Technical Report TR25-1

Agricultural Experiment Station

Colorado State University

College of Agricultural Sciences | Department of Soil and Crop Sciences | Plainsman Research Center | Extension

Plainsman Research Center
2024 Research Reports

For a complete list of authors for this research report, refer to the personnel with projects page.

Zane Jenkins, Manager & Research Associate IV

Plainsman Research Center
Box 477
42790 Hwy 160
Walsh, CO 81090

(719) 324-5643

Zane.Jenkins@colostate.edu

The current and past research reports of the Plainsman Research Center can be downloaded from the publication list at the Colorado Agricultural Experiment Station:

http://aes.agsci.colostate.edu/publications/caes-publications-list/caes_pub_list/

Funded by the Colorado Agricultural Experiment Station,

Crop Management and Sorghum Improvement, USDA, NIFA Project No. COL00654,

in cooperation with the Plainsman Agri-Search Foundation

This Plainsman Research Center booklet is dedicated to

Kevin Larson

This year's report is dedicated to Kevin Larson in honor of his Thirty-Five and a Half years of service as the Superintendent and resident Research Scientist at the Plainsman Research Center. Thank you for your years of hard work and careful stewardship of the Plainsman Agri-Search Foundation. All of us at Plainsman Research Center are thankful for your leadership and friendship all these years and wish you a happy retirement.

The Neill Foundation Board:

Randy Hutches, Todd Rose, Pat Cooper, & Dawn Rodarmel

The grants from the Neill Foundation allowed Plainsman Agri-Search to continue upgrading equipment and improving the facilities available to us. Within the past few years, your generous support has allowed us to procure a new plot sprayer, upgrade planters, and construct a new equipment shed. We are also planning on installing a Trimble auto-guide system on your sprayer in the near future.

Bernard Neill, for whom the Neill Foundation was named, was a founding member of the Plainsman Agri-Search Foundation. His spirit lives on through your generous funding decisions. We sincerely appreciate your continued support of our mission to conduct local and relevant research for the farmers of Baca County.

Plainsman Research Center, 2024 Research Reports

Table of Contents

2024 Staff and Personnel with Projects at Plainsman Research Center

Zane Jenkins
(719) 324-5643
Manager & Research Associate IV
Plainsman Research Center
Agricultural Experiment Station
Colorado State University

Kevin Larson
Retired Superintendent & Research Scientist II
Plainsman Research Center
Agricultural Experiment Station
Colorado State University.

Sally Jones-Diamond
(970) 491-1914
Director
Crops Testing Program
Soil and Crop Sciences Department
Colorado State University

Perry Jones
(719) 324-5643
Technician III
Plainsman Research Center
Agricultural Experiment Station
Colorado State University

Brett Pettinger
(719) 324-5643
Research Associate III
Plainsman Research Center
Agricultural Experiment Station
Colorado State University

PLAINSMAN AGRI-SEARCH FOUNDATION BOARD

2025

Paul Hinds (Vice President)
12785 Road 34
Campo, CO 81029

James Hume
21491 Road 55
Walsh, CO 81090

Brian Brooks
19511 Road 36
Walsh, CO 81090

Don Wood
36663 Road UU
Two Buttes, CO 81084

Lyndell Herron
Box 64
Manter, KS 67862

Truman Wright (Secretary/Treasurer)
19625 Road 50
Walsh, CO 81090

2026

Tanner Dunivan
Box 282
Walsh, CO 81090

Jordan Jones
Box 253
Walsh, CO 81090

Brian Wood
Box 88
Two Buttes, CO 81084

Calvin Melcher
Box 492
Holly, CO 81047

Matt Tedder
48940 Road X
Walsh, CO 81090

Todd Randolph (President)
53766 Road GG
Walsh, CO 81090

2024

Curtis Miller
53805 Road SS
Walsh, CO 81090

Kim Wood
721 Barkley
Springfield, CO 81073

Cordell Herron
Box 64
Manter, KS 67862

Quayde Thompson
Box 692
Vilas, CO 81087

Robert Wood
721 Barkley
Springfield, CO 81073

Douglas Melcher
12845 Hwy 89
Holly, CO 81047

Table 1. Climatological Summary

2024 Climatological Summary

Plainsman Research Center

Month	Temperature in Fahrenheit Max (F)	Min (F)	Avg Max Temp (F)	Avg. Min Temp (F)	Precip. (in)	Greatest Day Precip (in)	Snowfall (in)	Greatest Snow Depth (in)	Average Soil Temp. (F)	Pan Evaporation (In)
January	62	-11	38	16.3	1.58	0.83	11.2	5.5	31	
February	77	12	56	28.1	0.68	0.27	3.8	2	38.4	
March	78	15	62	28.4	0.2	0.1	0.5	0.5	46.6	
April	89	25	72	37.5	0.09	0.08	0	0	57	5.6
May	91	37	79	46.7	2.93	0.94	0	0	64.7	11.2
June	106	50	93	61.9	4.8	3.1	0	0	75.5	12.6
July	105	56	92	61.9	1.99	1.1	0	0	77.1	12.4
August	105	51	95	61.4	2.64	1.32	0	0	78.9	12.7
September	97	43	87	53.5	1.66	0.9	0	0	70.6	10.2
October	96	25	79	44.4	0.31	0.2	0	0	62.8	6.1
November	72	16	56	29.4	6.52	1.67	T	T	44.2	
December	69	11	56	23.3	T	T	0	0	38.3	
Total					**23.4**		**15.5**			**70.8**

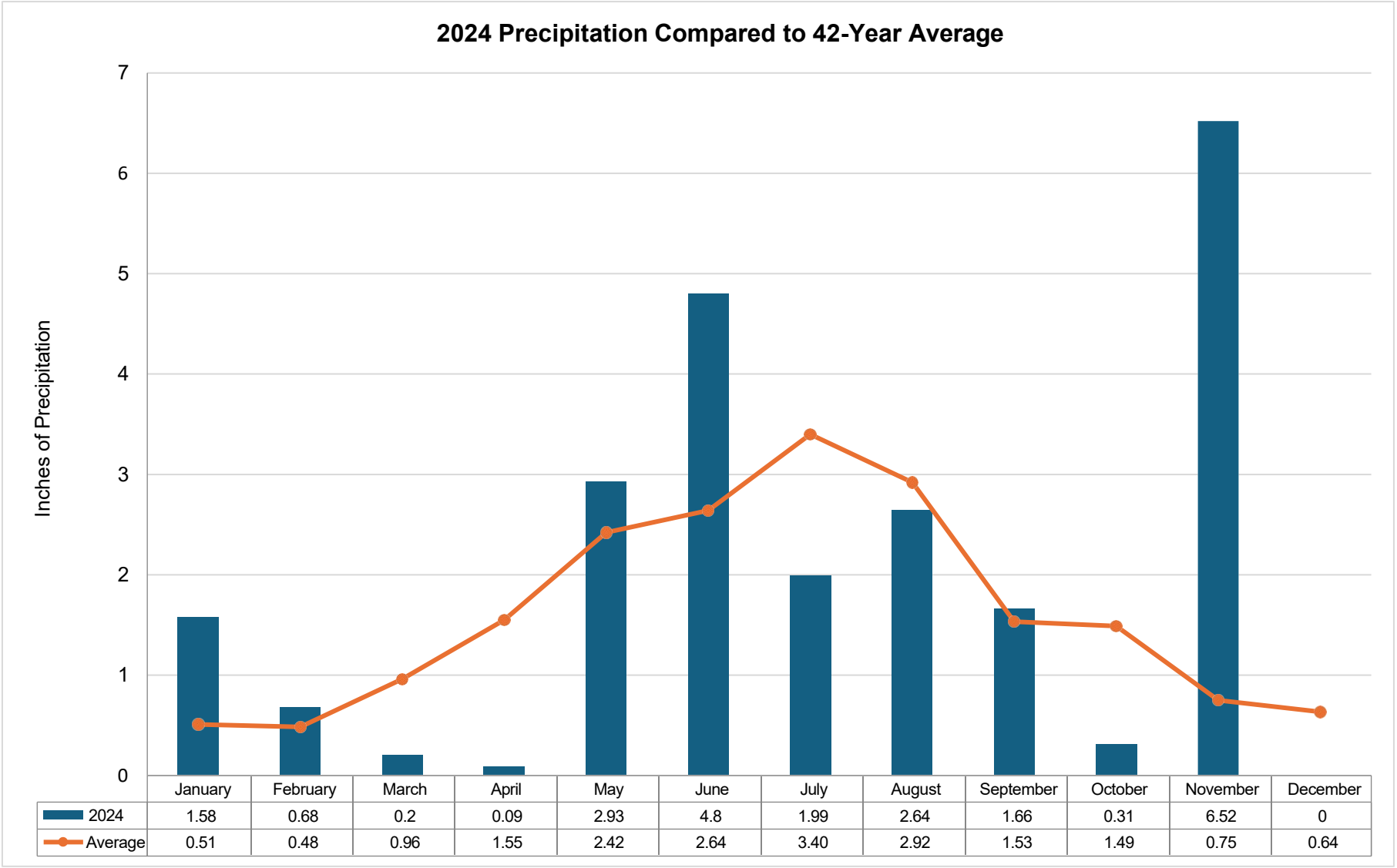
	2024	2023
Highest Temperature	106 on June 14th	103 on July 18th
Lowest Temperature	-11 on Jan. 14th	-4 on Jan. 31st
Last Freeze Spring	April 12th	April 22nd
First Freeze Fall	October 16th	October 14th
Frost Free Days	187 Days	175 Days
Avg. Precip. 42 Years (1983-2024)	19.29"	

Maximum Wind (Miles per hour)

January	67 on 9th	July	44 on 20th
February	41 on 28th	August	32 on 27th
March	41 on 2nd & 26th	September	41 on 21st
April	53 on 17th	October	43 on 30th
May	36 on 4th & 6th	November	32 on 13th
June	41 on 15th	December	49 on 31st

Note: Evaporation is observed from April 15 to October 15th.

Maximum wind is recorded at a height of 24 inches.



