	67.9	-
Ginny	19	-	-	23.9	-	65.1	-	-	67.5	-
Mean	20.0	23.40	28.95	24.50	25.62	65.16	70.20	44.43	73.28	62.64
C.V.%	12.3	1.5	2.1	4.2	-	0.5	19.5	19.3	11.1	-
LSD 5%	3.6	-	-	1.34	-	1.49	-	-	11.86	-
LSD 10%	3.0	0.70	0.93	1.10	-	1.23	NS	NS	9.80	-

Location: Latitude 48 9.9222'N; Longitude 103 6.132'W; Elevation 1902 ft
Planted: 4/22/2015
Harvested: 7/27/2015
Plot size: 61.25 ft^2
Previous crop: barley
Applied fertilizer in lbs/a broadcast: none
Soil test to 6": 28 ppm P : 236 ppm K OM-2.1 pH-7.7
Soil test to 2' in lb/a: 35 lbs of N
Soil type: Lihen Loamy Fine Sand
Yield goal: 50 bu/a
Planting population: 400,000 seeds/a
Row spacing: 7.5 inch
Herbicides applied: Spartan Charge 2 oz/a (4/28/2015), Section 2EC 6 oz/a and Destiny 1% v/v (6/4/2015)
Rainfall: 5.6 in (4/22 - 7/27)
Irrigation: 7.5 in (4/22 - 7/27)
Canopy height[1] = Height of the Canopy as is at harvest
Protein[2] = Protein content adjusted to a 0% moisture
2014[3]= yields had chemical damage

Off-Station Field Pea Variety Trial			WREC, Golden Valley County - 2015			
	Protein[1]		1000 Seed	Test	Yield	
	-----%-----		Weight	Weight	-----bu/a-----	
Variety	2015	3yr avg	g	lb/bu	2015	3yr avg
Yellow Cotyledon Type						
Agassiz	21.7	22.6	222	57.0	43.3	46.2
CDC Meadow	21.6	22.1	204	59.4	50.8	44.3
DS Admiral	21.0	21.9	223	57.4	34.5	36.6
Nette	21.7	-	221	59.9	38.3	-
Mystique	22.7	-	234	56.9	27.5	-
Green Cotyledon Type						
CDC Striker	22.6	22.6	194	58.0	44.5	40.2
Cruiser	22.4	23.4	195	58.2	36.0	35.9
Majoret	23.7	24.7	221	58.4	22.6	29.9
Ginny	21.3	-	196	58.9	41.0	-
Aragorn	22.8	-	191	57.8	30.5	-
Mean	22.15	-	210.0	58.19	36.89	-
C.V.%	2.9	-	3.7	1.0	11.5	-
LSD 5%	1.11	-	13.4	1.04	7.29	-
LSD 10%	0.92	-	11.1	0.86	6.02	-

Location: Latitude 46 50'N; Longitude 103 59'W; Elevation 2890 ft
Planted: 5/5/15
Harvested: 9/2/15
Harvested area: 56 ft2
Previous crop: durum
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Grail-Grassna complex
Soil test to 6" in ppm: 13 P : 351 K OM-3.5 pH-6.9
Soil test to 24" in lb/a: 33N
Chemical Applications: Roundup at 1 quart/A with Vida at 1fl.oz/A (preplant spring applied), Gramoxone SL at 1 pint/A (preharvest dessication, 7/27)
Protein[1] = Protein content adjusted to a 0% moisture

Off-station Field Pea Variety Trial			WREC, McKenzie County - 2015			
	Protein[1]		1000 Seed	Test	Yield	
	-----%-----		Weight	Weight	-----bu/a-----	
Variety	2015	3yr avg*	g	lb/bu	2015	3yr avg*
Yellow Cotyledon Type						
DS Admiral	24.8	26.4	248	58.0	30.9	38.1
Agassiz	26.8	27.7	225	56.9	35.8	34.3
CDC Meadow	25.5	-	203	59.2	33.3	-
Mystique	26.9	-	257	56.8	33.1	-
Nette	25.4	-	239	60.3	29.4	-
Green Cotyledon Type						
CDC Striker	24.4	26.6	193	59.5	37.0	37.6
Cruiser	27.9	27.8	217	58.4	27.4	31.9
Majoret	27.4	28.3	226	58.3	25.1	31.9
Ginny	24.8	-	212	59.2	30.5	-
Aragorn	26.7	-	218	58.2	30.0	-
Mean	26.04	-	223.6	58.49	31.25	-
C.V.%	7.6	-	3.1	1.0	12.9	-
LSD 5%	3.38	-	11.8	0.96	6.89	-
LSD 10%	2.79	-	9.7	0.80	5.69	-

Location: Latitude 47 48'N; Longitude 103 25'W; Elevation 2265 ft
Planted: 4/30/15
Harvested: 8/13/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Dooley-Zahl complex
Soil test to 6" in ppm: 7 P : 190 K OM-2.4 pH-7.4
Soil test to 24" in lb/a: 40N
Chemical Applications: Raptor at 4fl.oz/A with Basagran 6fl.oz/A and Trophy Gold NIS at 4oz/A (6/11)
3yr avg* = average of 2012, 2014, & 2015
Protein[1] = Protein content adjusted to a 0% moisture

Sprinkler Irrigated Green Pea Variety Trial
Sidney, MT-2015

Variety	TKW gm	Test weight lb/bu	Plant height cm	Yield^ lb/a
Majoret	224	63	56.0	5828
Hampton	213	63	56.1	4806
Arcadia	196	63	55.3	4749
Daytona	229	63	56.0	4434
CDC Striker	219	63	56.0	4125
K-2	200	62	54.5	3834
Viper	210	62	55.0	3752
Aragorn	175	62	54.0	3459
LN1123	164	63	57.0	2196
Mean	204	62.59	56	4202
P-value	<0.0001	0.1156	<0.0001	0.0136
LSD	4.2	NS	0.2	370
CV	5.63	0.82	0.87	21.84

Planted: April 23
Harvested: August 4
Previous crop: sugarbeet
TKW= thousand kernel weight
Yield^= adjusted to 13% moisture

Sprinkler Irrigated Yellow Pea Variety Trial
Sidney, MT-2015

Variety	TKW gm	Test Weight lb/bu	Bloom date	Yield^ lb/ac
Durwood	229	63	56.3	5472
SW Midas	199	63	55.8	5012
Nette 2010	270	63	54.5	4826
AAC Carver	218	63	56.3	4560
AAC Lacombe	227	64	57.0	4358
SW Trapeze	206	62	55.8	4341
Abarth	221	62	54.0	4289
Korando	254	62	53.0	4256
CDC Meadow	177	63	55.0	4211
Mystique	235	62	56.0	4050
CDC Saffron	203	62	56.0	3786
CDC Treasure	189	63	55.3	3755
AC Earlystar	194	62	55.3	3725
Jetset	203	63	55.3	3686
AC Agassiz	210	62	56.3	3515
Delta	202	62	54.5	3426
DS Admiral	202	62	55.5	3342
Mean	214.0	62.5	55.0	4158
P-values	0.0	<0.0001	<0.0001	0.5
LSD	36.8	0.8	0.1	NS
CV	12.1	0.9	0.8	28.3

Planted: April 21
Harvested: August 8
Previous crop: sugarbeet
TKW= thousand kernel weight
Yield^= adjusted to 13% moisture
NS = not significant

Dryland Recrop Green Pea Variety Trial
Richland, MT-2015

Variety	Grain yield lb/ac	Plant height cm	Test weight lb/bu	TKW 1000 kernel wt
Arcadia	2273	44	62.88	205.0
Viper	1980	55	63.03	246.4
Bluemoon	1942	43	63.08	249.6
Daytona	1939	52	62.63	260.9
Greenwood	1914	44	62.95	209.4
Majoret	1873	45	62.88	251.5
Hampton	1857	37	62.25	234.6
Aragorn	1731	48	61.60	218.0
Ginny	1730	45	63.25	221.1
LN1123	1702	47	63.50	222.4
CDCStriker	1652	51	63.23	235.6
Mean	1907.0	47.2	62.76	232.9
P-value	0.1273	0.0015	0.0036	<0.0001
LSD	NS	7.31	0.81	9.6
CV	15.28	10.86	0.91	2.89

Planted: April 21
Harvested: August 8
NS = not significant
Previous crop: small grains
Soil type: Farnuf Reeder loam
No fertilizer applied
Preplant application of Roundup and Prowl

Dryland Recrop Yellow Pea Variety Trial
Richland, MT-2015

Variety	Grain yield lb/a	Plant height cm	Test weight lb/bu
Earlystar	2152	56	62.8
Vegas	2127	48	63.3
CDCMeadow	2013	49	63.1
Navarro	1991	49	63.7
Hyline	1944	44	62.4
Korando	1940	47	63.0
Jetset	1938	49	63.5
Mystique	1937	55	62.9
CDCAmarillo	1936	54	63.0
Nette2010	1930	46	64.1
Delta	1923	43	63.4
AACCarver	1920	50	62.4
Gunner	1901	52	63.4
CDCTreasure	1886	51	63.6
Bridger	1875	47	63.1
Durwood	1874	58	63.1
Spider	1859	54	63.4
Salamanca	1821	53	63.0
Abarth	1745	47	62.6
Trapez	1739	49	63.0
DSAdmiral	1735	52	62.8
CDCSaffron	1668	49	63.3
Agassiz	1596	52	62.4
AACLacombe	1311	52	64.1
Mean	1908	50.1	63.16
P-value	0.2076	0.0107	<0.0001
LSD	NS	7.3	0.68
CV	18.35	10.41	0.76

Planted: April 21
Harvested: August 8
NS = not significant
Previous crop: small grains
Soil type: Farnuf Reeder loam
No fertilizer applied
Preplant application of Roundup and Prowl

Dryland Fallow Field Pea **EARC-Sidney, MT 2014**

Cultivar	Type	Yield lb/a 2014	Yield lb/a 3 yr	Test WT lb/bu 2014	100-seed wt gm 2014	100-seed wt gm 3 yr
SW Midas	Yellow	3072	2409	65.4	20.8	20.2
Arcadia	Green	2573	2214	65	20.6	20
Montech 4152	Yellow	2520	2188	66.1	24.8	24.6
DS Admiral	Green	2692	2121	65.6	23	23.2
Majoret	Green	2701	2089	66.6	23.7	22.8
Bridger	Yellow	1982	2075	65.5	21.3	21.5
CDC Striker	Green	2592	1974	65.8	23.6	22.8
Cruiser	Green	2439	1953	63.9	20.2	20.2
Earlystar	Yellow	2857	--	64.9	21.2	--
CDC Leroy	Yellow	2838	--	66.3	16.2	--
Jet Set	Yellow	2703	--	65	21.2	--
CDC Treasure	Yellow	2635	--	65.9	21.4	--
Aragorn	Green	2441	--	64.3	21	--
Daytona	Green	2441	--	65.5	25.8	--
Agassiz	Yellow	2435	--	65.3	21.8	--
LSD 5%		311.7	--	0.7	9.1	--

Planted: April 23 Harvested: July 31
This trial was not harvested in 2015 due to hail.

Chickpea Variety Trial														WREC, Williston - 2015
	Stand	Days to	Days to	Plant	Protein	Seed Size -----%-----				1000 Seed	Test	Yield -----lb/a-----		
Variety	%	Flower DAP[1]	Mature DAP[1]	Height inch	% 2015	<8mm	8-9mm	9-10mm	>10mm	Weight g	Weight lb/bu	2015	2yr avg	3yr avg
Large Kabuli														
CDC FRONTIER	89	55	100	14	19.4	59	38	3	0	374	62.0	2094	2198	2023
CDC ORION	75	53	101	12	16.4	19	51	29	2	443	60.1	1951	1878	1955
CDC ALMA	88	55	97	12	18.3	38	53	9	0	404	62.6	2243	2025	1950
CDC LUNA	84	54	96	11	18.2	33	52	15	1	406	61.3	1879	1820	1788
SAWYER	80	54	97	16	19.2	29	43	27	2	451	62.1	1758	1757	1673
SIERRA	81	55	99	14	18.4	9	32	45	15	499	60.5	1527	1456	1437
Small Kabuli														
B-90	80	59	101	13	18.7	100	1	0	0	255	62.1	1739	1804	1808
Desi														
CDC ANNA	86	53	94	14	18.8	100	0	0	0	206	61.0	2113	2051	1864
Mean	84.2	54.4	100.3	13.7	18.43	26.9	35.7	30.4	7.1	455.1	60.87	1800.7	-	-
C.V.%	5.5	2.6	1.9	11.7	6.1	13.7	11.0	13.7	52.6	3.6	0.9	10.1	-	-
LSD 5%	6.5	2.0	2.7	2.3	1.4	5.2	5.5	5.9	5.3	23.1	0.82	257.72	-	-
LSD 10%	5.5	1.7	2.2	1.9	1.1	4.3	4.6	4.9	4.4	19.3	0.68	215.25	-	-

Location of the WREC: Latitude 48 8'; Longitude 103 44'W; Elevation 2105 ft
Planted: 5/1/15
Harvested: 9/15/15
Harvested area: 56 ft2
Previous crop: spring wheat
Applied fertilizer in lb/a: none, but inoculated with granular inoculant at planting
Soil type: Williams-Bowbells loam
Soil test to 6" in ppm: 37P:430K OM-1.9 pH-6.0
Soil test to 24" in lb/a: 78N
Chemical Applications: Valoe at 3fl.oz/A (preplant fall applied), Spartan Charge at 2.75fl.oz/A (preplant spring applied), Intensity at 8fl.oz/A with Trophy Gold NIS at 1qt/A (6/9), Bravo Weatherstick at 1.5pints/A (7/2), Headline at 8fl.oz/A (7/17), Gramoxone SL at 1 pint/A with LI700 at 1quart/100 gallons (preharvest dessication 9/9)
DAP[1] = Days after planting

Sprinkler Irrigated Chickpea Fungicide Trial **Sidney, MT, 2015**

Variety	Disease[1] Rating^	Yield lb/ac
Frontier	5.3 A	1276 A
Sawyer	5.2 A	93.3 B
Sierra	5.1 A	37.5 B
Mean	5.2	86

P Value for Variables

	Disease[1]	Yield
Variety	0.773	<0.0001
Fungicide	0.858	0.016
# of Applications	0.898	0.02

Interaction of Variety and Number of Fungicide Applications

Variety	Number of Applications	Disease[1] Rating^	Yield lb/ac
Frontier	0	5.3	1022.9
Frontier	1	5.2	1316.1
Frontier	2	5.3	1323.1
Sawyer	0	5.3	24.2
Sawyer	1	5.2	79.7
Sawyer	2	5.2	155.1
Sierra	0	5.2	19.2
Sierra	1	5.1	29.1
Sierra	2	5.1	63.4
Mean		5.2	448.1
LSD		ns	ns

P Values for Interactions

Interactions	Disease[1]	Yield
# of Sprays/Variety	0.996	0.196
# of Sprays/Fungicide	0.517	0.059
Variety/Fungicide	0.038	0.057

	Frontier		Sierra		Sawyer	
Treatment	Yield lb/ac	Disease[1] Rating^	Yield lb/ac	Disease[1] Rating^	Yield lb/ac	Disease[1] Rating^
No Fungicide	1023	5.3	19	5.2	24	5.3
Bravo Top	1309	5.2	49	4.8	74	5.3
Propulse/Induce	1458	4.8	39	5.2	112	5.2
Serenade	1036	5.8	39	4.7	47	5.0
Endura	1616	5.0	47	4.7	152	5.5
Priaxor	1296	6.0	39	5.5	128	4.7
Proline/Induce	1195	4.7	30	5.8	116	5.3
Mean	1276	5	37	5	93	5

Disease[1] = Ascochyta

ns = not significant

^ scale 1-9, 1=no disease and 9=dead

Data with the same letters are not significantly different

Plots were inoculated with *Ascochyta rabiei* June 9th

Planted: April 21

Harvested: Sept 28

Previous crop: sugarbeet

Dryland Recrop Chickpea Fungicide Trial — **Richland, MT, 2015**

Variety	Disease[1] Rating^	Yield* lb/ac
Sawyer	5.73 A	1550 A
Sierra	5.52 A	1432 A
Frontier	4.91 B	1753 B
Mean	5.39	1578

P Value for Variables

	Disease[1] Rating	Yield
Variety	0.0135	0.46
Fungicide	0.56	0.56
# of Applications	<0.0001	0.002

Treatment	Disease[1] Rating^	Yield* lb/ac
No Fungicide	5.47 A	1586 A
Bravo Top	5.47 A	1482 A
Propulse/Induce	5.47 A	1467 A
Serenade	5.44 A	1655 A
Endura	5.36 A	1640 A
Priaxor	5.33 A	1639 A
Proline/Induce	5.17 A	1578 A
Mean	5.39	1578
LSD	0.37	264

P Values for Interactions

Interactions	Disease[1] Rating	Yield
# of Sprays/Variety	<0.0001	0.04
# of Sprays/Fungicide	0.74	0.92
Variety/Fungicide	0.94	0.83

Interaction of Variety and Number of Fungicide Applications

Variety	Number of Applications	Disease[1] Rating^	Yield* lb/ac
Frontier	0	4.9	1670
Frontier	1	5.1	1739
Frontier	2	4.5	1821
Sawyer	0	5.7	1528
Sawyer	1	5.8	1538
Sawyer	2	5.6	1586
Sierra	0	5.8	1560
Sierra	1	5.5	1352
Sierra	2	5.4	1528
Mean		5.4	1591
LSD		ns	ns

Planted: April 21
Harvested: September 11
[1]Disease = Ascochyta
^ scale 1-9, 1=no disease and 9=dead
*adjusted to 13% moisture
Data with the same letters are not significantly different
ns = not significant
Previous crop: small grains
Soil type: Farnuf Reeder loam
No fertilizer applied
Preplant application of Roundup and Prowl

Dryland Recrop Chickpea Variety Trial
Richland, MT- 2015

Variety	TW lb/bu	Height inches	TKW^ gm	Yield* lb/ac
CDCFroniter	61.1	33.5	398	2020
CDCOrion	59.2	32.8	434	1958
Myles	58.0	31.3	179	1027
Sawyer	59.4	36.5	521	1520
Sierra	58.8	36.5	550	1353
Mean	59.8	34.3	433.6	1619.0
P-value	<0.0001	0.0	<0.0001	<0.0001
LSD	0.2	1.0	7.0	85.0
CV	0.9	6.1	3.5	11.3

Planted: April 21
Harvested: Sept 11
Previous crop: small grains
^ 1000 kernal weight
* adjusted to 13%
No fertilizer
Farnuf Reeder loam
Preplant application of Roundup and Prowl

Sprinkler Irrigated Coded Sugarbeet Variety Trial
Sidney,MT-Approved Varieties for 2016