	January	February	March	April	May	June	July	August	September	October	November	December
2024	1.58	0.68	0.2	0.09	2.93	4.8	1.99	2.64	1.66	0.31	6.52	0
Average	0.51	0.48	0.96	1.55	2.42	2.64	3.40	2.92	1.53	1.49	0.75	0.64

Figure 1. 2024 Observed Precipitation Compared to 42 Years (1983-2024) Plainsman Research Center Site Average.

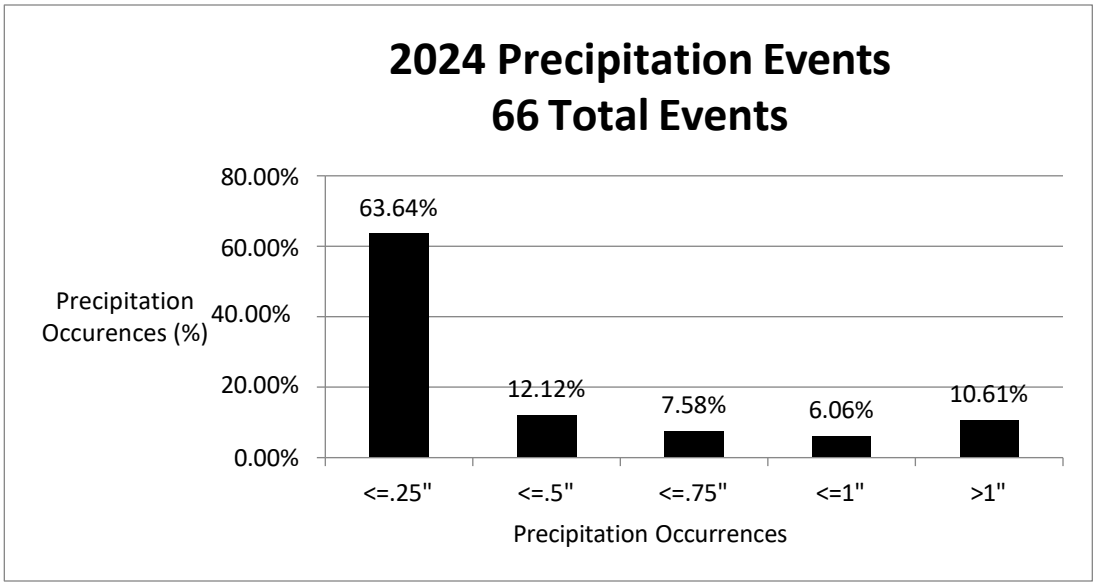


Figure 2. Distribution of Precipitation Events by Event Precipitation Total

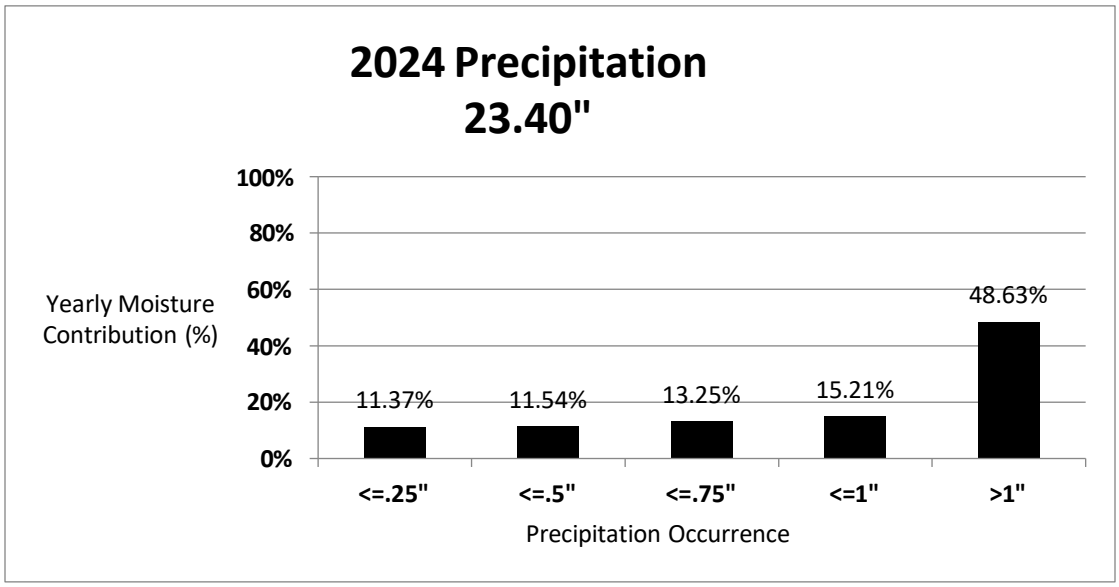


Figure 3. Distribution of Annual Precipitation by Precipitation Event Total

Overview of 2023-2024 Eastern Colorado Winter Wheat Trials

Sally Jones-Diamond

Colorado State University researchers strive to provide current, reliable, and unbiased wheat variety information to Colorado producers. Support of our research keeps public variety testing thriving in Colorado. Our work is possible due to the support and cooperation of the Colorado wheat industry, the Colorado Wheat Administrative Committee, the Colorado Wheat Research Foundation, seed companies who enter varieties, and farmers who donate their resources and time to host the replicated wheat variety trials.

The eastern Colorado winter wheat trials are conducted under a broad range of environmental conditions to best determine the expected performance of new and common varieties. We have a regional uniform variety testing program, meaning the dryland varieties entered in our northeast region are tested across seven test locations in Northeast Colorado, and varieties entered in the southeast region are tested across six test locations in Southeast Colorado. All irrigated varieties are tested in three irrigated trials spread across Northeast Colorado. In the dryland trials, there were 50 total varieties tested, including experimental lines across the two regions of the 13 total trial locations. The three irrigated trials had 24 varieties. The variety trials included a combination of both public and private varieties and experimental lines. Varieties included hard white winter wheat, hard red winter wheat, and forage wheat varieties. Seed companies with entries in the variety trials included AgriPro Syngenta, CROPLAN by WinField United, Limagrain Cereal Seeds, and Frenchman Valley Coop. There were entries from the Colorado State University marketing organization PlainsGold, the Kansas State University marketing organization Kansas Wheat Alliance, the University of Nebraska-Lincoln marketing organization NU Horizon Genetics, the Oklahoma State University marketing organization Oklahoma Genetics, and the Crop Research Foundation of Wyoming.

All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot sizes were approximately 150 ft^2 (except the Fort Collins irrigated trial, which was 80 ft^2). All varieties were planted at 700,000 seeds per acre for dryland trials and 2 million seeds per acre for irrigated trials except Fort Collins, which was planted at 1.2 million seeds per acre.

Individul location management data is listed in the 2024 Wheat Trial Management and Characteristics table in this report. Grain yield and protein was corrected to 12% moisture content. Variety trial grain weight, test weight, and grain moisture content information were obtained from a HarvestMaster H2 GrainGage™ weigh system on a modified Case IH plot combine. Protein content was obtained using a FOSS Infratec™ NOVA grain analyzer. All trials are statistically analyzed using a spatial mixed model with the best fit for each trial location using SAS 9.4.

General Growing Conditions Affecting the 2024 Colorado Wheat Crop

Wheat planting conditions in fall of 2023 were standard to above average for the region, although some areas had a short window for planting in adequate moisture. During early establishment, what started as a few abnormally dry pockets along the eastern border of Colorado led to widespread drought everywhere but Baca County by late November. Consistent winter precipitation diminished drought conditions across the majority of eastern Colorado. By early April, Southeastern Colorado, including Cheyenne, Kiowa, Prowers, and Baca counties, was abnormally dry and experiencing a moderate drought, which persisted through June. Northeast Colorado received timely and frequent rainfall throughout the spring, lasting until harvest, preventing drought conditions. Parts of Adams and Weld counties were abnormally dry from May through harvest. Isolated hail events either destroyed or severely damaged wheat fields for a number of producers, especially in Washington and Yuma counties in late May.

Stripe rust disease was not an issue until June, when frequent precipitation and high humidity favored the spread of the disease along the I-70 corridor. Many growers sprayed fungicides if the crop was not yet in the grain-fill period. Brown wheat mites were observed at moderate levels in east-central Colorado in the early spring, while higher levels that required chemical control were noted in southeast Colorado. Cutworms were widespread in northeast Colorado at varying levels of infestation. Wheat Stem Sawfly (WSS) is widespread across many northeast Colorado counties and continues to spread south and east.

Harvest occurred about two weeks earlier than normal in Colorado this year due to warmer than average temperatures in late winter and early spring. Wheat yields were mostly above average and test weights were generally very good across the state.