Variety	Root Yield T/ac		Percent Sucrose		Sucrose Yield lb/ac		Extractable	Sucrose lb/a
	2015	3 yr	2015	3yr	2015	3 yr	2015	3yr
Crystal S360NT^	37.7	38.5	16.50	17.38	12433	13396	11479	12530
Crystal S498	29.2	---	17.57	---	10225	---	9663	---
BTS 4424	34.2	---	15.61	---	10619	----	9887	---
BTS 437N^	31.2	36.6	16.46	17.13	10259	12624	9524	11847
Crystal RR081	29.0	29.1	16.47	16.02	9516	9649	8875	9023
BTS 42RR8N	33.9	30.4	16.38	16.04	11092	10146	10368	9503
Crystal RR052	30.8	30.1	16.28	15.52	10013	9739	9259	9035
Crystal RR269NT	33.5	31.9	16.29	15.56	10887	10278	10075	9540
BTS 42RR65	28.5	26.7	16.85	16.17	9605	8960	9011	8398
Average			16.53	30.45	10052		9375	
Probability			<.0001	<.0001	<.0001		<.0001	
CV(S/MEAN)			4.38	13.92	13.72		13.69	
LSD(0.05)			0.10	0.17	188		175	

Planted	April 28	Harvested	Sept 22
Thinned	June 8	Previous crop	small grains

^ 2 year averages

2015 Flood Irrigated Sugarbeet Green Manure Trial
Sidney, MT, 2015

Treatment	Root Yield T/ac	Sucrose %	Sucrose Yield lbs/ac	Extractable sucrose lbs/a
Peas Plowed Under	35.37	16.83	11910	11793
Peas Harvested	33.30	16.97	11358	11246
Mean	34.43	16.9	11659	11545
LSD	2.21	0.51	790	782

Planted: April 28 Harvested: Sept 22
Previous crop: peas

Sprinkler Irrigated Sugarbeet Population Trial
Sidney,MT-2015

Spacing inches	Root yield T/ac	Sucrose %	Sucrose yield lb/a	Extractable sucrose lb/a	Harvest Stand plants/a
3	30.4	16.0	9713	9025	32186 A
4	34.0	16.0	10907	10087	27346 B
5	33.4	15.5	10285	9433	27346 B
CV	10.8	3.2	10.73	10.7	16.43
LSD	ns	ns	ns	ns	

Planted April 28 ns = not significant
Harvested Sept 22 Variety BTS42RR8N
Previous crop: small grains
30 lbs nitrogen applied May 27 and June 19
Data with the same letters are not significantly different

Dryland Crop Performance Comparisons - Williston, ND 2015†

Gautam Pradhan

Crop	Type	Variety	Yield 3 Yr Avg. (bu/a)	Market Price ($/bu)	Gross Return ($/a)	+ or - Barlow ($/a)
HRS Wheat		Barlow	31.7	4.50	142.52	0.00
		Glenn	33.7	4.66	156.97	14.45
HRW Wheat		Jerry	56.1	2.71	152.03	9.51
Durum Wheat		Joppa	39.9	6.00	239.40	96.88
Barley	(Feed)	Conlon	62.8	2.00	125.60	(16.92)
	(Malt)	ND-Genesis	63.6	3.75	238.50	95.98
Oats		Jury	72.5	1.92	139.20	(3.32)
Corn		Average‡	64.5	2.72	175.44	32.92
Flax		Average‡	24.0	8.20	196.80	54.28
Soybeans	(Conventional)	Sheyenne	23.0	7.71	177.33	34.81
Field Peas	(Green)	Arcadia	46.5	7.50	348.75	206.23
	(Yellow)	CDC Meadow	50.8	7.00	355.60	213.08
			(lb/a)	**($/CWT)**		
Canola		6070 RR	1478.0	13.75	203.23	60.70
Safflower		MonDak	1923.0	20.00	384.60	242.08
Sunflower	(Oil)	Camero II	1709.0	15.00	256.35	113.83
Lentils	(Medium green)	CDC Richlea	1716.0	38.50	660.66	518.14
	(Small green)	Essex	1766.0	34.00	600.44	457.92
	(Small red)	CDC Red Rider	1701.0	34.00	578.34	435.82
Chickpeas	(Large kabuli)	CDC Frontier	2023.0	23.50	475.41	332.88
	(Small Kabuli)	B-90	1808.0	20.00	361.60	219.08

†The market price was obtained on 11/30/2015 from grain elevators in and around Williston.

‡Average of several varieties and/or types within the crop.

Comparing Tillage Systems (conventional, minimum, no-till) With Overhead Irrigation Using a 3-Year Crop Rotation of Corn, Soybean, and Barley (Nesson Valley 2015).

Tyler Tjelde and James Staricka

Introduction

Conventional tillage is used on more than 80% of the 300,000 irrigated acres in the MonDak region. The MonDak region consists of the northwest corner of North Dakota and northeastern portion of Montana. There is a large diversity of crops, greater than twenty, currently grown at various acreages throughout this region. The corn, soybean, barley rotation was chosen based on farmer interests, markets and increasing production acres of those crops. Controlling soil erosion has always been a major concern with conventional tillage. This project has been generated to provide agricultural producers of the MonDak region evidence that other viable tillage options exist within an irrigated environment.

Conventional Tillage Wind/Soil Erosion

Objectives

This project examines the interaction between crop production and tillage and the interaction between tillage systems and soil quality to better understand the benefits of overhead irrigation on production and tillage. Questions we hope to answer include: How is tillage going to affect the quality of our soil? Will soil quality affect crop production when irrigation is involved? What are the benefits of selecting the proper tillage to match the specific crop?

Methods

A three-year crop rotation of corn, soybean, and barley was initiated in the spring of 2008. The plot strips were 50' x 165', and replicated four times in a split block design. Tillage of the conventional plots was initiated in the fall following harvest. In the spring, additional tillage was done to the conventional tillage plots. Conventional tillage consisted of multiple passes (6 total) with a disc (2x), ripper (2x), and mulcher (2x) resulting in <30 % residue. Minimum tillage varied (≤ 2 passes) based on previous crop and was done in the spring prior to planting. Corn residue was aggressively disked at 5 mph cutting at a depth of 4 inches while maintaining >30% residue cover and then mulched for firmer seed bed. Barley residue was also disked but ground speed (3 mph) and depth (3 inches) were reduced to maintain the > 30% residue cover and then mulched to firm soil seedbed. A disk was used to till the soil (depth 2 inch/speed 2.5mph) in soybean residue, leaving most of the residue on the soil surface and mulched to firm soil seedbed. Only trash wipers (residue managers) were used in the no-till system of corn and soybean to move residue from seed row. Crops were seeded with commercial field equipment; corn and soybean planted with a John Deere 7200 Maxemerge with 30 inch spacing and barley planted with a John Deere 1790 no-till single disk grain drill. Corn varietal selection was determined by growing degree days and an 80 day-length variety. A 0.2 relative maturity soybean variety was used. Tradition barley was used all seven years of the project. Fertilizer was spring applied at recommended rates determined

by soil testing. Each crop was managed the same regardless of the tillage system during the growing season. Weeds were managed with herbicides to minimize their impact on production. Percent residue cover, soil temperature, and stand counts were measured after planting/crop emergence. Residue amounts were measured after planting using the Line Transect Method. Soil water content was measured in all three crops and tillage systems to identify crop water needs. Representative areas within the plots were harvested with a plot combine for data collection. Grain yield, proteins, and test weights were measured after harvest.

Results

Table 1 shows yield associated with tillage treatment for the three crops. Averaged across seven years for yield and test weight for each of the crops and the three tillage systems.

Table 1. Comparing Tillage Systems **WREC - Nesson Valley 2015**

	Corn						Soybean				Barley					
	Yield		Test Weight		Harvest Moisture		Yield		Test Weight		Yield		Test Weight		Protein	
	--- bu/a ----		---- lb/bu ----		------- % -------		--- bu/a ---		---- lb/bu ----		--- bu/a ---		---- lb/bu ----		----- % -----	
Tillage System	2015	6yr avg*	2015	6yr avg*	2015	5yr avg^	2015	7yr avg	2015	7yr avg	2015	7yr avg	2015	7yr avg	2015	7yr avg
Conventional Till	138.0	156.8	59.1	57.7	15.9	16.1	41.8	44.6	55.0	56.5	103.3	97.8	50.6	50.6	14.2	12.9
Minimum Till	154.8	160.8	59.2	57.3	16.6	16.1	42.8	45.0	55.1	56.6	117.0	91.0	50.3	50.4	13.5	12.6
No Till	159.8	148.5	58.0	55.9	18.6	17.5	44.3	44.1	55.6	56.7	118.3	84.8	48.7	49.6	13.3	12.0
Mean	150.9	155.4	58.8	57.0	17.0	16.6	43.0	44.6	55.2	56.6	112.9	91.2	49.8	50.2	13.7	12.5
C.V.%	13.3	--	0.6	--	5.9	--	9.4	--	0.5	--	9.6	--	0.9	--	3.9	--
LSD 5%	NS	--	0.6	--	1.8	--	NS	--	0.4	--	NS	--	0.8	--	0.9	--

*6 yr avg = 2009 excluded because of stand issues (2010-2015)

^5 yr avg = (2011-2015)

Conclusions

Comparing tillages systems with a three year crop rotation of corn, soybean and barley is proving to be as effective in minimum till as conventional till in a seven year average under irrigation. Other observations made are the soybean no till system following corn is doing as well as the conventional till and minimum till systems. The results have demonstrated in an irrigated environment reduced tillage can be as productive as a conventional till system.

Quantifying Water Use (Water Use Efficiency) in Irrigated Durum Wheat Production on Lihen Fine Sandy Loam Soils

Tyler J. Tjelde, James A. Staricka
North Dakota State University-Williston Research Extension Center

Abstract

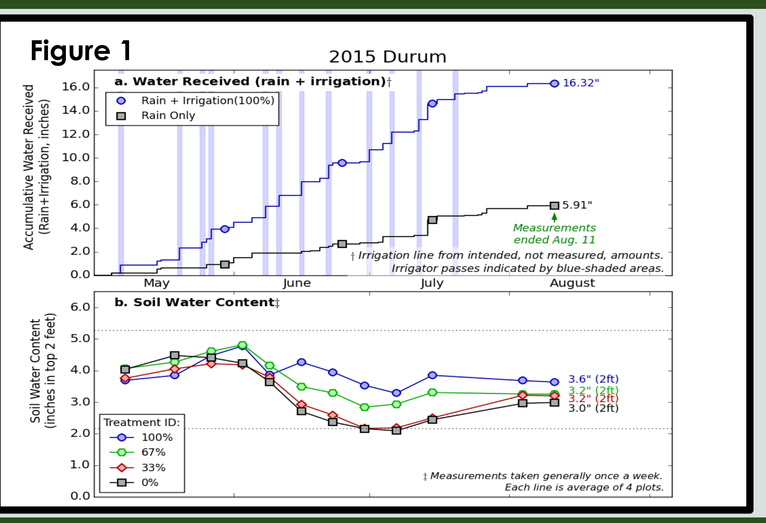
Water for irrigation is becoming limited, resulting in a critical need to improve water use efficiency. This investigation assessed overhead sprinkler irrigation to develop and modify irrigation scheduling for producers to maintain production while becoming more efficient with their irrigation water use. Durum wheat was grown using four irrigation rates (100%, 67%, 33%, and 0 irrigation) to determine the effect on yield and quality. The 100% treatment is the optimum amount determined by soil moisture monitoring throughout the growing season for sufficient plant available water. Durum yields have been maintained while reducing water rates by a third in four of six years and while reducing water by two-thirds in two of six years. Year-to-year differences in water usage and crop production are directly related to the seasonal climatic conditions.

Introduction

Irrigation is very important to the state of North Dakota. Irrigation provides consistent growth to crops with higher water demands that typically could not be grown otherwise. . There are 290,000 acres of irrigated land in North Dakota with the expansion potential of 500,000 acres. The value of irrigated land returns 3-4 times that of a typical dryland acre over long term production history. Improved irrigation management is the key to further develop these untapped irrigated acres. Can irrigation rates be reduced and production retained? Could reducing rates on already irrigated land be used to expand on existing dryland acre? The Missouri River has ample water and provides North Dakota with opportunities for further irrigation development. Yet the water used on the majority of current irrigated acres comes from aquifers and areas that have maximized water uptake and no more water permits exist. What happens to these areas if restrictions and limitations are put in place like others parts of the country that have limits on water usage? This reduction on allocated water usage will affect irrigation decisions. The purpose of this project was to assess crop performance at reduced water rates in the event water restrictions are implemented.

Methods & Materials

Figure 1



The experimental design is a Randomized Complete Block Design (RCBD) with four replications of four treatments. Each plot was 50 ft by 60 ft. The treatments consisted of four irrigation rates (100%, 67%, 33%, 0%). The irrigation amounts for the 100% treatment were determined using the soil moisture data collected from the neutron depth moisture gauge and referencing the North Dakota Ag Weather Network (NDAWN) irrigation scheduler (http://ndawn. ndsu.nodak.edu). Maintaining optimum soil moisture content (Figure 2b) is the objective of the 100% treatment and additional soil moisture to the 100% treatment would not improve production based on plant available water. The NDAWN scheduler is a checkbook system using soil properties (thickness of soil layers and the water holding capacity of each layer), weather parameters (average daily air temperature, daily solar radiation, daily rainfall), crop properties (root depth and water use based on growth stage, planting date and emergence date), and user-supplied irrigation information (dates and amounts). An observation station of the NDAWN system, listed as "Hofflund" on the NDAWN records, is located on the research site. Soil water content of top two feet was determined within each plot using a neutron depth moisture gauge. These weekly soil moisture measurements were used to calibrate the checkbook irrigation scheduling system. A rain gauge was placed within each plot and adjacent to the neutron gauge access tube. Data from the gauges were used to determine rain and irrigation rates. The data also provided a means to verify that each plot received the correct irrigation amount (Figure 2a). All cultural practices (tillage, fertilizer, planting populations, chemical, and fungicide applications) were the same for all treatments within crop to minimize the effects of variables other than water amount. Yield and quality analysis for all the crops was done by the WREC.

Results

Figure 2

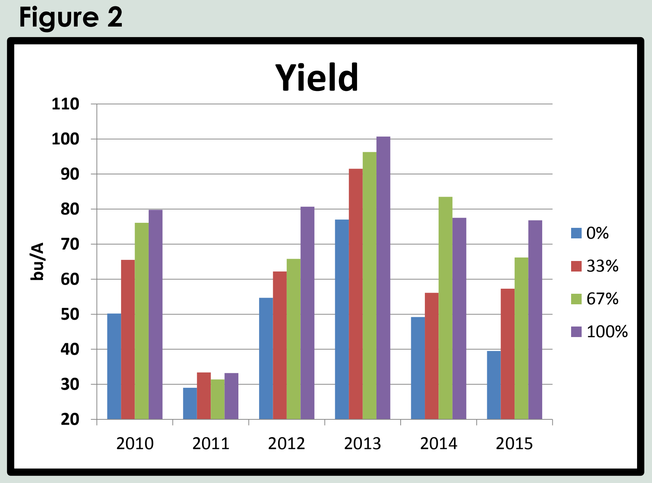


Figure 3

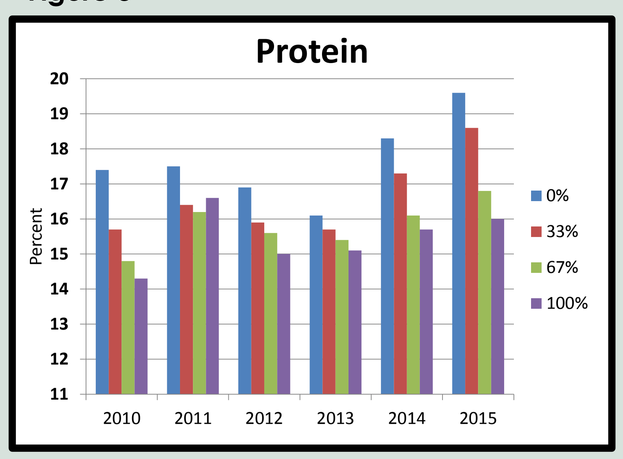


Figure 4

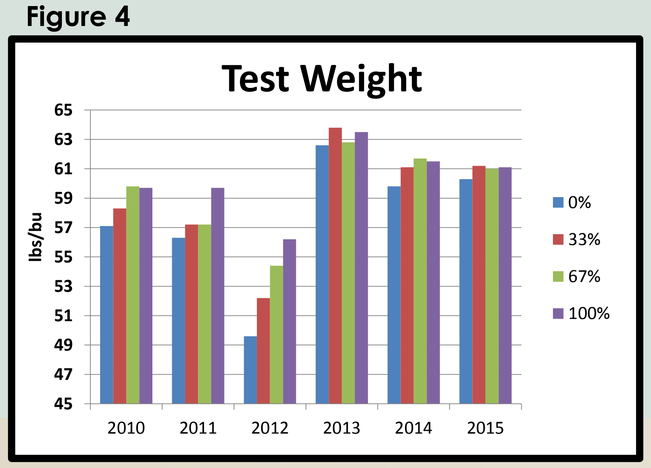
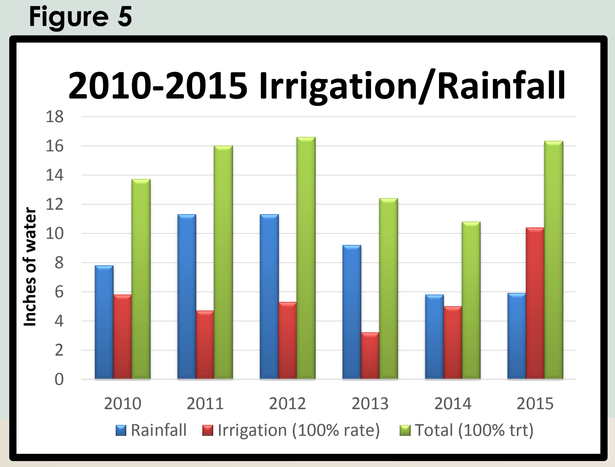


Figure 5



Results after six years of reduced water rates in durum shows reducing water by a third did not ($P<0.05$) decrease yields in four (2010, 2011, 2013, 2014) of six years. Reducing water by two-thirds did not decrease yields in two (2011 and 2013) of six years (Figure 2). The 2011 trial had Fusarium Head Blight that affected all treatments. Early plant growth and development with plant available water (PAW) levels above wilting point will reduce impacts on yields later into the season. Water usage each year is going to be different based on crop development and the climatic conditions. Quality results differed more than yield amongst the treatments. The 0% Treatment had significantly ($P<.05$) higher protein than the 100% treatment all six years (Figure 3). Test weights varied year by year (Figure 4). Looking at the year to year differences of water usage (Figure 5) relative to the yields (Figure 2), suggests this variation in water received is an interaction with weather and plant growth/development. Soil moisture readings (neutron probe) suggest PAW in the 100% treatment (Figure 1) has been optimal throughout the growing season and additional water applied would not increase yields.