COLORADO STATE UNIVERSITY EXTENSION

2024 Dryland Winter Wheat Variety Performance Trial at Walsh

Crops Testing www.csucrops.com

Variety	Brand/Source	Market Class	Grain Yield[a]	Test Weight	Protein	Plant Height
			bu/ac	lb/bu	percent	in
CP7017AX	CROPLAN	HRW	**46.0**	60.0	14.1	22
Avery	PlainsGold	HRW	**45.0**	57.5	14.0	28
CO18D297R	Colorado State University exp.	HRW	**44.0**	59.0	14.4	25
CO18035RA	Colorado State University exp.	HRW	**43.5**	59.0	15.1	23
CO20D108R	Colorado State University exp.	HRW	43.0	60.0	13.5	24
Canvas	PlainsGold	HRW	42.0	60.0	16.0	23
Monarch	PlainsGold	**HWW**	42.0	59.5	12.9	29
CO19D087R	Colorado State University exp.	HRW	42.0	57.5	13.7	22
CO19D304R	Colorado State University exp.	HRW	42.0	58.5	15.8	23
Kivari AX	PlainsGold	HRW	41.5	58.5	13.1	28
Whistler	PlainsGold	HRW	41.5	57.5	16.0	25
CO20SF014W	Colorado State University exp.	**HWW**	41.0	59.0	-	23
Byrd	PlainsGold	HRW	41.0	58.5	15.6	25
Crescent AX	PlainsGold	HRW	40.5	58.5	-	24
CO18042RA	Colorado State University exp.	HRW	40.0	58.5	15.1	27
CO20022RC	Colorado State University exp.	HRW	40.0	**61.0**	13.1	30
CO18D007W	Colorado State University exp.	**HWW**	39.5	59.5	13.4	29
Guardian	PlainsGold	HRW	38.5	59.5	15.4	21
Breck	PlainsGold	**HWW**	38.5	60.0	15.8	20
CO20SF141R	Colorado State University exp.	HRW	38.0	60.0	13.6	22
CO19393R	Colorado State University exp.	HRW	37.5	60.0	13.3	24
CO20SFD020R	Colorado State University exp.	HRW	37.5	59.5	-	24
CO19410R	Colorado State University exp.	HRW	37.5	59.5	13.2	23
Byrd CL Plus	PlainsGold	HRW	37.0	58.0	13.9	28
Windom SF	PlainsGold	**HWW**	37.0	60.5	15.1	26
Amplify SF	PlainsGold	HRW	36.5	59.0	15.3	24
LCS Julep	Limagrain	HRW	36.0	60.0	16.3	23
CO21SF263RA	Colorado State University exp.	HRW	35.5	57.0	15.9	21
CO19S129W	Colorado State University exp.	**HWW**	35.0	59.0	15.2	22
Snowmass 2.0	PlainsGold	**HWW**	34.5	59.5	-	23
CO200037R	Colorado State University exp.	HRW	34.0	60.5	13.4	23
Langin	PlainsGold	HRW	34.0	58.5	14.1	20
Fortify SF	PlainsGold	HRW	32.5	58.5	13.7	28
CO21SF191RA	Colorado State University exp.	HRW	32.5	57.5	-	25
AP Sunbird	AgriPro	HRW	31.5	**61.0**	14.6	22
CO20SFD019R	Colorado State University exp.	HRW	31.5	59.0	15.8	24
CP7220	CROPLAN	HRW	29.5	57.0	14.6	22
		Average	**38.5**	**59.1**	**14.5**	**24**
		[b]LSD (0.30)	2.6	0.4		
		[b]LSD (0.05)	4.9	0.7		
		Coeffecient of Variation (CV)	13.0			

[a] Yield adjusted to 12% moisture and varieties ranked by yield (highest to lowest). Variety yields in bold are in the top LSD group (0.30).

[b] Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Plainsman Research Center (Zane Jenkins, Kevin Larson, Brett Pettinger, and Perry Jones)
Harvest date:	June 24, 2024
Planting date:	September 19, 2023
Soil Type:	Wiley loam
GPS Coordinates:	37.43416, -102.31022
Trial Comments:	Planted 1.5" deep into moisture and no-till wheat residue. Fall emergence and growth was very good. Lush growth in the spring. Cutworm damage noted in early spring, trial sprayed with insecticide on April 22. Radar estimates showed the trial received 5" of precipitation and 3,990 growing degree-days (GDD) (base 32°F) from January 1st through June 24th.

COLORADO STATE UNIVERSITY EXTENSION

2024 Dryland Winter Wheat Variety Performance Trial at Lamar

Crops Testing www.csucrops.com

Variety	Brand/Source	Market Class	Grain Yield	Test Weight	Protein	Plant Height
			bu/ac	lb/bu	percent	in
Kivari AX	PlainsGold	HRW	**52.0**	59.5	11.3	19
CO19D304R	Colorado State University exp.	HRW	48.5	60.0	10.3	24
Whistler	PlainsGold	HRW	48.5	60.0	9.9	25
CP7017AX	CROPLAN	HRW	47.5	61.5	10.2	24
CO18D007W	Colorado State University exp.	**HWW**	47.0	60.5	10.8	26
CO20SF141R	Colorado State University exp.	HRW	47.0	60.0	10.6	26
Windom SF	PlainsGold	**HWW**	47.0	58.5	10.5	22
Breck	PlainsGold	**HWW**	46.0	61.5	10.7	25
CO19S129W	Colorado State University exp.	**HWW**	46.0	61.5	10.9	23
Snowmass 2.0	PlainsGold	**HWW**	46.0	61.0	10.5	25
CO20SF014W	Colorado State University exp.	**HWW**	46.0	59.5	10.4	27
CO19393R	Colorado State University exp.	HRW	45.5	61.5	11.0	23
CO18D297R	Colorado State University exp.	HRW	45.0	61.0	11.2	19
Avery	PlainsGold	HRW	45.0	60.0	10.4	24
CO18042RA	Colorado State University exp.	HRW	44.5	60.0	10.3	24
Monarch	PlainsGold	**HWW**	44.0	61.5	10.9	21
AP Sunbird	AgriPro	HRW	43.0	**62.0**	11.3	21
Byrd	PlainsGold	HRW	43.0	60.5	10.3	24
Crescent AX	PlainsGold	HRW	43.0	60.5	10.5	26
CO19D087R	Colorado State University exp.	HRW	43.0	59.5	10.2	24
CO20D108R	Colorado State University exp.	HRW	42.0	**62.0**	10.3	23
Fortify SF	PlainsGold	HRW	41.5	60.5	11.4	22
Guardian	PlainsGold	HRW	41.0	**62.0**	11.4	20
Amplify SF	PlainsGold	HRW	41.0	61.0	11.4	25
CO20SFD020R	Colorado State University exp.	HRW	40.5	**62.0**	10.7	23
Canvas	PlainsGold	HRW	40.5	61.5	10.9	25
CO20022RC	Colorado State University exp.	HRW	40.5	61.5	11.1	22
CO19410R	Colorado State University exp.	HRW	40.0	61.5	11.2	22
Langin	PlainsGold	HRW	40.0	60.0	11.0	21
CO21SF191RA	Colorado State University exp.	HRW	40.0	59.5	11.6	26
CP7220	CROPLAN	HRW	40.0	58.5	11.6	24
CO18035RA	Colorado State University exp.	HRW	38.5	60.5	10.3	22
CO21SF263RA	Colorado State University exp.	HRW	37.5	59.5	11.7	24
CO200037R	Colorado State University exp.	HRW	37.0	61.5	11.0	26
Byrd CL Plus	PlainsGold	HRW	36.5	60.0	11.0	23
CO20SFD019R	Colorado State University exp.	HRW	36.0	61.0	10.7	26
LCS Julep	Limagrain	HRW	34.0	**62.0**	11.9	25
		Average	**43.0**	**60.5**	**10.8**	**23**
		[b]LSD (0.30)	2.8	0.4		
		[b]LSD (0.05)	5.4	0.8		
		Coeffecient of Variation (CV)	5.4			

[a] Yield adjusted to 12% moisture and varieties ranked by yield (highest to lowest). Variety yields in bold are in the top LSD group (0.30).

[b] Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Stulp Farms
Harvest date:	June 21, 2024
Planting date:	September 8, 2023
Soil Type:	Baca silt loam
GPS Coordinates:	38.0034, -102.55723
Trial Comments:	Planted 2.25" deep into moisture and tilled wheat residue. Fall emergence and growth was good. Trial was showing symptoms of drought stress by mid-spring. Radar estimates showed the trial received 5.1" of precipitation and 3,683 growing degree-days (GDD) (base 32°F) from January 1st through June 21st.

COLORADO STATE UNIVERSITY EXTENSION

2024 Dryland Winter Wheat Variety Performance Trial at Sheridan Lake

Crops Testing www.csucrops.com

Variety	Brand/Source	Market Class	Grain Yield[a]	Test Weight	Protein	Plant Height
			bu/ac	lb/bu	percent	in
Whistler	PlainsGold	HRW	**49.5**	**63.0**	12.2	22
CO18D007W	Colorado State University exp.	**HWW**	45.0	62.5	12.9	22
CO18D297R	Colorado State University exp.	HRW	43.5	62.0	13.0	20
CO19D304R	Colorado State University exp.	HRW	42.0	62.5	11.2	20
CO21SF191RA	Colorado State University exp.	HRW	42.0	61.0	12.5	22
CP7017AX	CROPLAN	HRW	40.5	**63.5**	12.1	21
Kivari AX	PlainsGold	HRW	40.5	**63.0**	12.2	22
CO19410R	Colorado State University exp.	HRW	40.0	**63.0**	14.5	20
Breck	PlainsGold	**HWW**	39.5	62.0	12.6	23
CO21SF263RA	Colorado State University exp.	HRW	39.5	62.0	12.9	19
CO20SF014W	Colorado State University exp.	**HWW**	39.0	61.5	12.3	22
CO18042RA	Colorado State University exp.	HRW	38.5	62.0	13.3	21
Avery	PlainsGold	HRW	38.5	61.5	12.4	19
Windom SF	PlainsGold	**HWW**	38.5	59.5	12.9	19
Canvas	PlainsGold	HRW	37.5	**63.0**	12.7	21
CO20SFD020R	Colorado State University exp.	HRW	37.5	**63.0**	12.5	23
CO19D087R	Colorado State University exp.	HRW	37.5	62.0	12.2	21
CO18035RA	Colorado State University exp.	HRW	37.0	**63.5**	12.7	21
CO20SF141R	Colorado State University exp.	HRW	37.0	60.0	13.5	21
Amplify SF	PlainsGold	HRW	36.5	**63.0**	13.4	22
CO19S129W	Colorado State University exp.	**HWW**	36.5	**63.0**	12.1	22
Guardian	PlainsGold	HRW	36.0	**63.5**	12.4	20
Byrd	PlainsGold	HRW	35.5	**63.0**	13.1	20
CO20D108R	Colorado State University exp.	HRW	35.5	62.5	11.6	21
LCS Julep	Limagrain	HRW	34.0	**63.0**	12.5	18
Monarch	PlainsGold	**HWW**	34.0	**63.0**	12.9	22
AP Sunbird	AgriPro	HRW	34.0	62.5	12.8	20
Byrd CL Plus	PlainsGold	HRW	34.0	62.5	12.0	22
Langin	PlainsGold	HRW	33.5	62.0	13.3	20
CO200037R	Colorado State University exp.	HRW	32.5	**63.0**	12.5	19
CO20022RC	Colorado State University exp.	HRW	32.5	62.5	12.6	20
Crescent AX	PlainsGold	HRW	32.5	61.5	12.8	19
CO19393R	Colorado State University exp.	HRW	32.0	62.0	13.6	23
Snowmass 2.0	PlainsGold	**HWW**	31.5	61.5	12.8	18
CP7220	CROPLAN	HRW	27.0	58.0	13.4	18
Fortify SF	PlainsGold	HRW	26.5	61.5	14.0	17
CO20SFD019R	Colorado State University exp.	HRW	26.0	61.5	13.6	19
		Average	**36.5**	**62.0**	**12.8**	**20**
		[b]LSD (0.30)	3.3	0.6		
		[b]LSD (0.05)	6.3	1.1		
		Coeffecient of Variation (CV)	7.2			

[a] Yield adjusted to 12% moisture and varieties ranked by yield (highest to lowest). Variety yields in bold are in the top LSD group (0.30).

[b] Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Scherler Farms
Harvest date:	June 25, 2024
Planting date:	September 7, 2023
Soil Type:	Olney sandy loam
GPS Coordinates:	38.53114, -102.47207
Trial Comments:	Planted 1.5" deep into moisture and tilled sorghum residue. Fall emergence and growth was very good. Good growth in the spring. Brown wheat mites noted in early spring along with drought stress symptoms. Timely rainfall received in May and early June. Radar estimates showed the trial received 5.4" of precipitation and 3,767 growing degree-days (GDD) (base 32°F) from January 1st through June 25th.

COLORADO STATE UNIVERSITY EXTENSION

Summary of 2024 Collaborative On-Farm Test (COFT) Winter Wheat Variety Performance Results

Crops Testing www.csucrops.com

2024 Varieties (ranked left to right by highest yield)

	Kivari AX			Amplify SF with Indigo Seed Treatment			Amplify SF			AP Solid			Guardian			KS Territory			COFT Average		
Nearest Town/County	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein
	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent
Anton/Washington	53	58	14	53	59	14	53	59	15	52	60	14	48	58	16	46	56	16	**51**	**58**	**15**
Arriba/Lincoln	54	61	11	68	60	11	56	60	11	57	57	11	66	62	11	45	58	11	**58**	**60**	**11**
Bennett/Adams	72	59	11	66	60	12	65	61	11	64	61	11	62	60	12	62	58	12	**65**	**60**	**11**
Bethune/Kit Carson	47	61	14	43	62	15	41	63	15	43	63	15	37	63	15	41	55	15	**42**	**61**	**15**
Burlington/Kit Carson	49	63	12	32	62	13	36	63	13	34	63	13	40	62	13	39	61	13	**38**	**62**	**13**
Byers/Adams	59	63	12	52	64	13	58	64	13	58	64	13	58	64	13	63	63	13	**58**	**64**	**13**
Cheyenne Wells/Cheyenne	57	61	11	59	61	12	54	61	12	52	63	13	55	60	13	55	62	12	**55**	**61**	**12**
Eads/Kiowa	20	60	9	23	63	9	21	63	9	25	64	9	24	63	9	21	62	10	**22**	**62**	**9**
Julesburg/Sedgwick	42	60	11	39	62	12	39	61	12	37	63	12	37	63	12	43	60	12	**40**	**61**	**12**
Lamar S/Prowers	46	61	10	41	63	11	43	62	12	42	63	13	42	62	12	36	63	11	**42**	**62**	**11**
Lamar SW/Bent	27	58	11	30	58	12	27	58	12	30	60	12	29	60	12	33	57	12	**29**	**58**	**12**
Leroy/Logan	49	55	12	54	59	13	49	60	12	53	60	13	43	59	13	47	56	14	**49**	**58**	**13**
Otis/Washington	41	56	13	51	60	13	49	59	14	48	60	14	39	57	15	45	51	15	**46**	**57**	**14**
Prospect Valley/Adams	33	61	11	34	62	11	36	62	12	35	60	11	29	57	11	24	62	11	**32**	**61**	**11**
Severance/Weld (Irrigated)	137	64	13	122	61	12	126	62	12	118	62	11	135	61	12	116	59	13	**126**	**61**	**12**
Vilas/Baca	20	58	9	15	58	11	17	59	10	20	59	9	11	58	12	14	58	10	**16**	**58**	**10**
Walsh/Baca	43	62	-	41	63	-	37	63	-	38	64	-	39	64	-	38	62	-	**39**	**63**	**-**
Yuma/Yuma	29	58	12	32	63	11	30	62	11	31	63	12	25	60	12	28	59	12	**29**	**61**	**12**
Average	**48.8**	**59.9**	**11.4**	**47.6**	**61.1**	**12.0**	**46.5**	**61.1**	**12.0**	**46.5**	**61.6**	**12.1**	**45.5**	**60.6**	**12.4**	**44.2**	**58.9**	**12.4**	**46.5**	**60.5**	**12.1**
Yield Significance[b]	A			A,B			B,C			B,C			C,D			D					

LSD $_{(P<0.30)}$ for yield = 1.5 bu/ac, for test weight = 0.5 lb/bu, and for protein = 0.2 percent

[a] All yield and protein data are corrected to 12% moisture.

[b] Yield significance: varieties with different letters have yields that are significantly different from one another.

Dryland Wheat Strip Trial for Forage and Grain Yield

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

In the past, we have found that it is valuable and informative to test wheat varieties in large strips to complement the small plot wheat trials conducted by fellow CSU faculty and staff. This also allows farmers the ability to compare varieties locally.

Materials and Methods:

Fifteen wheat varieties were planted on September 29th, 2023, at 50 lb/ac in 20 ft by 1070 ft strips with two replications. We applied 50 lb N/acre using streamer nozzles preplant, in-furrow applied 5 gal/acre of 10-34-0 (20 lb/acre of P_2O_5, 6 lb of N/acre). Herbicide and insecticide were applied post-emergence to control weeds and insect pests as needed.
Forage samples were collected in a 2.5 x 2 ft area at jointing (April 9th) and boot (May 6th). We measured the forage for fresh weight at field moisture and oven-dried the samples until no change occurred for 24 hours. Wet weights were reported at 65% moisture, with dry matter weight also provided (see Table 7). Plots were harvested on June 28th, 2024, with a self-propelled combine equipped with a HarvestMaster H2 automated weighing system. Grain yields were adjusted to 12% seed moisture content. This year's trial also included a variety (Amplify SF) with one set of plots being treated with a biological product by Indigo Ag and another set of untreated plots. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

This year's large strip trial did not show a statistical difference in grain yield (P-value 0.2073). The highest-yielding variety was Avery at 44.4 bu/acre, with multiple other varieties being close behind, as seen in Table 6. In addition to the grain yield, test weight was also analyzed, and statistical differences between varieties were observed (P-value <0.0001). Canvas achieved the highest test weights at 64.4 lb/bu and WB4792 at 64.35 lb/bu.

Table 6. Plainsman Research Center Winter Wheat Strip Trial Grain Yield

Variety	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Plant Height (inches)
Avery	44.4	61.5	22.5
Whistler	43.5	61.0	23
Langin	42.9	61.4	22.5
Kivari AX	42.9	62.4	23.5
Canvas	41.9	64.4	26
T158	41.0	63.7	24
Aplify SF + Indigo	40.7	63.3	24.5
WB4792	39.6	64.4	24.5
Guardian	39.5	63.7	24.5
KS Territory	38.5	62.2	23.5
AP Solid	38.3	63.9	21.5
KS Dallas	36.9	63.3	22
Amplify SF	36.8	63.4	26
Joe	32.3	62.7	24.5
White Lightning	28.6	61.9	22.5
Average	**39.2**	**62.9**	**23.7**
LSD 0.05	N.S	0.3	
LSD 0.20	N.S	0.2	
P-value	**0.2073**	**<0.0001**	

[a]Grain yields adjusted to 12% grain moisture content, after seed maturation.

[b] Harvested Area: 15 ft by 1070 ft

Site Information
Plainsman Research Center
Planted: 9/29/23; 50 lb of seed/acre

Harvest date: 6/28/2024

Fertility:

50-0-0 Preplant
5 gal/acre 10-34-0 on planter

Pesticide:
Preplant: 40 oz Makaze, 16 oz 2,4-D LV6 Post
Emerge: 6 oz Pixxaro, 0.5 oz Affinity
Broadspec, 3.84 oz Roadhouse 1EC.

Precipitation: Planting to Harvest

12.74" total (Sept 0.00, Oct 4.24", Nov 0.30", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20": April 0.09", May 2.98", June 1.70")