Conclusion

The project has demonstrated that irrigation water usage can be reduced and yields maintained in durum production. Wheat is not a high water demand crop and irrigation can still drastically boost production. The water savings over the four years when yields were not significantly different between the 100% and 67% treatments totaled 6.25 inches of water per acre. This would result in a saving of 39 acre feet on a 160 acre pivot during those years. When using an alternative crop in rotation such as sugarbeet and using the data collected from a related trial would provide enough irrigation in the durum 67% treatment over this same time frame while maintaining yields in both. This data suggests that improving water use efficiency can reduce water usage and retain production.

The vision of the NVIRDP is to advance irrigation practices, improve crop production within an irrigated system, improve and enhance irrigation efficiency, and develop new alternative cropping systems to improve water, nutrient and pest management and develop high value/value added crops and crop varieties to promote irrigation development and ag processing in the region.

NDSU NORTH DAKOTA STATE UNIVERSITY

Plant Pathology Update: Fusarium Head Blight

Dr. Audrey Kalil

Plant Pathologist (WREC)

Fusarium Head Blight (FHB) caused primarily by the fungus *Fusarium graminearum* is one of the most important diseases affecting wheat, durum and barley in North Dakota. This pathogen overwinters on host crop residue (including corn) and when conditions are warm, humid and wet the fungus will produce spores which then infect the crop. Disease occurs when the spores land on the heads and can result in reduced seed production and shriveled kernels. Most importantly, this fungus also produces a mycotoxin called deoxynivalenol (DON), otherwise known as vomitoxin, which is harmful to animals and humans who consume the contaminated grain. The USDA recommendation is that DON levels not exceed 1 ppm in human foods.

To reduce FHB it is best to employ a combination of approaches. Avoid planting wheat, barley, or durum on crop reside from an FHB susceptible host to reduce the amount of initial fungal inoculum. Some fungicides are registered for control of FHB but timing of the application is very important. You can expect a reduction in disease of 50-60% if applied correctly. Variety selection is another means of control, with some varieties exhibiting moderate resistance.

Grain harvested from variety trials of HRSW and durum conducted at the WREC in Williston under dryland conditions, the WREC irrigated station at Nesson Valley, and at off-station plots sites in McKenzie and Mountrail counties were assessed for vomitoxin contamination. Vomitoxin analysis was conducted by the Horizon Resources grain elevator in Williston, ND using the Neogen Reveal Q+ DON test kit and AccuScan Gold reader.

We observed that under low disease pressure most of the varieties performed well. Under higher disease pressure some varieties had lower DON accumulation than others, however, the experimental design did not allow for statistical analysis. It is important to note that this is only one year of data, and performance of varieties could vary between growing seasons. Therefore, this analysis will be conducted over the next several years to determine which varieties have the best resistance to VOM accumulation associated with FHB in Northwest North Dakota.

For more information about DON contamination in wheat, please see the NDSU publication:

“DON (Vomitoxin) in Wheat: Basic Questions and Answers”
https://www.ag.ndsu.edu/pubs/plantsci/pests/pp1302.pdf

HRSW Variety Trial -Vomitoxin Levels

	Offstation		Nesson Valley	Williston
	Mountrail	McKenzie	Irrigated	Dryland
Variety	----------Vomitoxin (ppm)----------			
Velva	5.5	0.0	0.2	0.0
Jenna	0.9	0.0	0.0	0.0
Prosper	1.1	0.0	0.0	0.0
LCS Powerplay	0.9	0.3	0.0	0.0
Barlow	0.9	0.0	0.1	0.3
Elgin-ND	1.1	0.0	0.1	0.0
Reeder	3.1	0.0	0.0	0.0
SY Soren	0.2	0.0	0.0	0.3
Vida	2.0	0.0	0.1	0.0
Mott	3.1	0.0	0.2	0.0
Brennan	1.4	0.0	0.0	0.0
Glenn	0.7	0.0	0.0	0.0
Vantage	1.0	0.0	0.1	0.0
Breaker	0.6	0.0	-	0.3
LCS Breakaway	0.2	0.0	-	0.0
Mean	1.51	0.02	0.06	0.06
Standard deviation	1.4	0.1	0.1	0.1

Durum Variety Trial- Vomitoxin Levels

	Offstation		Nesson Valley	Williston
	Mountrail	McKenzie	Irrigated	Dryland
Variety	----------Vomitoxin (ppm)----------			
Divide	2.2	0.2	0.0	0.0
Mountrail	5.6	0.1	0.1	0.0
Carpio	2.7	0.1	0.4	0.0
Lebsock	1.7	0.0	0.0	0.0
Strongfield	6.0	0.1	0.0	0.1
Alkabo	2.1	0.0	0.2	0.0
AC Commander	9.8	0.0	0.3	0.0
Tioga	5.4	0.0	0.3	0.0
Joppa	1.4	0.0	0.0	0.0
Mean	4.10	0.06	0.14	0.01
Standard deviation	2.8	0.1	0.2	0.0

Mountrail Offstation Plots: Latitude 48 9'N; Longitude 102 21'W
Planted: 5/12/2015 Harvested: 8/27/2015
Fungicides applied: Tilt @ 3oz/acre (6/16/15)

McKenzie Offstation Plots: Latitude 47 48'; Longitude 103 25'W
Planted: 4/30/2015 Harvested: 8/13/2015
Fungicides applied: Tilt @ 3oz/acre (6/16/15)

WREC Nesson Site: Latitude 48 9.9222'N; Longitude 103 6.132'W
Planted: 4/15/2015 Harvested: 8/4/2015
Fungicides applied: Tilt @ 2 oz/a (6/4/15), Prosaro 8.2 @ oz/a (6/30/15)

WREC Williston Dryland: Latitude 48 8'; Longitude 103 44'W
Planted: 4/24/2014 Harvested: 8/12/2015
Fungicides applied: Tilt @ 3oz/ac (5/29/15), Prosaro @ 7oz/acre (6/30/15)

Reclaiming a 36” Pipeline with Cropping Rotations

Austin Link, Jerald Bergman Ph. D., Gautam Pradhan Ph. D., Diana Amiot, James Staricka Ph. D., Tom DeSutter Ph. D., Heather Dose, and Chris Augustine
North Dakota State University - Williston Research Extension Center

INTRODUCTION

Soil disturbance during the construction of pipelines, roadways, and well pads has become a serious issue in western North Dakota. Within cropland, soil health and yields need to be restored during the reclamation process. Reclamation of pipelines in a cropland setting has not been extensively researched and little is known about the best management practices for restoring crop yields.

During the spring of 2015, installation of a 36” water pipeline was completed at the Williston-REC. The pipeline extended 1.25 mi., running north to south, entirely across cropland. Soil disturbance occurred 100 ft. on the east and west sides of the pipeline as shown below in figure 1. We took advantage of this research opportunity by selecting several cropping rotations and perennial covers to evaluate as long-term reclamation techniques. This study is in its first year, and will produce data after harvest is completed and samples are processed in the fall of 2015.

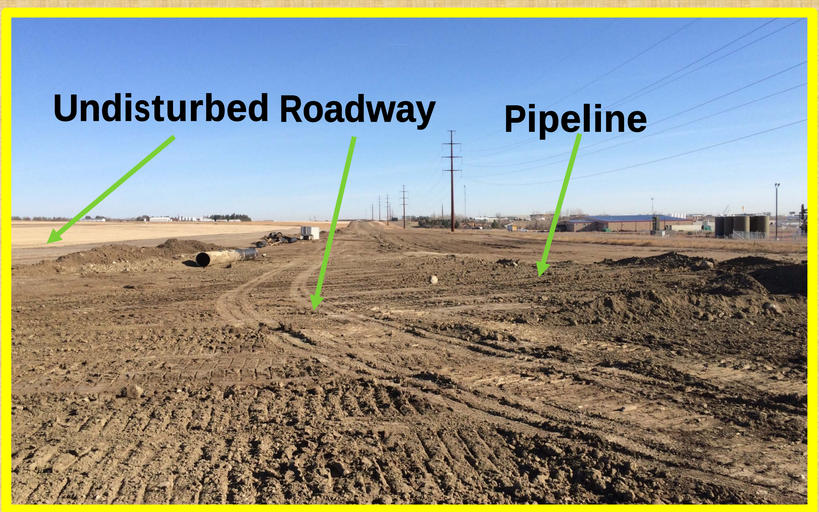


Figure 1. Extent of pipeline during top-soiling phase.

METHODS

Study location: Williston-REC in Williams County, ND

Challenges in reclaiming pipelines in a cropland setting include, but are not limited to:

- Proper backfilling and topsoil placement
- Areas of extreme compaction
- Destruction of soil structure
- Sheet or rill erosion
- Subsidence within the trench
- Reduction of soil microbes

Rotations were selected based on the most commonly grown crops in the Mon-Dak Region and will be evaluated for their ability to improve soil health, fertility, and eventually crop yield (figure 2).

CROPPING ROTATIONS

Rotation	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
1	HRSW	Durum	Durum	Durum	Durum	Durum	Durum	Durum	Durum
2	HRSW	Peas	Barley	Safflower	Durum	Peas	Barley	Safflower	Durum
3	Peas	Barley	Safflower	Durum	Peas	Barley	Safflower	Durum	Durum
4	Cover Crop Mix	Durum	Cover Crop Mix	Durum	Cover Crop Mix	Durum	Cover Crop Mix	Durum	Durum
5	HRSW	Cover Crop Mix	Durum	Cover Crop Mix	Durum	Cover Crop	Durum	Cover Crop	Durum
6	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	RR-Alfalfa	Durum
7	Perennial Grass	Perennial Grass	Perennial Grass	Perennial Grass	Perennial Grass	Perennial Grass	Perennial Grass	Perennial Grass	Durum

Figure 2. Pipeline cropping rotations.

Undisturbed Reference
Compacted Roadway
Pipeline

Figure 3. Different disturbance areas.

RESULTS

2015 Yield data for spring wheat is displayed in table 1. Soils data will soon be processed and comparisons will be made between rotations and in three separate areas of the pipeline; undisturbed reference area, compacted roadway, and the actual pipeline trench (figures 1 and 3).

Treatment	Stand	Height	1000 KTW	Protein 2015	Test Weight	Yield 2015
HRSW	%	(in)	grams	%	lb/bu	bu/ac
Undisturbed	100	23	23.5	17.4	53.3	24.5
Roadway	50	16	25.7	16.6	53.4	9.0
Pipline	66	19	25.0	16.1	53.0	15.2
Mean	72.1	19.3	24.7	16.7	53.2	16.3
C.V.%	11.7	7.9	3.3	1.7	1.1	18.4
LSD 5%	7.1	1.3	0.7	0.2	0.5	2.5
LSD 10%	5.9	1.1	0.6	0.2	0.4	2.1

Table 1. Spring Wheat Performance Data .

Figure 4. Differences in soil showing direct effects on stand and maturity in field peas.

As seen in figures 5 and 6 soil characteristics affect the performance of crops and development of root systems.

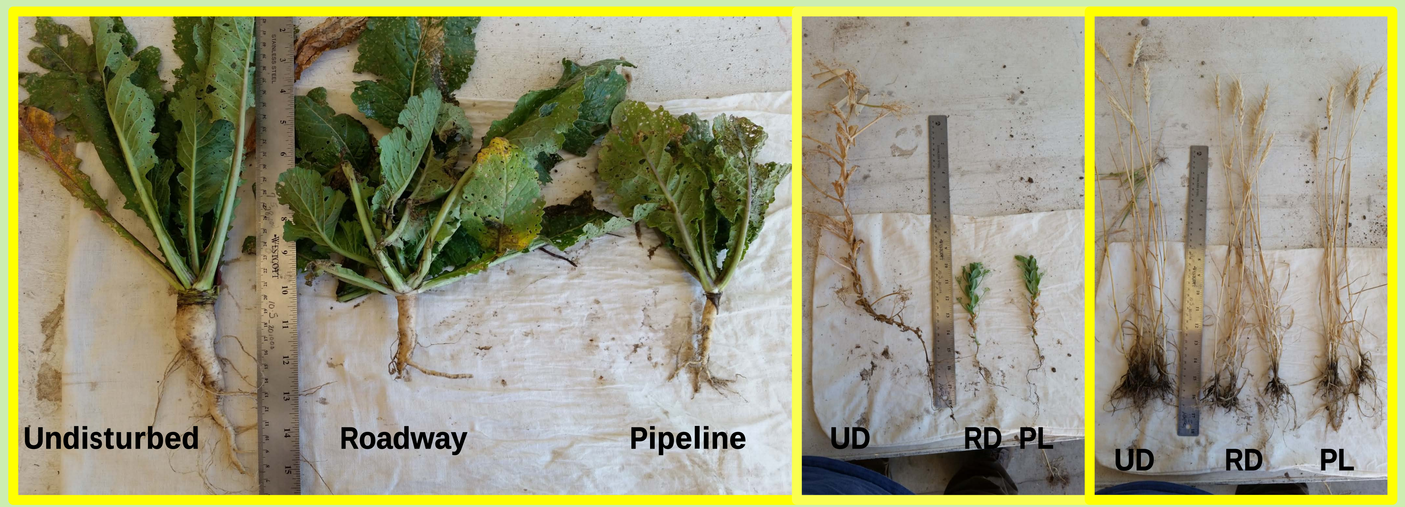


Figure 5. Radish, peas, and wheat roots show differences between disturbance areas.

SOIL CONDITIONS & MONITORING

The soil surface of the pipeline and roadway are heavily crusted and subsoil is severely compacted. Because of erosion concerns tillage was avoided and plots were seeded directly after top soiling was completed by the contractor. Several soil parameters have been measured and will continue to be monitored throughout the length of this study. These measurements include infiltration rates, compaction, and standard fertility tests (figure 7).

Figure 6. Cornell Infiltrometer being used to sample infiltration rates in different disturbance areas and between rotations.

FUTURE DEVELOPMENT OF STUDY

In addition to cropping rotations, the application of soil amendments may be an appropriate tool for reclaiming pipelines. In the spring of 2016 a similar trial will be established and will evaluate the use of manure in combination with cropping rotations to improve soil health and inherently yields. Manure will be evaluated against commercial fertilizer and a control to determine if physical and chemical soil properties can be improved without incurring the cost of increased fertilizer application.

ACKNOWLEDGMENTS

We would thank all the Williston-REC staff and collaborators for their contributions. Specifically, thanks go to Dr. Tom DeSutter and Heather Dose for their assistance with designing this study; Chris Augustine for technical guidance in sampling compaction and infiltration; Dr. Gautam Pradhan, Diana Amiot, and Justin Jacobs for assistance in planning this study; Dr. James Staricka for providing baseline soil sampling; and Kyle Dragseth and David Weltikol for hauling manure donated by Tyler & Dale Tjelde.

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Quantifying Water Use (Water Use Efficiency) in Irrigated Sugarbeet Production on Lihen Fine Sandy Loam Soils

Tyler J. Tjelde, James A. Staricka
North Dakota State University-Williston Research Extension Center

Abstract

Water for irrigation is becoming limited, resulting in a critical need to improve water use efficiency. This investigation assessed overhead sprinkler irrigation to develop and modify irrigation scheduling for producers to maintain production while becoming more efficient with their irrigation water use. Sugarbeets are grown using four irrigation rates (100%, 67%, 33%, and 0 irrigation) to determine the effect on yield and quality. The 100% treatment is the optimum amount determined by soil moisture monitoring throughout the growing season for sufficient plant available water. Sugarbeet yields (2010-2015) have been maintained in all six years, reducing water rates by a third and four of six years when reducing water by two-thirds. Year-to-year differences in water usage and crop production are directly related to the seasonal climatic conditions.

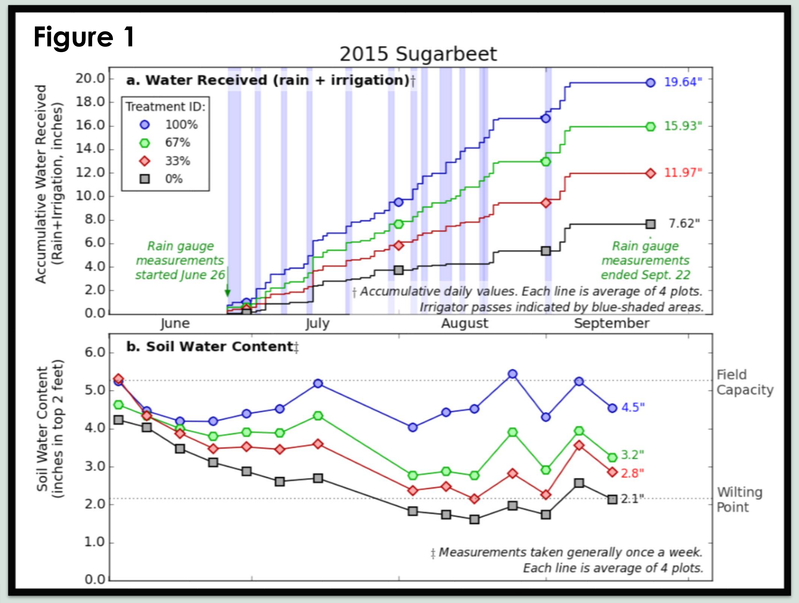
Introduction

Irrigation is very important to the state of North Dakota. Irrigation provides consistent growth of high water demand crops that typically could not be grown otherwise. There are 290,000 acres of irrigated land in North Dakota with the expansion potential of 500,000 acres. The value of irrigated land returns 3-4 times that of a typical dryland acre over long term production history. Improved irrigation management is the key to further develop these untapped irrigated acres. Can irrigation rates be reduced and production retained? Could reducing rates on already irrigated land be used to expand on existing dryland acre? The Missouri River has ample water and provides North Dakota with opportunities for further irrigation development. Yet the water used on the majority of current irrigated acres comes from aquifers and areas that have maximized water uptake and no more water permits exist. What happens to these areas if restrictions and limitations are put in place like others parts of the country that have limits on water usage? This reduction on allocated water usage will affect irrigation decisions. The purpose of this project was to assess crop performance at reduced water rates in the event water restrictions are implemented.

Methods & Materials

The experimental design is a Randomized Complete Block Design (RCBD) with four replications of four treatments. Each plot was 50 ft by 60 ft. The treatments consist of four irrigation rates (100%, 67%, 33%, 0%). The irrigation amounts for the 100% treatment were determined using the soil moisture data collected from the neutron depth moisture gauge and referencing the North Dakota Ag Weather Network (NDAWN) irrigation scheduler (http://ndawn. ndsu.nodak.edu). To maintain soil moisture content near field capacity (Figure 1b) is the objective of the 100% treatment where water added to the 100% treatment would not improve production. The NDAWN scheduler is a checkbook system using soil properties (thickness of soil layers and the water holding capacity of each layer), weather parameters (average daily air temperature, daily solar radiation, daily rainfall), crop properties (root depth and water use based on growth stage, planting date and emergence date), and user-supplied irrigation information (dates and amounts). An observation station of the NDAWN system, listed as "Hofflund" on the NDAWN records, is located on the research site. Soil water content of top two feet was determined within each treatment using a neutron depth moisture gauge (Figure 1b). These weekly soil moisture measurements were used to calibrate the checkbook irrigation scheduling system. A data-logging rain gauge was placed within each plot. The rain gauges were adjacent to the neutron gauge access tube. These logging rain gauges are battery-powered and automatically record the date and time of each 0.01 inch of rainfall or irrigation. Data from the gauges were used to determine rain and irrigation rates and duration. The data also provided a means to verify that each plot received the correct irrigation amount (Figure 1a). All cultural practices (tillage, fertilizer, planting populations, chemical, and fungicide applications) are the same for all treatments within crop to minimize the effects of variables other than water amount. Yield and quality analysis for all the crops was done by the WREC.

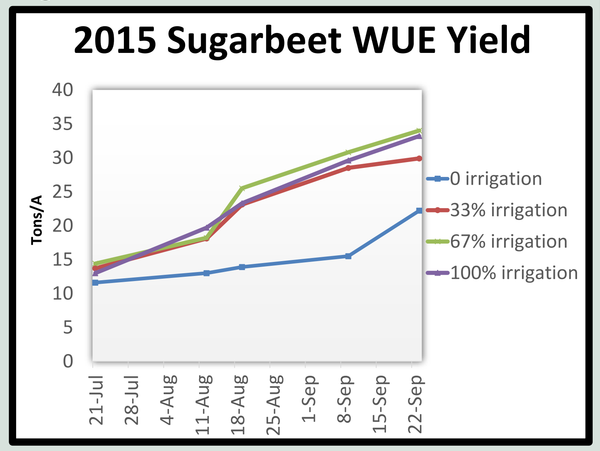
Figure 1

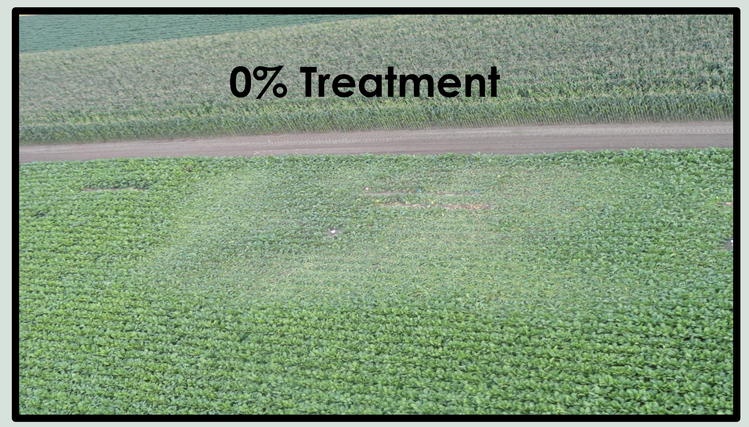


Results

Results after six years of reduced water rates in sugarbeet shows reducing water by a third does not (P<0.05) decrease yields. Four of the six years rates reduced by two-thirds did not affect yields (Figure 4). The results have remained consistent over the six years. As the treatments approach wilting point as illustrated in Figure 1b early in the growing season (early July) have a greater impact on yield (Figure 2) than in treatments that approach wilting point in the top two feet later in the growing season. This may be because as the season progresses and root development goes beyond the top two feet the treatments approaching wilting point are less affected. Early plant growth and development when plant available water (PAW) exceeds wilting point reduces the impact on yields later into the season. Water usage each year differs based on crop development and the climatic conditions. Looking at the year to year differences of water usage (Figure 3) to the yields (Figure 4), suggests this variation in water received is an interaction with weather and plant growth/development. Soil moisture readings (neutron probe) showed PAW in the 100% treatment has been optimal throughout the growing season and additional water applied would not increase yields.

Figure 2

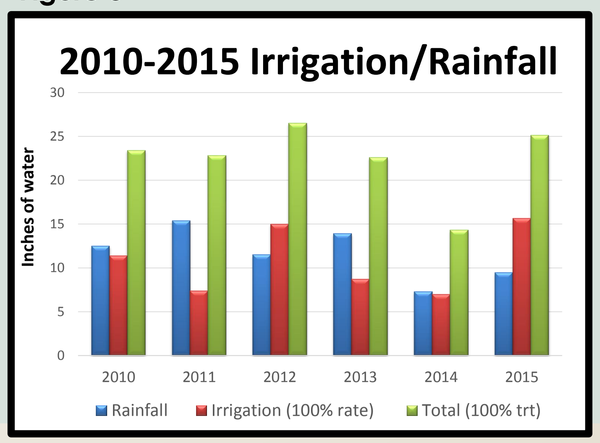




Conclusion

This research project has demonstrated that water usage can be reduced while yields maintained in sugarbeet production. Using the 2015 data, reducing irrigation by a third of the 100% treatment reduces water usage of greater than 5 inches and yields were not significantly different. Five inches of water over a 160 acre pivot equates to a water savings of 66.7 acre feet per year. The amount of water saved using the 67% treatment over the 6 years equates to 289 acre feet of water. This would provide irrigation of 3.7 inches to additional 160 acres, which may allow an alternative rotational crop to enhance productivity and value of the land.

Figure 3



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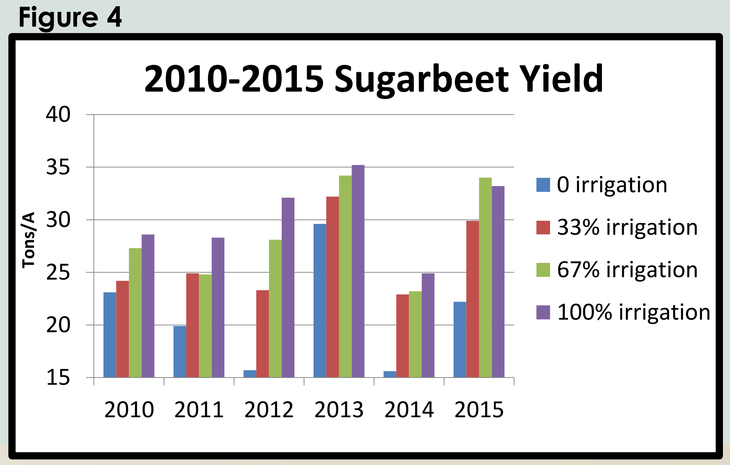

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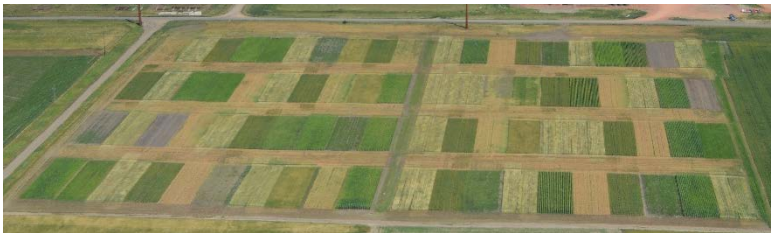
Sustainable Agroecosystem for Soil Health in the Northern Great Plains (Williston, ND - 2015)

Don Tanaka, Gautam Pradhan, Jim Staricka, Jerry Bergman, Audrey Kalil, Kyle Dragseth, Diana Amiot, Austin Link, David Weltikol, Cameron Wahlstrom



In 2013, the Williston Research Extension Center initiated a new project investigating diversifying dryland crop rotations. The objectives of this project are to "Develop agricultural systems to improve soil health, crop production, precipitation use, and economic sustainability". This is a long term research project involving multiple researchers from various disciplines. Don Tanaka, formerly USDA-ARS Scientist from Mandan and current WREC seasonal scientist, is serving as the coordinator of this project. Gautam Pradhan, WREC Dryland Research Agronomist, is investigating agronomic and physiological aspects, and conducting economic analysis. Jim Staricka, WREC Soil Scientist, is investigating the soil water use and physical soil quality aspects. Jerry Bergman, WREC Director, is responsible for the overall administration and is assisting in the agronomic component of the study. Audrey Kalil, newly hired WREC Plant Pathologist, will be investigating plant disease and insects aspects. Kyle Dragseth, WREC Farm Manager, David Weltikol, WREC Ag Technician-Mechanic, and Cameron Wahlstrom, WREC Crop Research Specialists are overseeing the field work and applying best management practices in the production of all crops. Diana Amiot and Austin Link, WREC Crop Production Research Specialists, are assisting in plot maintenance and data collection. WREC plans to recruit a soil microbiologist to participate in the project and utilize unmanned aircraft systems (UAS) to assess plant health through aerial images.

Experimental Details

- Treatments:
  - 5 Fixed Rotations and 6 "Dynamic" Rotations.
  - Each phase of every rotation included each year (fixed rotations).
- Field Design:
  - Randomized Complete Block; 4 Replications.
  - Individual plots are 60 by 200 feet. Total area (including roadways and borders) is 40 acres.
- All plots will be No-Till.

The 5 Fixed Rotations

2013	2014	2015	2016	2017
Durum	Fallow	Durum	Fallow	Durum
Durum	Durum	Durum	Durum	Durum
Durum	BP1*	Pea	Corn	Safflower
Durum	HRWW/ BP2	Pea/BP3	Corn	Safflower
……Perennial Grass Mix with Pollinator Plants……				

* BP1 = Biological primer 1; BP2 = Biological Primer 2; BP3 = Biological Primer 3; HRWW = Hard Red Winter Wheat.

What are the Biological Primers?

- Biological Primer 1 (BP1) is a full season cover crop mix, seeded between June 1st and June 20th. Pearl millet (3.5)†, Sorghum × Sudan (3.5), Turnip (1.0), Radish (2.0), Berseem clover (1.0), Sunflower (2.0), Soybean (15.0), Cowpea (10.0), Flax (1.0), Hairy vetch (3.0), Mammoth red clover (1.0), Phacelia (2.0), and Italian ryegrass (3.0).
- Biological Primer 2 (BP2) is a cover crop mix seeded after winter wheat but before August 10th. Turnip (1.0), Radish (2.0), Kale (1.0) Lentil (5.0), Oats (30.0), Sweet clover (1.0), and Buckwheat (2.0)
- Biological Primer 3 (BP3) is a cover crop mix seeded after pea. Triticale (40.0), Hairy vetch (2.0), Common alfalfa (2.0), Mammoth red clover (2.0), Turnip (1.0), and Radish (2.0).

†The figures in brackets are the seeding rates in lb/a.

"Dynamic" Rotations

- Crops in the dynamic rotations will be determined each year based on weather and market conditions and using the following tools:
  - The USDA-ARS Crop Sequence Calculator (An interactive program for viewing crop sequencing information and calculating returns; www.mandan.ars.usda.gov)
  - The NDSU Projected Crop Budgets for Northwest North Dakota (www.ag.ndsu.edu/publications/farm-economics-management).
- The crops will include a mix of cool-and warm-season grasses and broadleaves.
- Each year durum will be grown in one of the rotations to serve as a comparison.

The Dynamic Rotations To Date

2013	2014	2015	2016	2017
Durum	HRWW*	Lentil	HRWW	*TBD*
Corn	Soybean	Durum	*TBD*	*TBD*
Soybean	Sunflower	Barley	*TBD*	*TBD*
Safflower	Barley	Pea	*TBD*	*TBD*
Sunflower	HRSW	HRWW	*TBD*	*TBD*
Pea	Durum	Safflower	*TBD*	*TBD*

* HRSW = Hard Red Spring Wheat; HRWW = Hard Red Winter Wheat; *TBD* = to be determined.

Measurements

- Crop Performance: leaf chlorophyll, canopy temperature, grain yield, protein or oil content; grain nitrogen and phosphorus; total dry matter; straw production; straw carbon, nitrogen, and phosphorus; crop water use.
- Soil Quality: infiltration; aggregate stability; bulk density; organic matter amount, plant-available levels of nitrogen, phosphorus, potassium and other nutrients; pH; salinity.
- Pests: diseases, insects, weeds.
- Soil microbial parameters: To be determined.

Results

(A) Yield, quality, and economic returns of crops under different Crop Rotations

The annual precipitation at WREC, Williston, ND from Oct 2014 – Sep 2015 was 11.36 inches and the growing season precipitation from April – Sep, 2015 was 10.51 inches, which were 2.83 and 0.76 inches lower than the average of the last 59 years, respectively. This year, daily maximum temperatures of over 90°F were recorded for four to five consecutive days in the third week of July and the second week of August 2015. These hot days along with drought at the time of flowering and/or grain filling have adversely affected the yield and performances of late season crops like corn and safflower.

Figure 1: Yield and quality attributes of cereal, legume, oil, and cover crops under different crop rotations

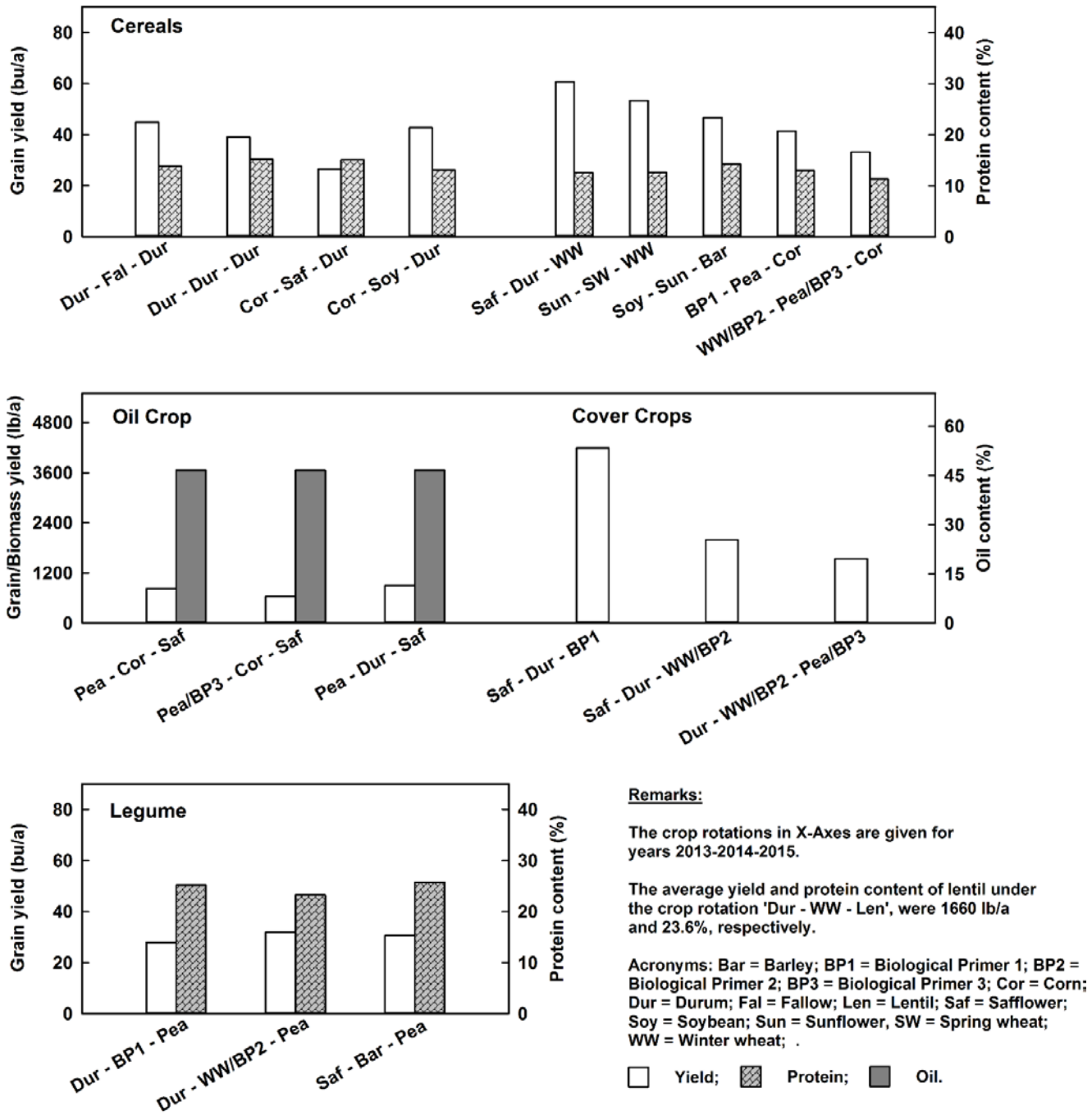


Figure 1 shows yield and/or quality attributes of cereal, oil, legume, and cover crops in 2015 under different crop rotations. There were significant treatment differences in durum yield ($p < 0.001$) but not in protein content ($p > 0.05$). Durum yield was the highest under the crop rotations 'Durum–Fallow–Durum' and 'Corn–Soybean–Durum' (~43.8 bu a^{-1}) followed by 'Durum–Durum–Durum' (39 bu a^{-1}); and the lowest under 'Corn–Safflower–Durum" (26.6 bu a^{-1}). There was no difference in yield and protein content of hard red winter wheat under two crop rotations: 'Sunflower–SW–WW' and 'Safflower–Durum–WW/BP2'. The corn under the crop rotation 'BP1–Pea–Corn' had 8 bu higher yield and 1.7% higher protein content than under 'WW/BP2–Pea/BP3–Corn'.