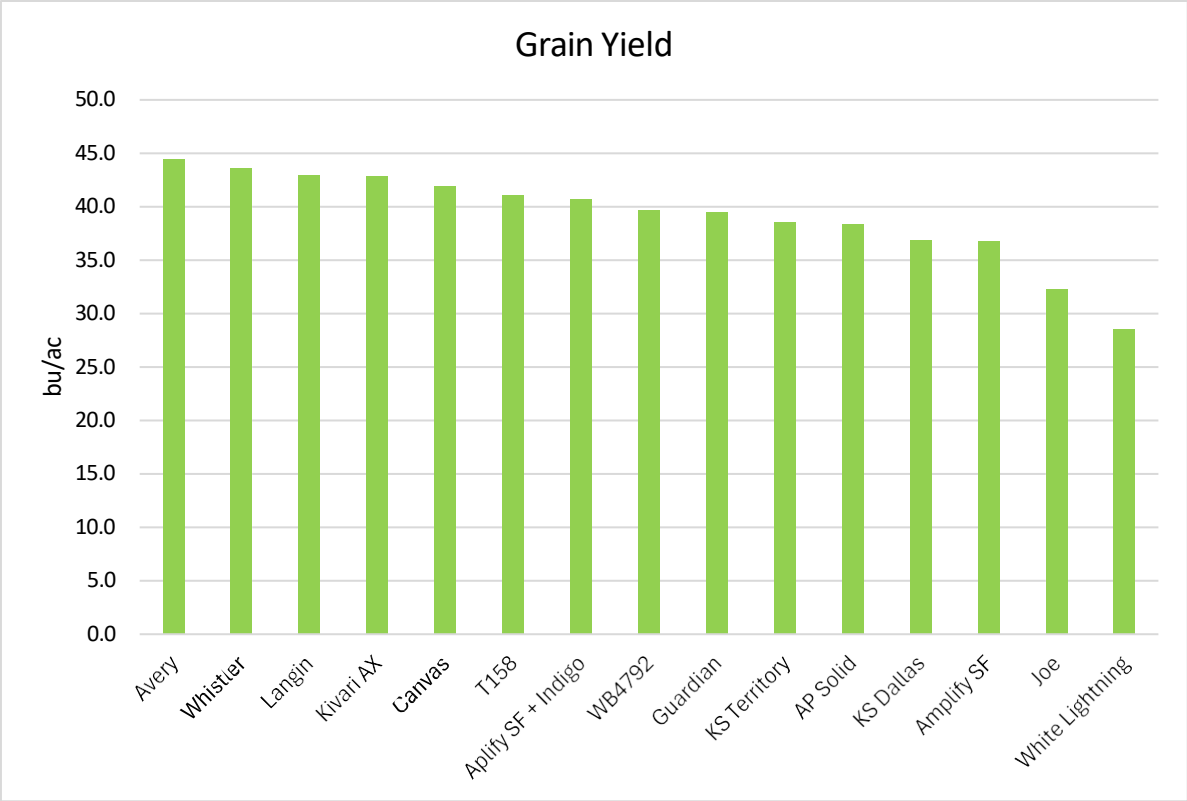


Figure 4. Grain Yield of 2024 Winter What Strip Trial

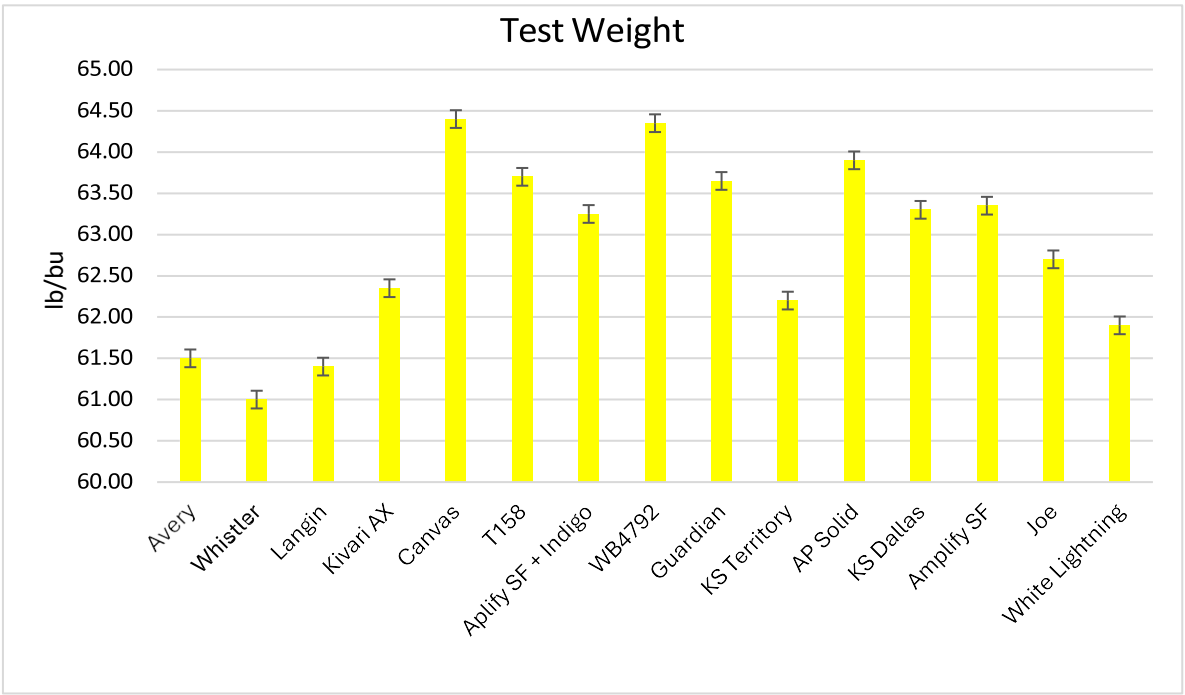


Figure 5. Test Weight with Error Bars (LSD 0.20)

Table 7. 2024 Plainsman Research Center Winter Wheat Biomass Nonreplicated

Variety	Jointing[a] Wet Weight[c] (lb/ac)	Jointing Dry Matter Basis[d] (lb/ac)	Boot[b] Wet Weight[c] (lb/ac)	Boot Dry Matter[d] (lb/ac)
Amplify SF	9,823	3,438	19,591	6,857
Amplify SF+ Indigo	12,018	4,206	22,115	7,740
AP Solid	11,085	3,880	26,121	9,142
Avery	11,469	4,014	18,823	6,588
Canvas	9,274	3,246	21,182	7,414
Guardian	11,030	3,861	15,914	5,570
Joe	8,067	2,823	16,682	5,839
Kivari	14,158	4,955	18,823	6,588
KS Dallas	11,414	3,995	21,841	7,644
KS Territory	11,195	3,918	18,329	6,415
Langin	14,268	4,994	16,902	5,916
T158	11,963	4,187	18,548	6,492
WB4792	8,835	3,092	23,158	8,105
Whistler	11,908	4,168	18,548	6,492
White Lightning	10,097	3,534	17,067	5,973
Average	**11,199**	**3,920**	**19,575**	**6,851**

[a]Jointing sample date 4/9/24
[b]Boot sample date 5/6/24
[c]Wet weight is reported at 65% moisture.
[d]Dry matter is adjusted to 0% moisture content.

Note: Weights based on 24" length of three 10" rows (5 sq ft) sample
Note: Biomass measurements were not replicated this year

Evaluation of Return® by Pivot Bio in Dryland Wheat

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

Many different biological-based products have come to market within the past decade. Return® is a biological seed inoculation product that, by inoculating seed with live bacteria, allows colonization of a plant's root system that will then fix from the atmosphere the estimated equivalent of 25 lb/acre of nitrogen for the treated plants according to the manufacturer, PivotBio. On behalf of local producers and retailers, we created a trial to act as a third party to see if this seed treatment would result in differences in grain yield or test weight gains in dryland wheat.

Materials and Methods:

The trial consisted of two replications of Avery treated with Return® at the recommended rate of 4 oz/100 lb of seed treated by a local Pivot Bio dealer and untreated Avery seed planted at 50 lb/acre. Preplant fertility was provided in the form of UAN streamed at 20" spacing, and 10-34-0 fertilizer was applied with the drill at 5 gal/acre when all treatments were planted on September 29th, 2023. Plots were treated with pesticides during the growing season to control kochia, tansy mustard, and pale western cutworm (see Table 8). Plots were harvested on June 28th, 2024, using a self-propelled Gleaner F3 combine, and yields and test weights were recorded by HarvestMaster H2 Grain Gauge. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There was a statistical difference between the treated and untreated Avery in grain yield (37.9 compared to 35.3) at the LSD 0.20 level (P-value = 0.198). This year's trial showed no statistical difference in test weight between treatments (P-value = 0.5000). We want to continue to test all innovative products to provide more information to our local farmers, and we will be conducting a trial on using Return® in winter wheat with various levels of pre-plant nitrogen in the 2024-2025 growing season.

Table 8. Evaluation of Return® in Dryland Winter Wheat

Treatment	Grain Yield[a] (bu/ac)	Moisture (%) at Harvest	Test Weight (lb/bu)
Avery+Pivot Bio	**37.9**	10.75%	62.0
Avery	35.3	10.75%	62.0
Average	**36.6**	**10.75%**	**62.0**
LSD 0.05	N.S		N.S
LSD 0.20	2.635		N.S
P-value	0.198		0.5000

[a] Grain yields adjusted to 12% grain moisture content after seed maturation.

[b] Harvested Area: 15 ft by 1070 ft

[c] Treatment Rate for Return® 4 oz per 100 lbs seed

Site Information
Collaborator: Plainsman Research Center (Zane Jenkins, Kevin Larson, Brett Pettinger, Perry Jones)
Planted: 9/29/23 at 50 lb seed/acre
Harvest date: 6/28/2024
Fertility:
50-0-0 preplant
5 gal/acre 10-34-0 on planter
Pesticide:
Preplant: 40 oz Makaze, 16 oz 2,4-D LV6
Post Emerge: 6 oz Pixxaro, 0.5 oz Affinity Broadspec, 3.84 oz Roadhouse 1EC
Precipitation: Planting to Harvest
12.69" total (Sept 0.0, Oct 4.24", Nov 0.3", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20", April 0.09", May 2.98", June 1.70")

Single Disc Drill and Hoe Drill Comparison for Wheat Production

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction

Two of our area's most used deep-placement wheat seeding systems are hoe drills and single disc drills. There are advantages to both systems. The advantage of the single disc drill is that it reduces disturbance to the soil surface, leaves more residue intact to reduce evaporation, and allows for greater soil water infiltration compared to a hoe drill. The advantage of the hoe drill is that it creates seed furrows for some soil protection, possibly additional snow catch, and allows for deeper planting depths when needed. We conducted this study because growers inquired if there might be a yield advantage between the planting systems.

Materials and Methods:

We used a no-till, wheat-sorghum-fallow site for this study. We compared a 24-row John Deere 1590 drill with 10 in. row spacings and an eleven-shank (cut down from a 40 ft drill) Crustbuster 3400 with 12 in. row spacings. We applied liquid 28-0-0 fertilizer in streams 20 in. apart at 50 units of N/acre for both treatments. We applied 20 lbs/acre of P_2O_5 as a dry fertilizer/wheat seed mix for the hoe drill and 20 lb/acre of P_2O_5 as a liquid seed in-furrow applied fertilizer for the single disc drill (see Table 9). We planted Avery at 45 lb/acre for both drill types on Sept. 29th, 2023. Strips were harvested with a self-propelled combine equipped with a HarvestMaster H2 Grain Gauge on June 29th, 2024. Grain yields were adjusted to 12% seed moisture content. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

No statistical differences were observed between drill types in this year’s trial. In either grain yield (P-value= 0.2486) or test weight (P-value= 0.3440). This continues to show both types can perform well in Southeast Colorado. This study has already been planted for the 2024-2025 season, and we look forward to seeing the results of that trial.

Table 9. Evaluation of Single Disk and Hoe Drills in Dryland Winter Wheat

Drill Units	Yield[a]	Moisture	Test Weight
Single Disk[b]	32.8	11.00%	62.2
Hoe Drill[c]	28.7	10.90%	62.4
Average	**30.7**	**10.95%**	**62.3**
LSD 0.05	N.S		N.S
LSD 0.20	N.S		N.S
P-value	0.2486		0.3440

[a] Grain yields adjusted to 12% grain moisture content after seed maturation.

[b] John Deere 1590 Single Disk
[c] Crustbuster 3400 Hoe Drill

[d] Harvested Area: 15 ft by 1073 ft

Site Information
Planted: 9/29/23 at 50 lb seed/acre of Avery
Harvest date: 6/29/2024
Fertility:
50-0-0 preplant
5 gal/acre 10-34-0, Single Disk drill;
50 lb/acre of 40 Rock™ N-P-K-S-Zn 12-40-0-6.5-1
Pesticide:
Preplant: 40 oz Makaze, 16 oz 2,4-D LV6
Post Emergence: 6 oz Pixxaro, 0.5 oz Affinity Broadspec, 3.84 oz Roadhouse 1EC
Precipitation: From Planting to Harvest 12.69" total (Sept 0.0, Oct 4.24", Nov 0.3", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20", April 0.09", May 2.98", June 1.70")

Limited Irrigated Corn Hybrid Performance Trial

Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

The Plainsman Research Center conducted a limited irrigated corn hybrid trial using our pivot irrigation system to identify hybrids that are well-suited to and highly productive in our area. This would provide data to local producers so they can make a more informed decision for their operations and help the participating seed company identify high-performing hybrids within their product lineups. This year's trial included thirteen hybrids from four different seed companies represented. We are grateful for their participation and partnership in conducting this hybrid trial.

Materials and Methods:

This year's trial was planted into corn stalks from the 2023 crop strip-tilled in the fall to apply fertility and create a seedbed (see Table 10). All hybrids were planted at 28,000 seeds/acre with starter fertilizer and 1 pt/acre Sniper® LFR® in-furrow to mitigate corn rootworm feeding on May 5th, 2024. Each hybrid had two 10' wide strips with an average length of 860'. Corn hybrids within the trial had relative maturity (RM) between 109 RM and 117 RM, with the bulk of entries being between 112 RM and 114 RM. Herbicides were applied pre-plant and post emergence to control weeds as needed, with a miticide applied later in the season via aerial application to control spider mites. A total of 20" irrigation was applied, and the plot received 13.13" of precipitation. Plots were harvested with a self-propelled combine equipped with a HarvestMaster H2 Grain Gauge on November 25th, 2024. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

This year's trial showed statistical differences in both grain yield (P-value =0.0400) and test weight (P-value <0.0001) among the hybrids in the trial. The hybrid 212-02VT2PRIB was the highest-yielding hybrid at 225.9 bu/acre and was significantly different from all other entries using the LSD 0.20. If using the LSD 0.05, the following high-yielding hybrids show no statistical difference in grain yield amongst each other: 212-02VT2PRIB, 14-20PCE, 6411VT2PRIB, 13N18-3111, and 212-60TRERIB. The hybrid 212-02VT2PRIB had the highest test weight and was significantly different from all other entries at both the LSD 0.20 and 0.05 levels (see Table 10).

Table 10. Plainsman Research Center Limited Irrigated Corn Hybrid Trial

Brand	Hybrid	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Grain Moisture (%)	Emerged Population (plants/ac)	Relative Maturity[b]
Channel	212-02VT2PRIB	**225.9**	**62.4**	13.0%	27,000	112
NC+	NC 14-20PCE	211.4	59.6	13.5%	25,750	114
Rob See Co	RC6411VT2PRIB	209.2	61.0	13.6%	27,750	114
Golden Harvest	G13N18-3111	208.7	56.4	14.7%	26,500	113
Channel	212-60TRERIB	208.3	58.2	13.6%	27,500	112
Rob See Co	RC6131TRERIB	199.8	58.8	13.6%	27,500	111
Golden Harvest	G15L32-DV	190.0	57.1	14.4%	27,500	115
Golden Harvest	G17A74-DV	189.7	58.2	15.3%	27,500	117
Golden Harvest	G16Q82-DV	188.3	59.1	14.0%	27,000	116
Rob See Co	RC6232DGVT2PRIB	188.3	59.6	13.5%	27,250	112
Rob See Co	RC6381SSPRIB	188.0	60.1	13.1%	28,000	113
NC+	NC 09-90PCE	183.5	58.3	13.2%	27,500	109
Golden Harvest	G10L16-DV	181.8	57.6	13.6%	25,250	110
Average		**197.9**	**58.9**	**13.8%**	**27,077**	
LSD (0.05)		18.3	0.9622			
LSD (0.20)		11.4	0.5989			
P-value		0.0400	<0.001			

[a]Yield adjusted to 15.5% moisture and hybrids are ranked by yield. Yield and Test Weight in bold are in the top LSD (0.20)

[b]Relative maturities are provided by the seed companies.

[c]Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

[d] Population taken preharvest

This experiment consisted of two replications

Site Information

Plainsman Research Center: (Zane Jenkins, Brett Pettinger, Perry Jones)

Planting Date: 5/9/24

Harvest Date: 11/25/24 Harvest area was 10' by 860' (Average strip length)

Previous Crop: Corn

Planted Population: 28,000

Precipitation Planting to First Freeze: Total 13.13" (May 2.04", June 4.80", July 1.99", Aug 2.64", Sept 1.66", Oct 0.00")

Total Irrigation: 20"

Soil Type: Ulysses and Norka silt loams

Fertility:

Fall Strip-Till: 175-30-0 (213.4 lb/acre NH_3 & 7.5 gal/acre 10-34-0)

Planter Applied: 5-20-0-1 Zn (5 gal 10-34-0 & 1 qt 10% Zn EDTA)

Pesticides applied:

Pre-Plant Herbicide: 32 oz Mad Dog 5.4, 3.3 qt Degree Xtra, 5 oz Explorer, 6.4 oz Staredown

In-furrow Insecticide: 1 pt/acre Sniper LFR with 10-34-0

Post Emergence herbicide: 37.5 oz Mad Dog 5.4, 5 oz Status, 16 oz Atrazine 4L

Post Emergence miticide: 5 oz Zara SC

We would like to give special thanks to Nutrien Ag Solutions and Air Care Inc. for their cooperation in applying the post emergence miticide.

Dryland Corn Hybrid Performance Trial at Walsh

Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

The Plainsman Research Center conducted a dryland corn hybrid performance trial to identify hybrids that are well-suited to and highly productive in our area. This was conducted to provide data to local producers so they can make more informed decisions for their operations and give the participating seed company third party data that can help them identify high-performing hybrids within their product lineups. The 2024 trial included five hybrids from two different seed companies represented. We are grateful for their participation and partnership in conducting this trial.

Materials and Methods:

This year's trial was planted into wheat stubble from the 2023 crop strip-tilled in the fall to apply fertility and create a seedbed (see Table 11). All hybrids were planted at 12,500 seeds/acre with starter fertilizer and 1 pt/acre Sniper® LFR® in-furrow to mitigate corn rootworm feeding on May 10th. Each hybrid had two 10' wide strips with an average length of 1150'. Corn hybrids within the trial had relative maturity (RM) between 101 RM and 110 RM. Herbicides were applied pre-plant and post emergence to control weeds as needed. The plot received 13.13" of precipitation. Plots were harvested on October 31st with a self-propelled Gleaner F3 combine equipped with a HarvestMaster H2 Grain Gauge. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

This year's trial average was 52.1 bu/acre and the plants did well, considering the dry conditions during pollination. The trial did not show significant differences among the hybrids in grain yield (P-value=0.3280). However, there was a significant difference in test weight (P-value=0.0054), as seen in the table, with G08D29-D achieving the highest test weight (see Table 11). Based on the trends, this study shows that the shorter maturity corn hybrids tended to perform better during this growing season.

Table 11. Plainsman Research Center Dryland Corn Trial at Walsh

Brand	Hybrid	Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)	Emerged Population (plants/ac)	Relative Maturity[b]
NC+	NC 01-01VT2PRIB	55.9	58.25	9.93%	12,000	101
NC+	NC 03-63PCE	53.3	58.6	10.13%	11,750	103
Golden Harvest	G08D29-D	53.2	**60.15**	10.88%	11,750	108
Golden Harvest	G08R52-V	52.0	57.25	10.75%	11,000	108
Golden Harvest	G10L16-DV	46.1	57.2	10.52%	11,750	110
Average		**52.1**	**58.3**	**10.44%**	**11,650**	
LSD (0.05)		N.S	1.0			
LSD (0.20)		N.S	0.6			
P-value		**0.3280**	**0.0054**			

[a]Yield adjusted to 15.5% moisture and hybrids are ranked by yield. Test Weight in bold is significant.

[b]Relative maturities were provided by the seed companies.

[c]Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are the same).

[d] Population taken before harvest

[e] This experiment consisted of two replications

Site Information
Site: Plainsman Research Center
Collaborators: Zane Jenkins, Brett Pettinger, Perry Jones
Planting date: 5/10/24
Harvest date: 10/31/24 Harvest Area was 10' by 1150'
Planted population: 12,500
Precipitation Planting to First Freeze: Total 13.13" (May 2.04", June 4.80", July 1.99", Aug 2.64", Sept 1.66", Oct 0.00")
Soil Type: Wiley loam
Fertility:
Fall Strip-Till: 65-20-0 (73 lb/acre NH_3 & 5 gal/acre 10-34-0)
Planter Applied 5-20-0-1 Zn (5 gal/acre 10-34-0 & 1 qt/acre 10% EDTA Zn)
Previous Crop: Wheat
Pesticides Applied:
Pre-Plant Herbicide: 32oz Makaze, 21oz Moccassin II, 5oz Carabiner, 1.1 lbs. Atrazine 90WDG, 6.4oz Staredown
In-Furrow Insecticide: 1 pt/ac Sniper LFR
Post-Emerge Herbicide: 32oz Mad Dog 5.4, 5oz Status, 16oz Atrazine 4L

Dryland Corn Hybrid Performance Trial at Towner

Zane Jenkins, Chris Stum, Lane Stum, Linly Stum

Introduction:

As part of our land grant mission, the Plainsman Research Center partners with Southeast Colorado's producers to provide local and relevant research. One of these key partnerships is with the Stum family in Kiowa County. Thanks to their cooperation, we can better provide local data to help more farmers in Southeast Colorado make better decisions about their operations.