Table 1. The Economic returns from different crop rotations

Treatments	Cropping Patterns										Avg Net Return from 3 yrs
	2013		2014		2015						
	Crop	Net* Return	Crop	Net* Return	Crop	Yield	Price†	Rev	Cost‡	Net Return	
(#)		($/a)		($/a)		(bu or lb/a)	($/bu or lb)	($/a)	($/a)	($/a)	($/a)
1	Durum	202.15	Fallow	-27.93	Durum	44.83	6.00	268.98	143.63	125.35	99.86
2	Fallow	-19.76	Durum	255.15	Fallow	0.00	0.00	0.00	23.09	(23.09)	70.77
3	Durum	202.15	Durum	202.15	Durum	39.00	6.00	234.00	169.72	64.28	156.19
4	Durum	202.15	BP1	-58.46	Pea	27.99	7.50	209.89	141.27	68.62	70.77
5	BP1**	-63.09	Pea	175.16	Corn	41.37	2.72	112.53	149.14	(36.61)	25.15
6	Pea	422.30	Corn	30.21	Safflower	822.39	0.20	164.48	170.56	(6.08)	148.81
7	Corn	163.09	Safflower	54.89	Durum	26.56	6.00	159.34	169.72	(10.37)	69.20
8	Safflower	280.96	Durum	145.15	BP1	0.00	0.00	0.00	48.88	(48.88)	125.74
9	Durum	202.15	WW/BP2	64.57	Pea/BP3	31.90	7.50	239.27	168.07	71.20	112.64
10	SW/BP2	56.26	Pea/BP3	211.64	Corn	33.25	2.72	90.44	149.14	(58.70)	69.73
11	Pea/BP2	372.20	Corn	14.82	Safflower	632.25	0.20	126.45	170.56	(44.11)	114.30
12	Corn	163.09	Safflower	42.82	Durum	26.56	6.00	159.34	169.72	(10.37)	65.18
13	Safflower	280.96	Durum	145.15	WW/BP2	60.80	2.71	164.75	194.00	(29.24)	132.29
14	Durum	202.15	WW	55.72	Lentil	1660.00	0.39	639.10	142.11	496.99	251.62
15	Corn	163.09	Soybean	16.64	Durum	42.73	6.00	256.40	158.24	98.17	92.63
16	Soybean	203.17	Sunflower	121.10	Barley	46.70	3.75	175.13	167.58	7.55	110.61
17	Safflower	280.96	Barley	108.56	Pea	30.59	7.50	229.40	141.27	88.12	159.21
18	Sunflower	133.95	SW	-36.48	WW	53.40	2.71	144.70	167.20	(22.49)	24.99
19	Pea	412.65	Durum	226.15	Safflower	898.83	0.20	179.77	155.95	23.82	220.87
20	Perrenial	-166.57	Perrenial	-8.26	Perrenial	0.00	0.00	0.00	8.26	(8.26)	-61.03

*Net returns were calculated from previous years records.

**BP1 = Biological Primer 1; BP2 = Bio. Primer 2, BP3 = Bio. Primer 3; SW = Spring Wheat; WW = Winter Wheat.

†The prices were obtained on Nov 30, 2015 from grain elevators in and around Williston.

‡The costs were calculated from the farm records and the estimations given in the 'Projected 2015 Crop Budgets - North West North Dakota' (Swenson and Haugen, 2014).

There were significant differences among treatments in yield and quality of pea and safflower. The peas under the crop rotations 'Safflower–Barley–Pea' and 'Durum–WW/BP2–Pea/BP3' had 2.6 and 3.9 bu higher grain yields than under 'Durum–BP1–Pea'; but, protein contents were 1.9 % and 2.5 % higher under 'Safflower–Barley–Pea' and 'Durum–BP1–Pea', respectively than under 'Durum–WW/BP2–

Pea/BP3'. The effect of previous crops on available soil moisture at the time of planting might be one of the reasons for the lower yield of pea under 'Durum–BP1–Pea' than under other two rotations. The crop rotation, 'Durum–BP1–Pea, had one of the lowest available soil moisture at the time of planting than all other rotations, and it was at least 1.3" lesser than 'Durum–WW/BP2–Pea/BP3' and 'Safflower–Barley–Pea' rotations (Table S1). Similarly, the safflower under 'Pea–Corn–Safflower' and 'Pea–Durum–Safflower' had 190 and 267 lb higher grain yield than under 'Pea/BP3–Corn–Safflower'. Statistical comparisons were not possible for barley, lentil, and cover crops, and their yield and/or quality are given for general information purpose only.

Table 1 shows the economic returns from cash crops in 2013, 2014, and 2015 under different crop rotations, and the average net return from each crop rotation (treatment). As the five year crop rotation has not yet been completed, the information is a report of observed results and is not intended to be used by producers in making financial decisions.

(B) Soil water content and water use efficiency under different crop rotations

At the end of the previous growing season (November 2014), soil water content varied among cropping treatments and ranged from 6.2 to 11.5 inches in the top 4 feet of soil (Table S1). Cropping treatments that had been planted to a high water use crop in 2014 (e.g., sunflower, BP1, and the Perennial mix; Trts 16, 4, & 20) tended to have the driest soil in November 2014. The cropping treatment that had been fallowed in 2014 (Trt 1) had the wettest soil in November 2014. Cropping treatments that were planted in durum in 2014 (Trts 2, 3, 8, 13, & 19) had a wide range of soil water contents in November 2014 (from 7.9 to 10.1 inches); it appears that the November 2014 soil water content of these treatments was influenced by the crop grown in 2013.

Table S1: Soil water content in November 2014 & November 2015 and the change from November 2014 to 2015 for each crop rotation. Amounts and ranking is given for each value

Treatments	Cropping Patterns			Water in top 4 ft of soil (inches)					
	2013 Crop	2014 Crop	2015 Crop	Nov 2014	Rank †	Nov 2015	Rank †	Change	Rank †
1	Durum	Fallow	Durum	11.5	20 W	10.1	19 W	-1.4	3 D
2	Fallow	Durum	Fallow	10.1	19 W	11.8	20 W	1.7	16
3	Durum	Durum	Durum	8.2	13	9.7	16	1.5	13
4	Durum	BP1	Pea	6.7	2 D	9.7	17	3.0	19 W
5	BP1	Pea	Corn	8.5	14	8.5	7	0.0	6
6	Pea	Corn	Safflower	8.2	11	8.4	6	0.2	8
7	Corn	Safflower	Durum	7.7	6	9.3	12	1.6	14
8	Safflower	Durum	BP1	8.0	9	6.2	1 D	-1.8	1 D
9	Durum	HRWW/BP2	Pea/BP3	8.2	12	9.2	11	1.0	12
10	HRSW/BP2	Pea/BP3	Corn	8.9	16	9.1	9	0.2	7
11	Pea/BP2	Corn	Safflower	7.8	7	8.1	5	0.3	10
12	Corn	Safflower	Durum	7.1	4	8.8	8	1.7	15
13	Safflower	Durum	HRWW/BP2	7.9	8	7.3	3 D	-0.6	4
14	Durum	HRWW	Lentil	9.2	17	9.4	14	0.2	9
15	Corn	Soybean	Durum	8.5	15	9.2	10	0.7	11
16	Soybean	Sunflower	Barley	6.2	1 D	9.3	13	3.1	20 W
17	Safflower	Barley	Pea	8.0	10	9.8	18 W	1.8	17
18	Sunflower	HRSW	HRWW	7.2	5	9.4	15	2.2	18 W
19	Pea	Durum	Safflower	9.6	18 W	8.0	4	-1.6	2 D
20	Perennial	Perennial	Perennial	7.0	3 D	6.9	2 D	-0.1	5

† Rank is driest to wettest, i.e. 1 to 20. The three driest instances are marked in red with a "D" and the three wettest instances are marked in green with a "W".

At the end of the current growing season (November 2015), soil water content ranged from 6.2 to 11.8 inches in the top 4 feet of soil. Cropping treatments that had been planted in a high water use crop in 2015 (e.g., BP1, the Perennial mix, and HRWW followed by BP2; Trts 8, 20, and 13) had the driest soil. The cropping treatment that had been fallowed in 2015 (Trt 2) had the wettest soil in November 2015. The range of soil water contents among the treatments planted to durum (Trts 1, 3, 7, 12, & 15) was even greater (from 7.1 to 11.5 inches) in November 2015 than it had been in November 2014. The soil water content of these treatments appears to be influenced by the 2014 crop.

The change in soil water content between November 2014 and November 2015 ranged from a 1.8 inch loss to a 3.1 inch gain. The average was a 0.7-inch gain, indicating that overall there was a slight gain in soil water content from November 2014 to November 2015. The greatest soil water losses occurred in treatments where a low-water use crop had been grown in 2014 followed by a high water use crop in 2015 (Trts 8, 19, & 1). The largest soil water gains occurred in treatments where a high-water use crop was grown in 2014 followed by a low water use crop in 2015 (Trts 16, 4, & 18).

The five cropping treatments planted to durum in 2015 had a wide range in soil water contents at the time of planting (Table S2). The range in soil water content at planting (7.2 to 10.8 inches) was three times greater the range at harvest (5.3 to 6.5 inches), indicating that the amount of water used by the crop was largely determined by the soil water content at time of planting. This provided an opportunity to investigate the influence of water availability on yield.

Table S2: 2015 Durum crop water, yield, and water use efficiency

Treatments	Cropping patterns			Water in top 4 ft of soil (Inches)		Soil water depletion (inches)	Crop water use (Inches)	Yield (bu/a)	WUE (bu/in)
	2013 Crop	2014 Crop	2015 Crop	April 20	August 3				
1	Durum	Fallow	Durum	10.80	6.50	4.30	11.24	44.83	3.99
3	Durum	Durum	Durum	8.90	5.48	3.42	10.36	39.01	3.76
7	Corn	Safflower	Durum	7.84	5.72	2.12	9.06	29.71	3.28
12	Corn	Safflower	Durum	7.22	5.49	1.74	8.68	26.56	3.06
15	Corn	Soybean	Durum	8.70	5.28	3.42	10.36	42.73	4.12

Durum yields among the treatments ranged from 26.5 to 44.8 bu/a. Crop water use, calculated as soil water depletion plus 6.94 inches of rain, ranged from 8.7 to 11.2 inches. Water use efficiency (WUE), calculated as bushels of durum produced per inch of water, ranged from 3.1 to 4.1 bu/in. with an r^2=71% (Note: r^2 is a statistical measure that in this case represents the percentage of yield variation that can be explained by crop water use). The WUE calculation assumes that grain will be produced with any amount of available water, i.e., no water is needed to grow the plant before grain is produced. It is more reasonable to assume that the crop will use some amount of water before grain is produced. This can be estimated by preforming a statistical procedure called “linear regression”. A linear regression performed on this data indicated that **5.05 inches of water was needed to grow the durum crop and 7.5 bushels of grain was produced for each additional inch of water** (r^2=95%). This compares quite reasonably to a traditional “*rule of thumb*” that it takes 5 inches of water to grow a wheat crop and that 5 bushels of wheat is produced for each addition inch of water. It may also suggest that the amount of grain produced per inch of water has increased since the time when this rule of thumb was first stated. This increase may be from improvements in crop varieties and farming methods.

Onion Variety Trial **EARC-Sidney, MT 2015**

Cultivar	Stand Plants/ acre	Average Diameter inches	Percent <2.25" diameter	2.25-3" diameter	3-4" diameter	>4" diameter	Average weight oz/onion	Total Yield cwt/ac
Countach	66248	2.4	37	45	18	0	5.1	210
Delgado	58080	2.5	33	35	31	2	6.1	220
Marenge	55358	2.5	39	36	24	1	5.8	191
Sedona	44468	2.3	46	30	24	0	5.0	137
Crockett	68063	2.4	48	27	25	0	5.2	219
Hamilton	64433	2.5	28	48	23	0	5.6	224
Calibra	55811	2.3	47	35	18	0	4.4	222
Okoroso	64886	2.7	28	29	42	1	7.4	289
Campero	46283	2.5	37	31	30	2	5.9	169
Valero	63979	2.5	35	38	27	1	5.7	223
Mean	58761	2.5	37.6	35.5	26.2	0.7	5.6	210.0
LSD(0.05)	4711	0.49	28.9	10	23.4	2.6	2.9	117
CV	3.62	1.98	7.73	4.28	9.2	38.3	5.32	5.97

Planted: May 4 Harvested: September 30
Previous Crop: Sugarbeets

Sprinkler Irrigated Onion Variety Trial **EARC-Sidney, MT, 2015**

Cultivar	Stand Plants/ acre	Average Diameter inches	Percent <2.25" diameter	2.25-3" diameter	3-4" diameter	>4" diameter	Average weight oz/onion	Total Yield cwt/ac
Marenge	55358	2.5	39	36	24	1	5.8	191
Sedona	44468	2.3	46	30	24	0	5.0	137
Crockett	68063	2.4	48	27	25	0	5.2	219
Hamilton	64433	2.5	28	48	23	0	5.6	224
Calibra	55811	2.3	47	35	18	0	4.4	222
Okoroso	64886	2.7	28	29	42	1	7.4	289
Campero	46283	2.5	37	31	30	2	5.9	169
Valero	63979	2.5	35	38	27	1	5.7	223
Mean	58761	2.5	37.6	35.5	26.2	0.7	5.6	210
LSD(0.05)	4711	0.49	28.90	10.00	23.40	2.60	2.9	117

Planted: May 4 Harvested: September 30
Previous Crop: Sugarbeets
Irrigation:

5/29/2015	1.00"
6/17/2015	1.23"
7/2/2015	0.77"
7/15/2015	1.78"
7/24/2015	1.78"
8/6/2015	1.78"
8/14/2015	2.00"
8/20/2015	2.00"

Soil type: Savage silty loam

2015 Research Update

Dryland and Irrigated Horticultural Crops

Kim Holloway and Kyla Splichal

Horticulture in 2015

The 2015 growing season weather started in spasms back in April and into May. Our temperatures fluctuated wildly, creating confusion in our perennial plants, from the largest trees down to the smallest violet. The lowest temp in April, 21°F, and the highest, 78°F, were less than 8 days apart. The plants tried to adjust, and many succeeded.

Our last killing frost occurred on May 18. The first killing frost in the fall occurred on October 16. We had over 150 frost free days! According to NDAWN, we accrued over 2500 growing degree days from April 8 to October 21. We experienced dry conditions, receiving only 11.96" of rain, though it spaced nicely throughout the growing season.

Apple Orchard

Even though our orchard is upwards of 40 years old, we harvested apples from 10 different trees again this year. We collected over 100 pounds off these old beauties, but their days are numbered. Most have a bacterial canker that will take them eventually. Deer caused considerable damage to 2 trees, and drought conditions took their toll.

Pizza and Taco Garden

When we planned the gardens, the two beds at the top of the garden begged for something different. We decided that our favorite two foods, pizza and tacos, should be represented in the garden. We put fennel, tomatoes, peppers, basil, parsley, rosemary, oregano, and thyme in the pizza garden. The taco garden received more peppers, tomatoes, oregano, and parsley as well as corn, black and pinto beans, and cilantro. We enjoyed them all and discovered that fennel, when planted too close together, will fall over. After tabulation, over 250 pounds of tomatoes, peppers, beans, corn and herbs were harvested from this garden.

Herb Garden

We wanted to try Cardoons, so we put them in this garden. Unfortunately, even with our long growing season, they never bloomed. We could have harvested the leaves for cooking, but we wanted to see how long the plants would live. They survived hard frosts, up until the temperature dipped down to 9°F. How captivating to think a native Mediterranean plant will grow here! The buttercup squash got stuck here, too. A really nice addition to any autumn meal, they grew well in our garden, producing 40 pounds and 11 fruits from one hill. All the herbs smelled heavenly in the summer sunshine, producing well past frost, and drying into fragrant bundles for soups and stews. Basil, parsley, oregano, chives, dill, fennel, cilantro, French tarragon, and thyme all grew well and harvested easily. The parsley even produced a thick second crop!

Grapes

At the end of April, believing the cold dry winter over, we began pruning the grapes. The buds looked good, plump and alive. By the time our last frost occurred on May 18 evidence mounted that the vines were not doing well. Not only did we lose primary buds, we lost some vines clear to the ground, particularly in the south vineyard. In the north vineyard, about 2/3 of the vines suffered severe damage, some dying to the ground, some losing primary buds and some showing trunk damage. We were not alone. The entire industry across the northern plains lost many of their grape selections, even the cold-hardy ones. Along with NDSU, we continue to hope that the new NDSU-bred grapes will survive in the ever changeable weather patterns our climate shows.

Variety				3	Brix	pH	TA	# prdc.
	2013	2014	2015	yr. avg				plants
Baltica	2.2	9.0	5.0	5.4	22.5	3.3	2	8
Bluebell	2.6	8.8	*	3.8				0
Brianna	*	0.2	1.9	0.7	21.7			6
Edelweiss 1'	64.4	6.2	*	23.5				0
Edelweiss 2'	58.0	5.2	*	21.1				0
Edelweiss 3'	37.2	0.4	*	12.5				0
ES 12-6-18	8.2	74.6	17.4	33.4	23.2	3.0	2	12
ES 5-4-71	2.4	*	1.5	1.9	20.3			3
Frontenac Gris	7.0	*	7.0	4.7	26.7			8
Frontenac N. Vyd.	11.6	26.2	2.0	13.3	24.9			8
Frontenac S. Vyd.	135.6	51.2	*	62.3				0
King of the North	8.0	44.4	8.2	20.2	23.5			10
La Crescent	10.7	26.6	4.2	13.8	24.4			9
Marechal Foch	1.0	1.0	0.2	0.7	24.0			1
Marquette	1.4	2.0	53.5	19.0	20.9	3.1	2	9
MN 1131	6.4	28.0	4.9	13.1	24.1	3.2	1	10
Petite Amie	*	*	0.6	0.2	20.2			1
Prairie Star	0.8	5.6	1.3	2.6	20.0			1
Riparia	0.2	15.0	3.8	6.3	24.1			3
Sabrevois	1.8	6.6	0.2	2.9	20.4			2
Somerset Seedless	0.3	1.8	*	0.7				0
St. Croix	15.0	1.2	*	5.4				0
St. Croix 1'	153.0	1.2	*	51.4				0
St. Croix 2'	80.2	2.2	*	27.5				0
St. Croix 3'	117.8	3.0	*	40.3				0
Valiant	31.6	115.4	20.6	55.9	21.0			8
Total	757.4	435.8	132.2	441.8				99
* indicates no yield								

Juneberries

The Juneberries began the year by exploding into bloom in April.
To control the fungi we've been plagued with the last few years, we decided to apply early and frequently some low-toxicity, effective fungicides. We applied 4 times, once before bloom, and 3 times after bloom.

Fertilizer Application	Rate/acre	Date
10-50-0	40lb	30-Apr
9-0-0	20 lbs.	21-May
48-0-0	20 lbs.	18-Jun

Fungicide Application	Rate	Date
Neem Oil 70%	1 tsp/gallon	14-Apr
Actinovate SP	1 tsp./gallon	8-May
Actinovate SP	1 tsp./gallon	14-May
Actinovate SP	1 tsp./gallon	25-May

We still saw Cedar Apple Rust on probably 20% of the Juneberry plants, but very little on the berries. Perhaps a longer application period (into June, when it typically shows) is merited. Some mummy berry, which afflicted us last year, also showed up, but didn't figure meaningfully. Leaf and berry blight was noticeably absent this year.

The overall health of the Juneberry plants, as measured by growth, was significantly better than last year. On average, they put on 18"+ of branching. Serious pruning must be done to be able to walk in the rows next year. We don't want to damage the bushes! Considerably less suckering occurred this year. Perhaps it's due to the dry winter we had.