Materials and Methods:

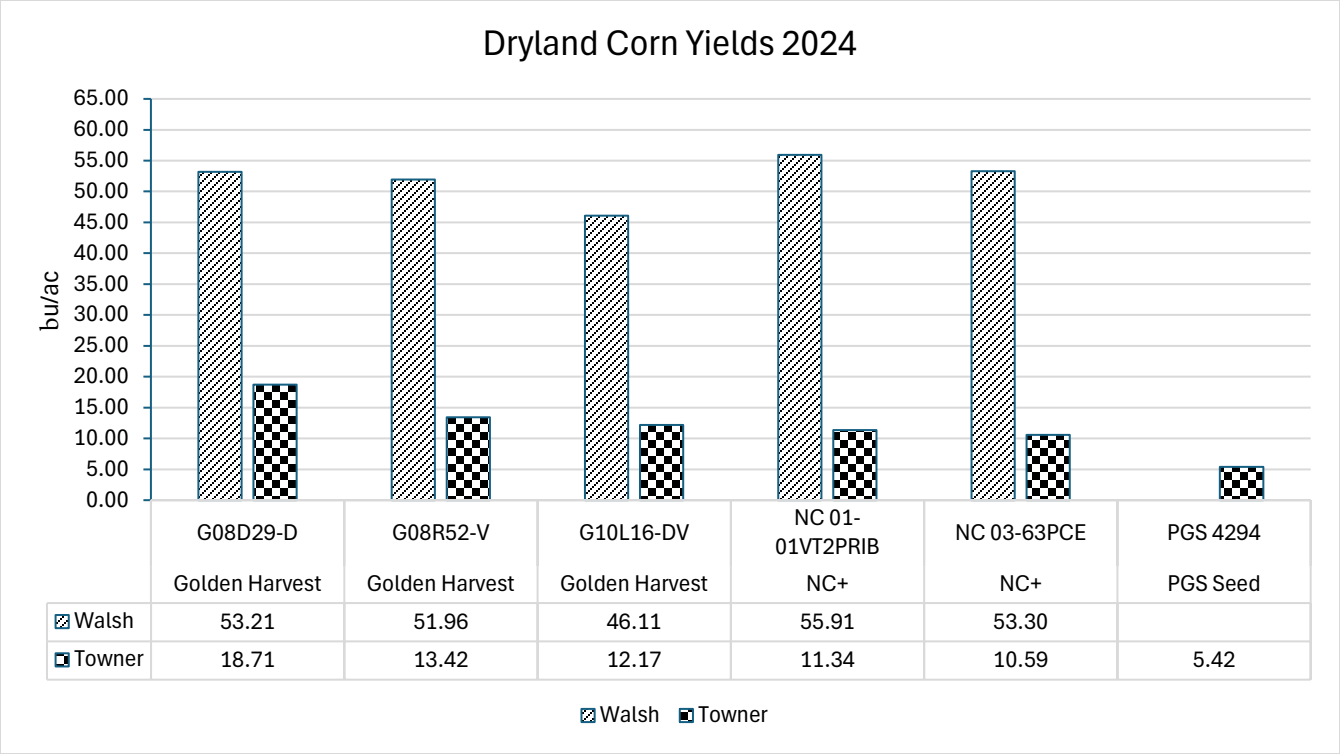
All hybrids were planted at 12,500 seeds/acre on May 17th. Each hybrid had two 30’ wide strips with an average length of 2675’. Corn hybrids within the trial had relative maturity (RM) between 94 RM to 110 RM. Herbicides were applied pre-plant and post emergence to control weeds as needed. There was also a set of unreplicated plots within this field, put in by the Stum family. The recorded measurements from those plots will be included below in the results of the replicated plots. Plots were harvested on October 15th with a self-propelled combine and weighed with a scale cart provided by the Plainsman Research Center, with test weight and moisture being recorded by a handheld tester (John Deere SW30300). LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

Yields in this year’s trial were extremely low compared to years past due to dry conditions during and before the growing season. There was no statistical difference in grain yield (P-value 0.3179) or test weight (P-value = 0.8151). A major contributing factor to this was the low rainfall. However, we still believe these results can provide helpful information to observe how these hybrids performed in these dry conditions compared to the hybrid performance trial at the Plainsman Agri-Search Foundation farm near Walsh, which received more rainfall this growing season.

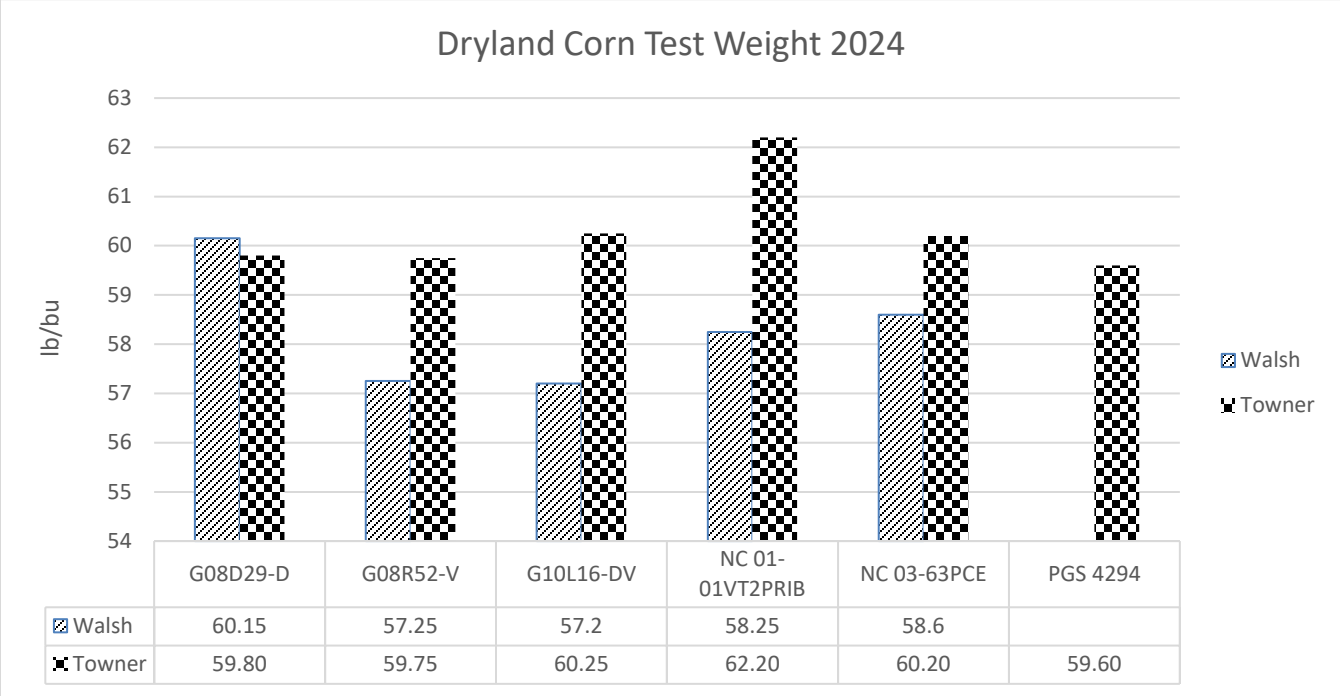
Table 12. Plainsman Research Center Dryland Corn Trial at Towner 2024

Seed Company	Hybrid	Grain Yield (bu/ac)	Test Weight (lb/bu)	Moisture (%)	Population (plants/acre)	Ear Set Height Low (inches)	Ear Set Height High (inches)	# Ears	Avg Ear Height (inches)
Golden Harvest	G08D29D	18.7	59.8	14.90%	10,454	24	27	1.5	25.5
Golden Harvest	G08R52V	11.3	62.2	13.80%	6,970	19	23.5	1	21.25
Golden Harvest	G10L16DV	12.2	60.3	19.10%	12,197	24	28.5	1	26.25
NC+	NC 01-01	13.4	59.8	13.60%	10,454	19.5	22	1	20.75
NC+	NC 03-63	10.6	60.2	13.20%	10,454	20.5	23.5	1.5	22
PGS Seed	PGS 4294	5.4	59.6	11.30%	5,227	19.5	22.5	1	21
Average		**10.9**	**59.9**	**13.50%**	**9,692**	**20.6**	**23.9**	**1.1**	**22.3**
LSD 0.05		N.S	N.S						
LSD 0.20		N.S	N.S						
P-value		0.3179	0.8151						
Hybrids without replication due to lack of seed (Denotes No Replication in 2024)*									
Rob See Co	*RCD0109*	*8.4**	*58.8**	11.8%*	8,712*	18	22	1	20
Rob See Co	*RC4213*	*7.9**	*58.2**	9.9%*	12,197*	19	22	1	20.5
Rob See Co	*RC4166*	*7.9**	*59.4**	10.1%*	12,197*	19	21	1	20
Rob See Co	*RC9795*	*7.3**	*59.0**	12.4%*	10,454*	20	24	1	22



	G08D29-D Golden Harvest	G08R52-V Golden Harvest	G10L16-DV Golden Harvest	NC 01-01VT2PRIB NC+	NC 03-63PCE NC+	PGS 4294 PGS Seed
Walsh	53.21	51.96	46.11	55.91	53.30	
Towner	18.71	13.42	12.17	11.34	10.59	5.42

Figure 6. Dryland Corn Trial Grains Yields at Both Walsh & Towner



	G08D29-D	G08R52-V	G10L16-DV	NC 01-01VT2PRIB	NC 03-63PCE	PGS 4294
Walsh	60.15	57.25	57.2	58.25	58.6	
Towner	59.80	59.75	60.25	62.20	60.20	59.60

Figure 7. Dryland Corn Trial Test Weights at Both Walsh & Towner

Irrigated Grain Sorghum Hybrid Performance Trial

Zane Jenkins, Sally Jones-Diamond, Brett Pettinger, & Perry Jones

Introduction:

The Plainsman Research Center conducted an irrigated grain sorghum study using our center pivot irrigation system in partnership with CSU Crops Testing to identify hybrids that are well-suited to and highly productive in our area. This trial was designed to provide data to our local producers to make better informed decisions for their operation and third party data for the participating seed company to help them identify high-performing hybrids within their product lineups. This year's trial consisted of nineteen hybrids from five different seed companies. We are grateful for their participation and partnership in this trial.