Leaf cleanup will occur for the health of the plants. Cleaning up all fallen leaves and berries interrupts the fungus life cycle.

Harvest took two weeks, because of our Field Day activities and the net system we put up to reduce bird predation made it hard to work in the juneberry patch. The nets did work very well.

Juneberry Data

	---------- Weight. (lb.) ----------					Avg./	#	2015
	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5	Variety	Plants	Yield(l
1-2	1.5		1.3	3.7	0.1	1.7	7	6.6
1-4	1.2	1.6	0.4	0.8	0.9	1.0	9	4.9
1-5	2.2	0.4	0.6	0.0	2.4	1.1	10	5.6
1-6	2.0	0.4	2.0	0.7	2.1	1.4	8	7.1
1 -7	1.3	0.5	0.6	0.1	0.1	0.5	8	2.5
5-1	0.6	0.4	0.3	0.4		0.4	5	1.6
9-1	7.0	0.3	1.5	0.3	0.0	1.8	8	9.1
12-1	0.1	0.2	0.1	1.4	0.4	0.4	7	2.2
14-2			1.6	0.1	2.2	1.3	7	3.9
15-2	0.1	1.8	0.5	2.3	0.5	1.0	10	5.2
16-1	1.0	0.2	0.4	0.5	0.5	0.5	9	2.6
17-1	3.4	0.7		0.2	0.1	1.1	6	4.4
17-2		1.3	0.2	1.4		1.0	8	2.9
18-1	5.0	2.6	1.9	2.4	2.4	2.9	10	14.4
41-1	1.0	0.1	0.4	0.6	1.1	0.6	8	3.2
48-1	2.5	1.8	0.2	0.1	0.7	1.0	8	5.2
48-2	1.8	0.1	0.2	0.4	0.4	0.6	5	2.8
53-1	0.2	0.6		1.0		0.6	9	1.8
53-2			0.4	0.1	0.0	0.2	5	0.6
66-2		0.1	0.2		0.2	0.1	3	0.4
67-1	0.1	1.1	0.1	2.0		0.8	7	3.2
71-1	1.4	0.4	0.2	0.4	0.8	0.6	10	3.2
CeCe		0.0	1.5	0.2	0.9	0.6	8	2.6
Buffalo	0.8	0.5	0.2			0.5	6	1.5
Honeywood	1.3	0.2			0.1	0.5	7	1.5
Kelner		0.3		0.6		0.5	10	1.0
Martin		0.8	0.6			0.7	9	1.5
Parkhill		0.5			1.0	0.7	8	1.5
Regent	0.9	3.6	0.2	0.5	0.6	1.2	9	5.8
59-1	0.9					0.9	2	0.9
68-1							1	
7-1							1	
Ttl. wt.	36.3	20.4	15.5	20.1	17.4		228	109.9

FFA Pumpkins

The Williston Research Extension Center and the Williston High School chapter of the FFA collaborated again this year in raising pink pumpkins. The FFA acquired the seeds and at the appropriate times, (which this year was March 23 and May 22) helped the WREC staff plant them, first in 4" pots and then out into the field. Harvest occurred on September 18 with Ms. Bolstad and 19 students loading the bus with the pumpkins. The FFA sold the pumpkins and split the donations between cancer research and their FFA chapter. The FFA Pink Pumpkins again this year produced very well. Off 17 plants, they harvested over 100 pumpkins. We had a great time supporting a super project!

The NDSU Junior Master Gardener Program provides funds and educational materials for gardening projects across the state. We received a Junior Master Gardener Grant for this project which allowed us to purchase irrigation and landscape fabric and pins as well as fertilizer.

Dakota Horizons Girl Scout Troop 10030 Garden

The Junior Master Gardener Program also granted us funding that allowed us to purchase seed, gloves, potting soil, and some other things for our Girl Scout garden space. When the troop and I met to talk about what they wanted to plant in their garden, **everything plus bananas** wouldn't fit. We finally reduced the list to 30 different kinds of plants.

We planned the layout of the 200 square foot garden with straw bales on one end. This increased our square foot planting by about 46 square feet. We planted on May 18. The straw bales had been conditioned for 2 weeks beforehand, potting soil added to the tops of the bales, and little plants readied for transplanting. The girls, some who'd never planted before, planted the seeds. The plants did very well and almost all the seeds germinated and grew. As a matter of fact, they harvested over 200 lbs. of vegetables and pumpkins off this one little garden bed. They ate every bit they didn't give away or use for decoration at Halloween!

FBC Tomato and Zucchini Trials Garden

The Farm Breeding Club "…brings farmers together to share knowledge and seed stock for seed saving, crop breeding and fellowship." The Club offered to any member of the Northern Plains Sustainable Agricultural Society the chance to perform trials with two tomato varieties and a zucchini this year. We jumped at the chance to work with these people and received our seeds in late March.

We began these trials indoors, planting on April 7, 2015. Both the tomatoes and the zucchini seeds germinated at a 100% rate. They remained healthy and vigorous until we transplanted them on May 27. Eight Caro Rich x Silvery Tree Fir, eleven Kootenai x Speckled Roman Paste, and four zucchini survived.

The Caro cross, my favorite, grew quite a variety of colors and sizes of tomato. Only one vine had the desired lacy look, and it produced the most consistent, round fruits. The best turned deep orange, with thick, firm skin, of about 3" diameter. All of them were SWEET and tasty. They all showed lots of meat, not much seed, and held up in salads, sauces, and the freezing and drying processes. The only problem we had was cracking around the stem end and I didn't save seed from them. Otherwise a really terrific tomato! We picked 236 plus tomatoes and 144 pounds of fruit from 8 vines.

The Speckled Roman/Kootenai cross also gave us a large variety of fruits with variation in striping, shape, size, and vine structure. None got out-of-control big. They all produced lots of tomatoes and all remained fairly healthy until pulled. The one I saved seed from produced the first ripe tomato, remained just about 3.5' high, and gave long (3"), dark, gold-striped fruit with a meaty inside, few seeds, and delicious flavor. A real winner! It also held up to saucing, drying, freezing and salads. From these vines we pulled 204+ fruits and 160 pounds.

Now, the zucchini is another matter entirely. Yes, they produced prolifically (106 fruits and 108 pounds). Yes, the color, and sometimes shape rated as perfect. But. Blossom end rot. I've never had a zucchini with blossom end rot. All four surviving plants kept throwing out blossom end rot, no matter what I tried. Only at the end of the season did they stop.

When I consulted with our new plant pathologist Audrey Kalil, she suggested several resources, the following among them:

https://extension.unh.edu/resources/files/Resource004563_Rep6502.pdf

South Dakota Extension Fact Sheet 909 from March 2002.

University of California Cooperative Extension Publication Number 31-040C from March 2010.

NDSU extension has several articles available at www.ag.ndsu.edu/extension/ search for blossom end rot.

None of these resources gave me a definitive answer on what happened this year, but I now have several things to be on the lookout for next year.

Jumble Toss Garden

What began as a way to test a statement by Don Tanaka, our consultant agronomist, became our favorite trial of the year. Dr. Tanaka insisted he grew his vegetables all jumbled together. He would put all the seeds in a bag, then mix them up and toss them into the garden. In order to believe whether this actually works, we had to try it.

We chose a variety of seeds, put them in a bag and shook, and then tossed them into a prepared garden bed. We covered them over with a light layer of mulch, and walked away, expecting to have only weeds, but oh my goodness; every single thing came up! From nasturtiums to carrots we had a large variety of plants seeking to grow. The heavier seed flew farthest, so we had sunflowers competing and winning over the beans, basil and Swiss chard, which hung on until the sunflowers were blown over by the wind. At that point they shot up and

filled out. Amazingly, weeds didn't thrive in this bed. The beans, tomatoes, marigolds, poppies and cosmos and zinnias out-competed them. Needless to say, next year will be interesting in discovering which varieties self-seeded.

What didn't grow well in this bed was sage, rosemary, lavender, lettuce, spinach or carrots. Why? We don't know. They might have been consumed by the critter that ate the watermelon, but we have no witnesses.

Overall, we enjoyed watching what grew where, and how they did. Amazingly, no disease or stress showed, and even crowded in some places, they remained healthy throughout. We harvested about 109 pounds of vegetables: 22 pounds of cucumbers, 9 pounds of tomatoes, 12 pounds of beans, 2 pounds of Brussel sprouts, 2.3 pounds of Swiss chard and carrots and a whopping 57 pounds of Spaghetti squash. We harvested only 2.3 pounds (2) watermelon. The critters ate well on about 20 melons. And the flowers bloomed until well after the frost.

Straw Bales Garden

The straw bale concept came to us in the form of a book by Joel Karsten from Minnesota, *Straw Bale Gardens: The Breakthrough Method for Growing Vegetables Anywhere, Earlier and with No Weeding!* Well, being busy gardeners, we were intrigued by the earlier and weed free aspects of the claims.

So we purchased 48 durum straw bales in October, and placed them in two garden beds end to end. In the spring, we constructed the support system for the plants. This consisted of 7' T-posts every three bales, with 2x4 braces lengthwise and across. We then strung four strands of wire along the T-posts as supports for the taller plants and vines.

When the temperatures warmed in April we decided to plant out in early May. We began preparing for planting two weeks before by applying Nitrogen fertilizer to each bale, according to directions in the book, at the rate of ½ cup per bale. We applied a granular fertilizer (but in the future I'll apply a liquid), every other day for a week. The watering at this time was: every bale got 2 minutes from the hose, approximately 2 gallons every day. After a week we added ¼ cup fertilizer every other day to each bale. We began testing the temperature and moisture also.

We found that the granular fertilizer and the water didn't evenly cover the bales. The temperatures and moistures differed greatly between the bale sides and middles as well as placement within the row. There's a direct correlation between temperature and moisture, too. The higher the temperature went, the higher the moisture read. As the straw begins to decompose (the purpose of the N fertilizer) the temperature rises. After 2 weeks of the treatment, the temperatures go down to match air temperature, and it's safe to plant into the bales.

On May 4th, we applied 2 bags of potting soil, wet it down, and planted seeds into that. We added drip irrigation that ran every day, as well as overhead watering 3 times a week. Two weeks later, we embedded plants into bales, starting at the top, and then working down the sides.

Very few of the side-planted vegetation survived; these were potatoes, snapdragons, some salvia, calendula, and a few nasturtiums. The nasturtiums did get aphids a few weeks into the trial and were pulled, but the rest hung on until frost.

Garlic

Bulbs from Cheshok Red, Northern White and German Porcelain harvested in 2014 were saved and divided into cloves for 2015 fall planting. Inchelium Red, Kettle River Giant, Italian Loicano, Silver Rose and Elephant, were also included in the October 8, 2014 planting. The varieties were harvested and weighed on August 12, 2015 and the results are as follows:

Garlic **WREC-Williston, ND 2015**

	------- 2014 -------		---------- 2015 ----------			
Cultivar	Yield --- lb ---	Harvested Bulbs	Yield* --- lb ---	Cloves Planted	Bulbs Harvested	Survival ---%---
Northern White	2	17	2.2	11	11	100
Cheshok Red	4.6	31	4	23	21	91
Inchelium Red	0	0	0	20	0	0
Kettle River Giant	--	--	0.4	25	1	4
Italian Loiacano	--	--	0.6	21	8	38
Silver Rose	--	--	0.4	23	8	35
German Porcelain	0.6	13	1	9	8	89
Elephant	--	--	1.2	2	2	100

Planted: October 08, 2014 **Harvested:** August 12, 2015

Previous Crop: Garlic

* Weighed with tops on

On October 5, 2015 all seven varieties were planted in the high tunnel and covered in straw.

High Tunnel

We've kept our high tunnel full and busy this year. We've planted three times since March, and are delighted with the results: 596.5 pounds of produce, from cool season beets and kale to warm season watermelon and back to beets and kale. It's been deliciously prolific and it still has cool season crops growing as of November 25!

High Tunnel Planting #1		High Tunnel Planting #2		High Tunnel Planting #3	
Variety	Wt. (lb.)	Variety	Wt. (lb.)	Variety	Wt.(lb.)
Beet		**Eggplant**		**Lettuce**	
Sweet Dak. Bliss	5	Millionaire Hybrid	3.55	Encore Salad Mix	1.25
Bull's Blood	10.6	Rosa Blanca	0.6	Romain	0.11
Choggia	7.4	**Okra**		Select SaladBlend	0.13
Turnip		Red Burgundy	8.39	Black seed Sim.	
Purple top White	3.2	Jambalaya	5.8	**Kale**	
Carrot		**Artichoke**		Wild Garden	0.89
Scarlet Nantes	8.4	Imperial Star		Red Russian	
Shell Pea		Cardoon		**Swiss Chard**	
Homesteader	2	**Tomato**		Bright Lights	0.1
Snap Pea		Brown Berry	45.13	Fordham Green	
Sugar Snap	5.04	Chocolate cherry	22	**Radish**	
Sugar Ann	3.8	**Pepper**		French Breakfast	2.4
Onion		Mini Belle Blend		**Peas**	
Frontier	4.1	Chablis Hybrid		Oregon Sugar snap	
Lettuce		Ethnic Sweet	3.04	Sugar ann	
Romulus	3.85	Sweet Chocolate		**Mixed Greens**	1.4
Swiss Chard		**Cucumber**			
Bright Lights	2	Barese	6.4		
Green Cabbage		Tasty Green	104.7		
Farao	25.6	Mini White			
Kale		**Hot Peppers**			
Red Russian	8.6	Early Jalapeno			
Wild Garden	12.6	**Melon**			
Kohlarbi		Sweet Granite	56		
Korridor		Dakota Sisters	44.4		
		Watermelon			
		Blacktail Mountain	68.8		
		Texas A&M Mini	66		
		Pumpkin			
		New England Pie	46.6		
		Radish			
		Watermelon	7.2		
Total Weight #1	**102.2**	**Total Weight #2**	**488.6**	**Total Weight # 3**	**6.28**

AAS Garden

This year the All-America Selections included a few new and exciting faces. For the first time ever they have chosen three organic herbs to be named a 2015 AAS Vegetable Award Winner. We were fortunate enough to receive two out of the three herbs to plant in our display gardens. The first organic herb was a basil variety, ‘Persian’ and the second herb was a chive variety called ‘Geisha’. We were again thrilled by the color and bounty that this year’s AAS display garden provided all season long. In fact, most of the petunias, salvias, osteospermums, geraniums, penstemons and Echinacea were all still blooming right up until frost!

Production of the vegetable plants in this demonstration garden was up this year because the melons, cucumbers, watermelons, peppers, tomatoes and squash just kept on generating fruits, until the first part of October. The total harvest from the AAS vegetables and herbs was 320 lbs.

Perennial Trial

This trial was established in collaboration with NDSU Extension Horticulturist Dr. Esther McGinnis which aims to evaluate the cold hardiness of new cultivars of both Echinacea and Heuchera. WREC planted 14 varieties of Coneflower Echinacea cultivars and 16 varieties of Coral Bell Heuchera cultivars on June 4th 2015. The trial was evaluated in the fall based on observations of their aesthetic qualities for the landscape which included ratings of ornamental value and pest incidence. The trial will be evaluated in the spring to see which cultivars survived the winter and will still be of landscape value in our area. See tables for more information.

Perennial Echinacea Trial — **Williston, ND**

	Plant Size		Flower	Ratings	
	--- Inches ---		Count	--- 1 to 10 scale ---	
Cultivar	Height	Width	# in bloom	Pest	Ornamental
Salsa Red	13.0	17.6	74.5	9.3	10.0
White Swan	13.3	10.9	22.3	7.3	7.5
Hot Papaya	17.3	12.9	22.3	8.3	7.3
Purple Emperor	12.3	12.8	28.5	9.3	9.8
Fatal Attraction	14.1	10.6	25.3	7.0	8.3
Supreme Cantaloupe	16.8	11.1	26.0	8.5	7.8
Butterfly Kiss	12.0	13.3	36.3	8.5	9.0
Cleopatra	7.3	6.9	9.8	6.5	5.8
Julia	13.0	13.6	34.5	8.5	7.5
Sombrero Coral	11.8	11.9	40.8	9.8	10.0
Ruby Star	16.5	15.0	32.8	6.8	7.5
Pixie Meadowbrite	14.6	16.5	69.5	10.0	10.0
Piccolino	7.4	8.3	53.8	9.8	6.5
Pow Wow White	14.0	14.1	44.8	7.5	8.3
Mean	13.1	12.5	37.2	8.3	8.2
CV	25.9	16.1	34.1	15.2	18.6
LSD 10%	4.00	2.40	15.10	1.50	1.80

Planted: June 04, 2015 **Spacing:** 3' on center

Rating Scale: 1 being low, 10 being high

Echinacea 'Hot Papaya'

Perennial Heuchera Trial					**Williston, ND**
	Plant Size		Flower	Ratings	
	--- Inches ---		Count	--- 1 to 10 scale ---	
Cultivar	Height	Width	# in bloom	Pest	Ornamental
Marmalade	5.9	9.4	0.0	10.0	8.8
Obsidian	6.8	11.8	2.5	10.0	10.0
Cherry Cola	4.5	8.1	5.8	10.0	5.8
Stainless Steel	12.3	9.4	0.3	10.0	8.5
Lime Marmalade	5.3	9.5	25.3	10.0	5.8
Frosted Violet	6.4	11.4	6.0	10.0	6.0
Crimson Curls	6.5	10.8	0.0	10.0	9.5
Plum Pudding	5.6	11.6	2.3	10.0	7.3
Midnight Rose	6.4	11.0	0.5	10.0	10.0
Apple Crisp	5.5	10.5	1.0	10.0	9.3
Zipper	5.8	8.1	0.8	10.0	5.8
Caramel	6.8	11.5	0.0	10.0	9.5
Berry Smoothie	5.3	10.8	0.0	10.0	6.8
Miracle	3.5	6.4	0.0	10.0	2.5
Autumn Leaves	5.8	10.4	4.3	10.0	5.3
Mean	6.1	10.0	3.2	10.0	7.4
CV	14.8	13.7	138.5	0.0	15.9
LSD 10%	0.99	NS	2.55	NS	1.39

Planted: June 04, 2015 **Spacing:** 2' on center

Rating Scale: 1 being low, 10 being high

The variety 'Fire Alarm' was not included in results for Williston and Absaraka trials because of poor survival after transplanting

Heuchera 'Lime Marmalade'

Irrigated Onion Variety Trial — **WREC - Nesson Valley 2015**

Variety	Seed Source	Days to Maturity*	2014 Yield	2015 Yield	2 Year Average	<2 1/4"	2 1/4 - 3"	3 - 4"	Culls	Harvested	Single Center	Total
			---------- cwt/A ----------			----- Average Number Bulbs/Treatement Rep -----					---- % ----	--Bulb/A--
Crockett	Bejo	118	980	657	818	7	9	4	6	26	33	186889
Oloroso	Nunhems	Not Reported	860	587	724	2	12	3	7	24	90	175273
Hamilton	Bejo	118	694	713	703	2	10	7	2	20	40	145587
Sedona	Bejo	118	743	579	661	2	10	4	2	18	53	130615
Campero	Nunhems	Not Reported	769	494	632	4	12	2	4	22	23	156687
Delgado	Bejo	115	560	685	622	2	10	6	3	20	33	143780
Valero	Nunhems	Not Reported	669	502	585	4	9	3	6	22	30	155396
Calibra	Bejo	115	440	556	498	3	12	2	4	22	40	155654
Marenge	Nunhems	115	423	509	466	3	10	4	4	21	30	152041
Countach	Nunhems	118	327	490	409	4	11	2	6	23	43	163398
Trailblazer	Takii	Not Reported	213	334	274	7	7	0	14	27	20	196181
Trekker	Takii	95-100	240	204	222	2	3	0	15	20	60	143006
Highlander	Takii	85-90	-----	350	-----	5	8	2	4	19	13	137585
Frontier	Takii	95-100	-----	290	-----	4	8	1	2	14	20	103511
Ascent (T-801)	Takii	80-85	-----	222	-----	6	3	0	15	24	40	172175
Mean			577	478	551	4	9	3	6	21	38	154519
C.V. (%)			-----	23.1	-----	87.1	37.1	81.1	80.5	26.7	47.2	26.1
LSD (P= 0 .1)			-----	153.7	-----	4.6	4.6	2.9	7.0	8.0	24.9	NS

Planted: 4/22/2015 **Harvested**: 8/20/2015 **Previous Crop**: Barley

Soil: Lihen fine sandy loam soil; pH=7.8; 1.7% O.M.; 40 lb. N; 52 ppm P and 223 ppm K.

Planting: 5 row cone seeder at 7 ½" spacing wide, Reps 1 and 2 measured 10 ft long, Rep 3 was 9 ft long. The study had 3 replications. The row to be harvested was thinned to 3-4" between bulbs.

Fertilizer: 215 lbs. Urea (46-0-0) applied June 4th

Weed/Pest Control: All seed pelleted with differing formulations of insecticide and fungicide perseed company. Prowl H20 (24 oz/A) applied on June 3rd, June 4th Section 2EC (6 oz/A) + Destiny (1% v/v) and on June 23rd Moxy (1.5 pt/A) were applied for weed control. Hand weeded as needed.

Rainfall: 6.23" from April 22nd to August 20th

Irrigation: 11.2" from April 22nd to August 20th

Harvest: The thinned row was hand harvested from each plot August 20th after strong winds blew most of the tops over. They were weighed and graded August 27th.

* Days to Maturity reported from seed company.

High Tunnel Decreases Occurrence of Sub-optimal Temperatures But Also Increases Occurrence of Supra-optimal Temperatures

Jim Staricka, Kim Holloway, and Kyla Splichal

High tunnels may extend the growing season for fruits and vegetables by providing protection from cold air during spring and autumn. If air temperature management in high tunnels is passive, the temperature within a high tunnel may exceed the optimal for plant growth on sunny days, even when the temperature outside does not.

The Williston Research Extension Center constructed a high tunnel for horticultural research in 2006 with renovations done in 2013. Temperature data loggers were placed in three locations both inside of the high tunnel and outside of the high tunnel. Each logger was covered with a radiation shield and placed 40 inches above the soil surface. The data loggers, configured to record the ambient temperature at 15-minute intervals, were installed on 24 April 2014 and have been operating continuously since then.

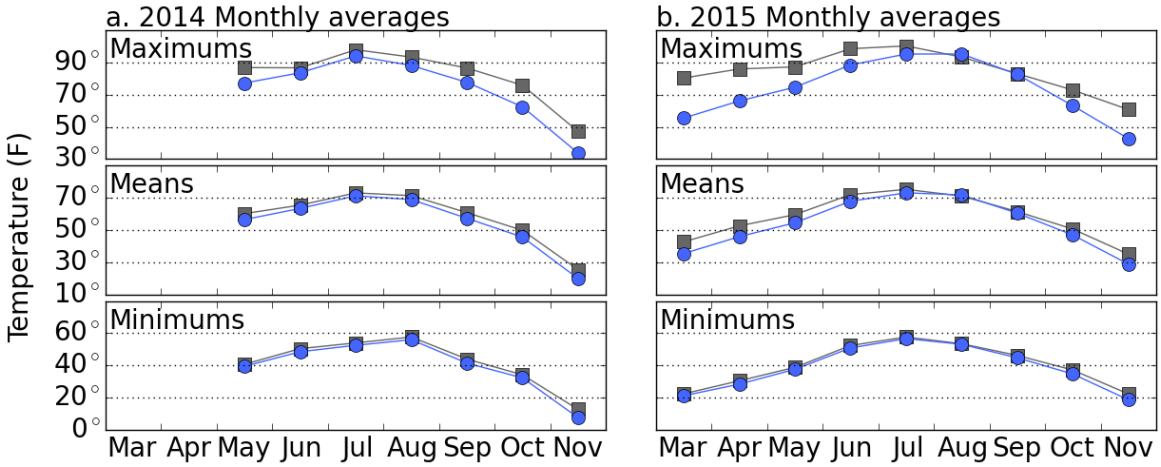
Because temperature data was not recorded for most of April 2014, the growing season statistics presented in Table 1 were calculated for the period of May 1 through November 30 to facilitate comparison between years. Generally, 2015 was warmer than 2014. The mean (i.e., average) temperature, both inside and outside of the high tunnel, was 3° warmer in 2015 than 2014. The difference between the 2014 and 2015 daily maximum temperatures was greater, as the daily maximums were 3° (inside) and 4° (outside) warmer in 2015 than in 2014. The difference between the 2014 and 2015 daily minimums was not quite as great, as the daily minimums both inside and outside the high tunnel were only 2° warmer in 2015 than in 2014. The differences between the 2014 and 2015 maximum, mean, and minimum temperatures varied from month to month and were greatest in November (Figure 1).

It was warmer inside of the high tunnel than it was outside of the high tunnel (Table 1). The average mean temperature inside was 3° warmer than outside. The daily minimum temperatures were 2° warmer inside versus outside and the daily maximum temperatures were 8° (2014) and 7° (2015) warmer inside versus outside. The difference in temperatures between the inside and the outside of the high tunnel varied month to month, especially for the daily maximum temperatures (Fig. 1). The differences were large in the early spring, decreased steadily to nearly nothing by mid-summer, and then increased nearly steadily as autumn progressed.

Table 1: Average minimum, mean, and maximum daily air temperatures inside and outside of the Williston Res. Ext Center high tunnel.

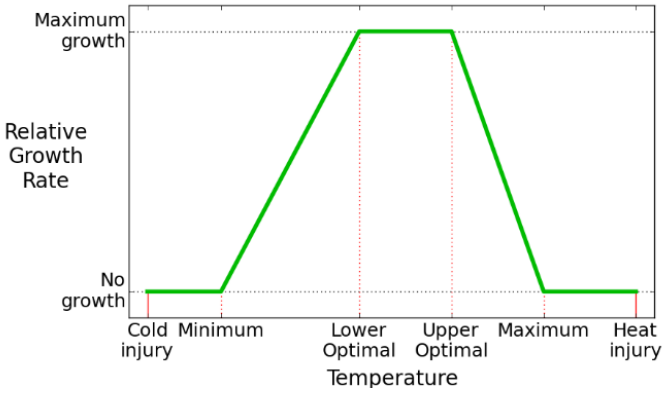
Year and Location	Minimum	Mean	Maximum
2014 (May 1 – Nov 30)			
Inside of high tunnel	42°	58°	82°
Outside of high tunnel	40°	55°	74°
2015 (May 1 – Nov 30)			
Inside of high tunnel	44°	61°	85°
Outside of high tunnel	42°	58°	78°

Figure 1: Daily maximum, mean, and minimum air temperatures inside (-■-) and outside (-●-) of the high tunnel



Plant growth rate is influenced by temperature. The general relationship between temperature and growth rate is similar for most species (Figure 2), but the critical temperatures vary. For example, the optimal temperatures for beet, broccoli, cabbage, and similar vegetables are between 60° and 65°, while for eggplant, hot pepper, sweet potato, and similar vegetables the optimal temperatures are between 70° to 85°.

Figure 2: Typical relationship between temperature and plant growth rate.



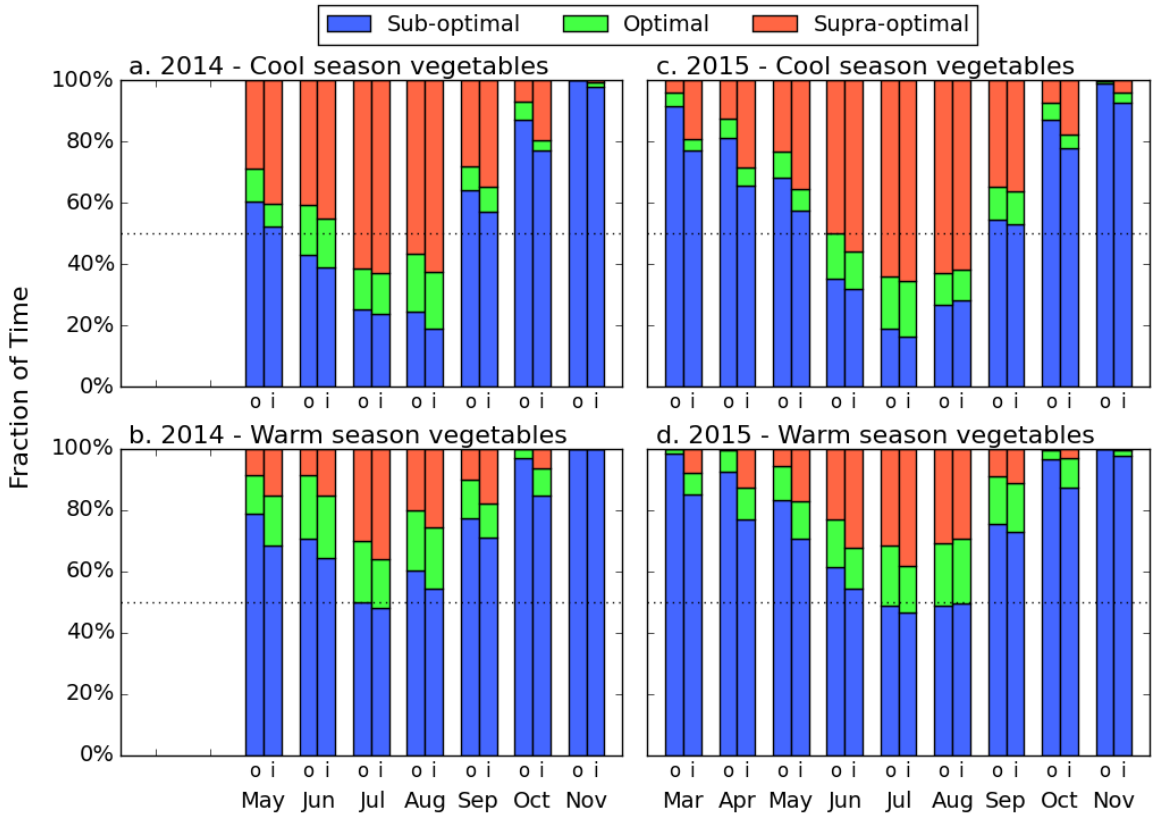
Black and Drost (2010), using data in part from *Knott's Handbook for Vegetable Growers*, separated common garden fruits and vegetables into 12 groups based on their critical temperatures for growth. Two of these groups, a cool-season group and a warm-season group (see Table 2), were selected to determine whether or not the high tunnel increased the occurrence of temperatures optimal for plant growth.

Table 2: Description of vegetable groups used for temperature analysis.

	Cool season group	Warm season group
Optimal temperature	60° – 65°	70° – 80°
Members of group	beet, broad bean, broccoli, cabbage, chard, collards, kale, parsnips, radish, spinach, turnip	eggplant, hot pepper, okra, sweet potato, watermelon

The fraction of time that temperatures were supra-optimal (i.e., warmer than optimal), optimal, and suboptimal (i.e., cooler than optimal) for plant growth was determined for each month from May to November of 2014 and for each month from March to November of 2015 (Figure 3).

Figure 3: Fraction of time when temperature outside ("o") and inside ("i") of the high tunnel was sub-optimal, optimal, or supra-optimal for growth



In all months for both groups, the fraction of time when temperatures were optimal was small. For the cool-season vegetables, optimal temperatures never occurred more the 19% of the time in any month. For the warm-season vegetables, optimal temperatures never occurred more the 21% of the time in any month. Usually, temperatures were either sub-optimal or supra-optimal. For the cool-season vegetables, supra-optimal temperatures dominated (i.e., occurred more than 50% of the time) in July and August of 2014 and June, July, and August of 2015 and sub-optimal temperatures dominated during the other months except June 2014. For the warm-season vegetables, supra-optimal temperatures never dominated; sub-optimal temperatures dominated every month except July and August of 2015.

The high tunnel did not always increase the occurrence of optimal temperatures. This is because often when the high tunnel decreased the occurrence of sub-optimal temperatures, it also increased the occurrence of supra-optimal temperatures. In many cases, the increase of supra-optimal temperatures was greater than the decrease of sub-optimal temperatures so that the duration of optimal temperatures actually decreased. For example, in May 2014, the high tunnel decreased the duration of optimal temperatures for the cool-season vegetables but increased the duration of the optimal temperatures for the warm-season vegetables.

In this study, the high tunnel increased the duration of optimal temperatures 14 of the 32 months analyzed, and decreased the duration of optimal temperatures 18 of 32 months. An increase in optimal temperatures occurred more often for the warm-season vegetables than for the cool-season vegetables (11 months versus 3), and occurred more often in spring and autumn than in June, July, or August (11 months versus 3).

When sub-optimal temperatures are decreased and supra-optimal temperatures are increased, the net effect on plant growth will depend on which is detrimental to plant growth. Perhaps if adequate water is supplied to the plants, the detrimental effect of supra-optimal temperatures can be lessened.

For high tunnels to improve temperature conditions for plant growth, an automated temperature management system is essential. This was expressed by Black and Drost (2010) in a publication from Utah, and it appears that the same is true for cooler climates such as North Dakota. An effective system would reduce temperatures within a high tunnel during times when the temperatures inside the high tunnel within exceed the optimal and are warmer than the outside temperature. Possible methods include thermostatically-controlled ventilation systems and thermostatically-controlled shading systems.

High tunnels may provide benefits to plant growth unrelated to temperature. For example, they can reduce the potential of physical damage to plants by wind or hail. However, without an automated temperature-management system, the benefits provided by high tunnels for plant growth are limited.

References Cited:

Temperature management in High Tunnels. Utah State University Cooperative Extension. Brent Black and Dan Drost. April 2010.

Hops

Kyla L. Splichal

In the fall of 2014, WREC was awarded a USDA Specialty Crop Block grant which allowed for expantion of hop variety research and establishment of a new hop yard. The new trellis was built using 20' telephone poles buried 4 feet into the ground and allows for vertical growth of the bines up to 15 feet. Twelve popular hop varieties were selected and planted. The trellis was strung and bines were trained beginning to mid-June. The hop cone harvest started August 19th and continued through September 9th using a Hopster5P mechanical harvester. This harvester allowed us to cut the bines down and harvest directly in the field. Special thanks to Jeff and John at HopsHarvester LLC for getting us this harvester in a timely manner and working with us through all the concerns/questions that arose during harvest. Data from this hops variety/research study allows us to compare varieties for adaptation to Western North Dakota. As a result of collaborative efforts with Dr. Harlene Hatterman-Valenti in Fargo, a similar hops variety/research trial was established in Absaraka, North Dakota. Hops are a perennial crop and will be grown, strung and harvested in the upcoming seasons. See table for harvest information.

Hops Variety Trial- WREC — **Williston, ND 2015**

Variety	Origin[1]	Brew Usage[2]	Typical Beer Style	Typical Alpha Acid Ranges	2015 Tested Alpha Acid	2015 Hop Storage Index[3]	2014 Reported Yield for Idaho[4]	2014 Reported Yield for Oregon[4]	2014 Reported Yield for Washington[4]	2015 Yield[5]
				---- % ----			---------- Pounds/Acre ----------			
Challenger	UK	D	English Ale	6.5-9%	8.9	0.24	Not Reported	Not Reported	Not Reported	2539
Galena	DM	B	English Ale	10-15%	6.2	0.21	Not Reported	Not Reported	1801	1846
Cascade	DM	A	American Pale Ale	5-7%	3.1	0.21	1746	1402	1824	1626
Nugget	DM	B	Barley Wine	12-14%	3.6	0.22	Not Reported	1978	1538	1281
Newport	DM	B	Barley Wine	13-17%	2.4	0.25	Not Reported	Not Reported	Not Reported	1162
Centennial	DM	D	American Pale Ale	9.5-11%	6.3	0.24	754	1095	1347	1041
Willamette	DM	A	English Style Ale	4-6%	2.0	0.26	Not Reported	1453	1130	1036
Glacier	DM	D	American Pale Ale	5.50%	4.2	0.24	Not Reported	Not Reported	1202	878
Brewer's Gold	UK	B	Ale	8-10%	3.2	0.25	Not Reported	Not Reported	Not Reported	632
Zeus	DM	B	Pale Ale	20%	1.2	0.26	2891	Not Reported	2811	397
Mt. Hood	DM	A	Lager	4-7%	3.0	0.22	Not Reported	1450	1333	339
Spalt Select	GE	A	Bock	3-6.5%	3.0	0.26	Not Reported	Not Reported	Not Reported	177

[1]DM = Domestic, UK = United Kingdom, GE = German as reported by Hopunion LLC

[2]A = Aroma, B = Bittering, D = Dual purpose as reported by Hopunion LLC

[3]HSI is a non-dimensional number calculated by measuring the adsorption of an alkaline methanolic hop extract at two different wavelengths using UV spectrophotometric analysis. Normal range is from 0.25 for fresh hops and 2.5 for fully oxidized hops.

[4]USDA-NASS report prepared by Hop Growers of America (HGA)

[5]Yield LSD (10%) = 584

Hops Selections for North Dakota

NDSU Williston Research Extension Center

Kyla L. Splichal

Abstract

Hops (*Humulus lupulus,)* is an herbaceous perennial bine belonging to the *Cannabinaceae* family which also includes the genre of *Cannabis* (Hemp) and *Celtis* (hackberries). It has many uses other than for beer-making. Such uses include medicinal and cosmetic products, ornamental value, as well as a delicacy. Native varieties, along with cultivated varieties, are successfully grown in North Dakota; however, there is a lack of research on the yield and quality of this unique commodity. Desired acid and oil profiles of the hops are what give them their marketability. The priorities of this project are to determine whether high yield and high quality hops can be grown in North Dakota, and to determine the best variety selections for our upper Midwestern climate. We will be evaluating 12 different varieties on a high trellis. We will make note of which varieties acclimate well to two regional locations by recording their vigor and production during the season. Funding from the Specialty Crop Block Grant will assist with evaluating these varieties, installing the trellising system, and the processing involved with harvesting hops. The proper trellising system will have a direct impact on the yield, and proper processing mechanisms will have a direct impact on the marketability of the finished product.

Introduction

As home brewers and craft-breweries are on the rise in this region, so is the demand for locally sourced and/or organically grown products. There appears to be an emerging market for not only organically grown hops, but also one specifically for microbreweries and home craft brewers with the desire to create uniquely distinct products. One might also find a surprising market in agro-tourism, and the promotion of farm diversification. This project's objectives are to determine whether high yield and high quality hops can be grown in North Dakota, and to determine the best variety selections for our upper Midwestern climate in order to make the proper recommendations.

Methods & Materials

The type of trellising system that was chosen is called a high-trellis. Twenty foot high telephone poles were placed 4' into the ground, making the trellis height 16 feet. There are three high-trellis rows, spaced 15' apart; each representing one replication of 12 varieties in a randomized complete block design. There are three plants from the same variety grown in each rep and evenly spaced 3' apart with a seven foot buffer between varieties. Data was collected from all of the plants. Vigor and overall plant health was evaluated using an arbitrary scale of 0-5, with zero being the least vigorous and five being the most. Harvest weights, vigor and spider mite damage notes will be analyzed from one of the three plants in each rep. One bulk sample from each variety was sent to a lab for Alpha Acid, Beta Acid, Hop Storage Index (HIS) and Essential Oils testing as shown in Table 1. After harvest, the hops were placed in a dryer and weights were recorded after 24 hours.

Variety	Date Planted	Date Harvested	Weight harvested grams
Brewer's Gold	6/10/2015	9/8/2015	296.35
Cascade	8/1/2014	8/25/2015	526.17
Centennial	8/1/2014	8/19/2015	328.85
Challenger	8/1/2014	9/9/2015	1189.92
Galena	8/1/2014	9/2/2015	864.85
Glacier	8/1/2014	9/9/2015	411.26
Mt. Hood	8/1/2014	9/8/2015	106.59
Newport	8/1/2014	9/1/2015	544.31
Nugget	8/1/2014	8/31/2015	600.25
Spalt	8/1/2014	9/2/2015	83.16
Willamette	8/1/2014	8/26/2015	485.34
Zeus	6/10/2015	9/2/2015	185.97

Table 2. Shows dates planted and harvested, along with the mean weight per variety among the three reps

Results

One year's worth of growth and harvest data has been collected. The yield data is summarized from one plant per rep for each variety. Hops are a perennial crop that reach maximum production after a minimum of three years. The results after one year have shown a few varieties to have desirable characteristics and yields for the Northwestern North Dakota, but will still take two more years to determine full potential.

Hops Variety Trial- WREC — **Williston, ND 2015**

Variety	Origin[1]	Brew Usage[2]	Typical Beer Style	Typical Alpha Acid Ranges	2015 Tested Alpha Acid	2015 Hop Storage Index[3]	2014 Reported Yield for Idaho[4]	2014 Reported Yield for Oregon[4]	2014 Reported Yield for Washington[4]	2015 Yield[5]
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[4]USDA-NASS report prepared by Hop Growers of America (HGA)

[5]Yield LSD (10%) = 584

Table 1. Shows variety information, Alpha Acid ranges, Hop Storage Index, Reported yields for primary growing US Region, and WREC Yields

NDSU NORTH DAKOTA STATE UNIVERSITY

Evaluating Soil Temperature in Sweet Potato *Ipomoea batatas*

Kyla Splichal, Tyler Tjelde and James Staricka

Introduction

Contrary to popular belief, the sweet potato is not even closely related to the white or Irish potato that we think of when referring to the term. In fact, sweet potatoes do not belong to the Nightshade family at all, but rather to the morning glory or *Convolvulaceae* family. It is a perennial vine that produces a tuberous, sweet-tasting, starchy root. It is native to tropical regions of the Americas. WREC has been testing sweet potatoes since 2010.

Image 1

Objectives

This project evaluated ground coverings and their effects on soil temperatures. Sweet potatoes are a root crop that thrive in warmer climates. The hypothesis was that warmer soil temperatures early in the season would allow for an earlier planting date, longer growing season and thus, increased yields.

Methods

Black woven landscape fabric and black plastic were chosen as the treatments with bare soil as a check (Image 1). The treatments were laid out with soil sensors with two leads buried 4" below the soil surface on May 1st (Image 2). Two varieties of sweet potato, *Georgia Jet* and *Beauregard,* were chosen based off of previous years' performance. The trial was set up in a randomized complete block design with four replications and three treatments. The soil sensors were installed in two of the replications.

Image 2

Results

The sweet potatoes were planted June 2nd. Slips were transplanted every twelve inches. Soil temperature data was collected from May 1st through September 14th with temperature recordings every 15 minutes. Temperature variation between the treatments was observed starting May 30th with the greatest variation occurring July 17th. Figure 1 is used to show differences in soil temperatures between the three treatments, and the average of each treatment (4 sensors) is observed in the graph. Soil temperatures were lowest in bare soil, with plastic having the highest soil temperature. Yields for 2015 were lower than normal because of plant establishment early in the growing season. Table 1 shows

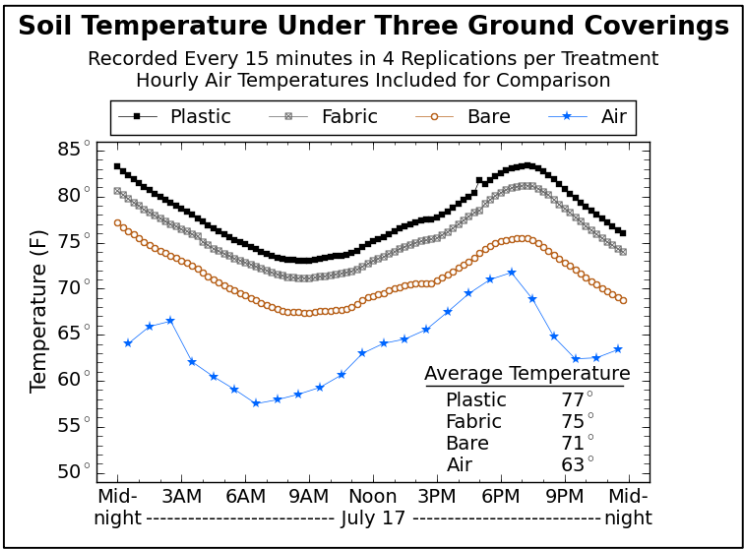

Figure 1

the differences in yields between the three treatments. *Georgia Jet* is a dark red skinned, orange fleshed variety that produces very large roots. It is an 85 day variety making it desirable for northern growers. *Beauregard* is also a high yielding 95 day variety developed by Louisiana State University. It has reddish-purple skin and bright orange flesh.

Irrigated Sweet Potato Trial **WREC-Nesson Valley 2015**

			USDA Grades				
			-------- % --------				
Cultivar	Treatment	cwt/A	US #1	Petite	US #2	Commercial	Culls
Georgia Jet	Fabric	51	16.0	20.0	10.0	20.0	34.0
	Plastic	30	11.1	5.6	22.2	11.1	38.9
	Bare	32	22.9	4.2	8.3	10.4	54.2
Beauregard	Fabric	113	26.8	14.1	4.0	5.4	49.7
	Plastic	83	13.7	22.1	6.9	3.1	54.2
	Bare	30	20.5	18.2	0.0	13.6	47.7

Planted: June 2nd 2015 **Harvested:** September 29th 2015

Previous Crop: Wheat

Plot size: 63 ft^3

Soil: Lihen Fine sandy loam; pH 7.5, O.M. 2.0%, 38 lbs N, 32 ppm P and 225 ppm K

Fertilizer: 364 lbs 46-0-0 broadcast April 10th. 152 lbs 11-52-0 applied in row at planting.

Rainfall: 8.09" from June 2nd to September 29th

Irrigation: 9.2" from June 4th to September 29th

Table 1

Conclusion

This project will be conducted again in 2016. Soil temperatures were increased when adding a soil cover and in this part of the country the window for production is already narrow. Evaluating soil temperatures using fabric, plastic and bare treatments in sweet potato production does show potential for increasing yields.

Foundation Seed Increase Update 2015

Kyle Dragseth, David Weltikol, Cameron Wahlstrom, Kelly Stehr

Hello to you all! We hope you all had a great 2015 growing season and are getting geared up for another great year in 2016. Our foundation seed increase program is keeping busy during the winter months cleaning grain and preparing for what we hope is another successful year in 2016.

We are very excited that through a cooperative effort with the North Dakota Game and Fish Department, WREC acquired a lease on 1,120 acres located on the River bottoms of the Lewis and Clark Wildlife Management Area for pure seed production. This parcel of land is located only 2 miles south of our existing Research Extension Center land and will serve as a significant addition to our Foundation Seed Increase Program, allowing us to grow more crop varieties and expanded production of new and existing crop varieties.

Listed below are the varieties available for sale. Please contact the WREC at 701-774-4315 or Kyle at 701-770-1652, by writing to the Williston Research Extension Center at 14120 Hwy 2, Williston, ND 58801, or by email to NDSU.Williston.REC@ndsu.edu with questions on varieties, pricing, and seed availability. If you are looking to grow a variety not listed please contact us and to see if that variety is available at one of our other Research Extension Centers.

Williston Research Extension Center Foundation Seed Increase

Varieties include the following:

HRSW	HRWW	Durum	Barley	Peas	Soybeans	Safflower	Flax	Lentils
Barlow	Decade	Joppa	ND Genesis	K2	Trail	Finch	York	Richlea
Mott		Carpio		Mystique	Ashtabula			
Elgin		Tioga						
Velva								
Reeder								

Eastern Agricultural Research Center Foundation Seed Increase

Varieties include the following:

HRSW	Durum
Duclair	Silver

Seed availability and prices can be obtained by calling 406-433-2208, by writing to the Eastern Agricultural Research Center, 1501 N Central Avenue, Sidney, MT 59270, or by email at msu.earc@montana.edu.

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Jerald Berman
Director

Kelly Stehr
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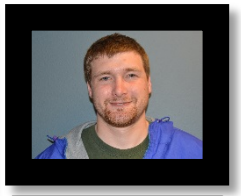
Gautam Pradhan
Research Agronomist

Diana Amiot
Ag Research Specialist



Austin Link
Ag Research Specialist

Under Recruitment
Ag Research Specialist

Soil Science

Jim Staricka
Soil Scientist

Extension

Under Recruitment
Cropping Systems Extension Specialist

Plant Pathology

Audrey Kalil
Plant Pathologist

Under Recruitment
Plant Pathology Research Specialist

Agronomy-Irrigation

Tyler Tjelde
Irrigation Agronomist

Justin Jacobs
Ag Research Specialist

Scott Jenks
Irrigation Ag Technician

David Schmidt
Irrigation Ag Technician

Foundation Seed Increase and Farm Management

Kyle Dragseth
Farm Manager

David Weltikol
Ag Technician Mechanic

Cameron Wahlstrom
Ag Research Specialist

Horticulture/Agronomy

Kim Holloway
Research Specialist

Kyla Splichal
Research Specialist

2015 Summer Staff

Haley Becker
Ron Hunt
Taheni Gargouri Jbir
Ida Purkey
Grace Dragseth
Sam Young
Brad Young

Seasonal Employees

Lynn Staricka

Sandy Spurlock

Consultants

Don Tanaka
Ag Cropping Specialist

Charles Flynn
Chemist

WREC Welcomes Three New Staff Members

Dr. Audrey Kalil, Plant Pathologist

Audrey has spent the last eight years working as a researcher, both in the agricultural biotech industry and in academia. Audrey earned her Bachelor of Science in Biology from the University of Minnesota-Twin Cities and then worked for three years as a research associate with an inoculant manufacturer. She then left to pursue her graduate studies at the University of Wisconsin-Madison. While at UW-Madison, Audrey studied beneficial root associated microbes, won the Outstanding Graduate Student Award from the UW-Madison Agronomy Department, and received her Ph.D. in Plant Pathology with a minor in Plant Breeding and Plant Genetics.

Previous to accepting the plant pathologist position, Audrey worked as an IPM Scout at the Williston Research Extension Center for the NDSU Plant Pathology Department this summer. She scouted five counties in western North Dakota for insects and diseases of small grains, soybeans, canola, corn, and sunflower.

Audrey is originally from Maple Grove, MN. She is married to Tom Kalil and has an 18 month old daughter named Avery.

Austin Link, Agronomy Research Specialist II

Austin grew up dairy farming in north central Minnesota where he learned many valuable skills such as rotational grazing systems and raising corn, oats, and peas. After the successful completion of his B.S. in Natural Resource Management with a focus on soil and water management from the University of Minnesota Crookston, Austin proceeded to NDSU where he attained a M.S. Degree in Range Science. His research focused on Restoration of Upland and Riparian Vegetation Communities in the Sheyenne River Valley. Upon completion of his M.S., Austin began working for an environmental consulting firm in Gillette, WY as a Vegetation Ecologist.

Currently, Austin serves as an Agronomy Research Specialist at the NDSU-Williston Research Extension Center. His duties and responsibilities include dryland crop variety testing and agronomic production research trials. He is also responsible for coordinating a 9-year pipeline reclamation study to evaluate the success of different cropping rotations, annual and perennial cover crops, and manure application in rehabilitating soil health and restoring crop yields.

Justin Jacobs, Agronomy Research Specialist II

Justin brings with him experience in both full-scale farming and research. He has several years of experience working for local producers in Williams County as a farm/ranch hand. He is familiar working with small grains, peas, chickpeas, and canola.

Justin earned his B.S. Degree in Crop and Weed Science with a focus in Agronomy from NDSU. During the summer of 2014, Justin was an intern at the WREC where he conducted research at the Nesson Valley Irrigated Research Project. With his valuable farm, research, and laboratory experience, Justin brings a passion to serve the farming community around him. His primary focus is in conducting agronomic variety trials of northwestern crops.

Eastern Agriculture Research Center Staff

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RESEARCH ASSISTANT

DISEASE FOCUS

Black Knot

Black Knot is caused by a fungus that attacks various species of the *Prunus* genus which includes cherries, peaches, plums apricots, almonds and chokecherries. The causal agent of this fungus is known as *Apiosporina (Dibotryon) morbosum*. Black knot's most common and obvious symptom is the thick black cankers that form on the branches and resemble the appearance of burnt wood. This is a perennial canker disease because the galls are formed in the first growing season as small light brown or olive green swellings and then fully erupt into the black hard, coal-colored galls the following season.

Importance

This disease is important for our area because of its incidence on chokecherries which are commonly planted in shelterbelts and landscapes. And more specific are ornamental plantings of 'Schubert' or 'Canada Red' Chokecherry because of their attractive purple foliage and especially fragrant flowers in the spring. Wild chokecherries are also found across the region and serve as hosts for this disease.

Disease Cycle

It is always recommended that you choose healthy, disease free and if possible, disease resistant varieties when making a selection. But when this isn't possible, understanding the life cycle of the causal agent is key to managing this disease. The disease cycle occurs with both sexual and asexual spores belonging to the Ascomycete group. These spores appear early in the spring to early summer and are spread by air movement and rain splash. The spores spread from tree to tree or to new infection sites on the same tree entering the bark of young succulent green shoots or through wounds. In the second year of infection, the swellings enlarge and a velvety layer of asexual spores is produced on the surface of the canker. Eventually by the end of the second growing season the swellings become hard and turn black. The blackened galls can continue to grow at the margins each year and will eventually girdle the branch causing it to die. It is in these knots that the spores overwinter.

Management

In the case of black knot, prevention is the only real way to manage the disease, however, most people don't notice the disease until it is in its second year of infection. In which case, removal of the cankers is the first step in treatment. Black knot infection is most noticeable during the winter when the foliage is not present. It is during this time that the galls should be pruned out completely making the cut at least 12" away from the gall wherever possible. This is not always possible, therefore, it is recommended that your pruning shears be disinfected after each cut with a solution of one part water to one part bleach. The pruned out stems should be burned or buried immediately; if left uncontained they will continue to re-infect the host plants, especially after making cuts on the tree that serve as re-entry points for the disease. If the infection has spread to the main trunk of the tree, there is no pruning or treatment that will rid the tree of this problem and unfortunately will kill the tree. The last and most drastic and sometimes costly measure to control black knot is spraying with fungicides. This method is often used as commercial applications in orchards and high value crops.

The purpose of this page was to create awareness of a disease that has been observed by homeowners in this area, and one that I have received the most questions on in the past few years. If you have any questions please feel free to contact me, Kyla Splichal, at the Williston Research Extension Center.

Upcoming Events for 2016

January 5	Diversity Direction & Dollars - Ramada Grand Dakota Lodge – Dickinson
January 5-7	MSU Crop & Pest Management Conference-- MSU, Bozeman, MT
January 6-7	Manitoba-North Dakota Zero Till Conf – Grand Hotel-Minot
January 13	New Trends in Agriculture - Cottonwood Inn - Glasgow
January 25-26	Northern Pulse Growers Assn. Conf. - Riverside Holiday Inn - Minot
January 27-29	Ag Expo-North Dakota State Fair Center-Minot
February 2-4	National Hard Spring Wheat Show - Grand Williston Hotel - Williston
February 5-6	2015 NDFMGA & Local Foods Conference – Cambria Inn & Suites-Fargo
February 9-10	Agri International Trade Show-Bismarck Event Center-Bismarck
February 12-13	GATE – Eastern Plains Event Center - Glendive
February 16	Mon-Dak Pulse Day – Elks Club-Wolf Point, MT
March 1-2	Western Crop/Pest Management School – Grand International Inn-Minot
March 3-4	Mon-Dak Ag Days - Richland County Event Center - Sidney
March 15-16	KUMV-TV Farm and Ranch Showcase - Raymond Center - Williston
June 23	Froid Research Farm Field Day- Froid, MT
June 24	MSU-EARC and USDA-ARS NPARL Dryland Field Day-- Sidney, MT
June 30	Eastern Agricultural Research Center Field Day—Sidney, MT (Tentative Date)
July 14	Williston Research Ext. Center Field Day - Williston
July 15	Nesson Valley Irrigation Field Day - Nesson Valley
July 14-15	Mon-Dak Ag Showcase – Williston
August 3-6	Richland County Fair and Rodeo—Sidney, MT