Materials and Methods:

This year's trial was planted into corn stalks from the 2023 crop that was strip-tilled in the fall to apply fertility and create a seedbed (see Table 13). All hybrids were planted at 40,000 seeds/acre with 5 gals 10-34-0 on May 28th, 2024. Each hybrid had two 10' wide strips with an average length of 860'. Herbicides were applied pre-plant and post emergence to control weeds as needed. Stand counts were taken after emergence. A total of 12" of irrigation was used, and the plot received 11.14" of precipitation from planting to the first freeze. Plots were harvested with a self-propelled combine and weighed with a scale cart provided by the Plainsman Research Center, with test weight and moisture being recorded by a handheld tester (John Deere SW30300) at the time of harvest. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

This year's irrigated trial yielded an average grain yield of 115.9 bu/ac. There were statistical differences among hybrids in grain yield and test weight, with the top-performing hybrids for grain yield being GS6455, M60GB31, M62GB36, BH4220, and SP66M16 (LSD 0.30). We are excited about next year's hybrid performance trial so we can continue to provide local and relevant information to our local farmers.

COLORADO STATE UNIVERSITY EXTENSION

2024 Sprinkler Irrigated Grain Sorghum Hybrid Performance Trial at Walsh

CROPS TESTING PROGRAM

Brand	Hybrid	Grain Yield[a]	Yield	Test Weight	Moisture	Emerged Plant Population[b]	Maturity Group[c]	Grain Color
		bu/ac	% of test average	lb/bu	percent	plants/ac		
Rob Seed Co	GS6455	**133.8**	115%	**60.6**	13.9	36,750	ME	Bronze
Dyna-Gro	M60GB31	**131.1**	113%	**60.4**	14.0	33,000	ME	Bronze
Dyna-Gro	M62GB36	**129.5**	112%	**60.4**	13.9	29,000	M	Bronze
BH Genetics	BH 4220	**128.7**	111%	59.1	14.2	34,750	ME	Bronze
Sorghum Partners	SP66M16	**127.4**	110%	58.7	13.9	34,250	M	Bronze
Dyna-Gro	M59GB94	124.3	107%	**60.3**	14.1	33,000	E	Bronze
Rob Seed Co	GS5423	121.7	105%	58.5	14.4	33,000	ME	Cream
Dyna-Gro	M63GB78	120.6	104%	58.7	13.6	34,750	E	Bronze
Sorghum Partners	SP43M80	119.6	103%	59.1	13.7	24,500	ME	Bronze
Sorghum Partners	SP45A45DT	116.7	101%	**60.6**	14.3	32,500	ME	Bronze
Sorghum Partners	SP58M85DT	114.0	98%	57.9	13.9	32,500	ME	Bronze
Dyna-Gro	M59GB57	112.6	97%	59.3	14.0	30,750	M	Bronze
Rob Seed Co	GS6166W	112.2	97%	57.5	13.6	27,250	-	Cream
Sorghum Partners	SPHF371_DT2	110.9	96%	59.0	13.5	30,750	ME	Bronze
Dyna-Gro	M60GB88	105.6	91%	53.4	14.2	25,000	M	Bronze
Sorghum Partners	SP65B21DT	105.4	91%	59.1	13.5	33,000	E	Bronze
Sorghum Partners	SP30A30DT	104.5	90%	57.1	14.0	35,500	E	Bronze
Dyna-Gro	M54GR24	94.3	81%	58.7	13.7	34,500	E	Red
Dyna-Gro	M62GC23	87.4	75%	57.4	13.1	31,250	ME	Cream
Richardson Seeds, Ltd	G1156	77.0	66%	56.3	13.8	21,000	E	White
	Average	**115.9**	**100%**	**58.6**	**13.8**	**31,400**		
	[d]LSD (.30)	8.6		0.6				
	[d]LSD (.05)	16.9		1.3				
	CV:	6.6		0.7				

[a]Yields adjusted to 14% moisture and hybrids ranked by yield. Hybrid yields in bold are in the top LSD group (.30).

[b]Harvest population is the total number of grain-producing heads/panicles counted at harvest that were mature, including tillers.

[c]Maturity group: E=early; ME=medium-early; M=medium. Maturity groups are provided by the company and may not align with the observed flowering dates in the trial due to the latitude and relatively high elevation of the trial site (4,659 feet).

[d]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Plainsman Research Center: (Zane Jenkins, Brett Pettinger, Perry Jones)
Planting Date:	May 28, 2024
Harvest Date:	December 2, 2024
Fertilizer:	Fall Strip-Till: 158-30-0 (182 lb NH_3 & 7.5 gal 10-34-0); Planter Applied: 5-20-0-0.5 Zn (5 gal 10-34-0 & 1pt 10% Zn EDTA)
Previous Crop:	Corn
Herbicide:	Pre-Plant: Mad Dog 5.4 at 32oz/ac, Degree Xtra at 3.3 qt/ac, Explorer at 5 oz/ac, Staredown at 6.4 oz/ac Pre-plant 5/22: Makaze at 32 oz/ac, Sterllius II at 1 pt/ac, Atrazine 4L at 32 oz/ac, Staredown at 6.4 oz/ac, Reviton at 1 oz/ac Post Emerge 7/16: Huskie at 16 oz/ac, Atrazine at 0.5 lb/ac, 2,4-D LV6 at 2 oz/ac
Soil Type:	Ulysses and norka silt loams
GPS Coordinates:	37.429489, -102.327245
Precipitation:	Total 11.14" (May 0.05", June 4.80", July 1.99", Aug 2.64", Sep 1.66", October 0.00")
Irrigation:	12"

Contact Zane Jenkins at zane.jenkins@colostate.edu or Sally Jones-Diamond at sally.jones@colostate.edu

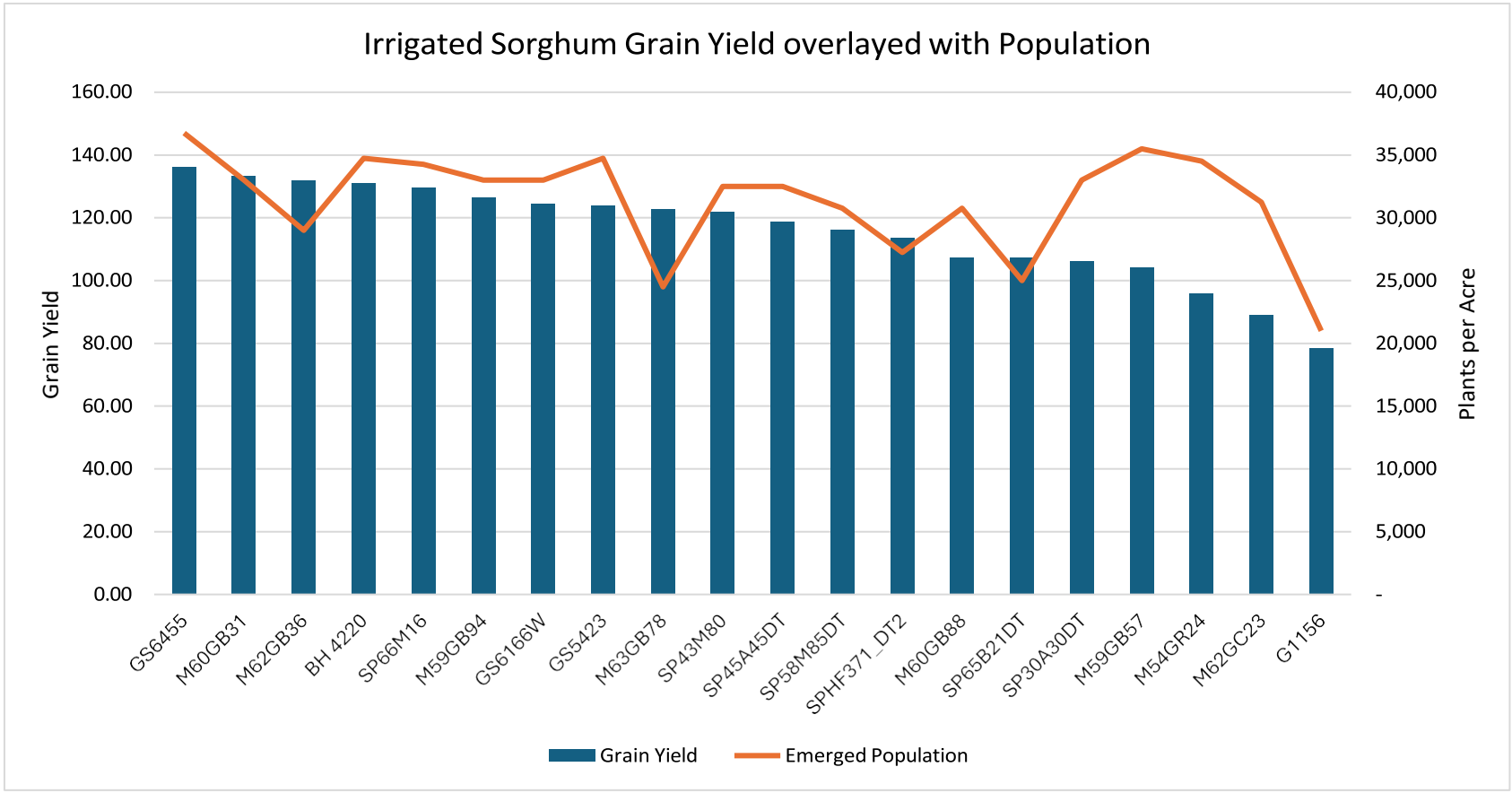


Figure 8. Grain Yield Overlayed with the Emerged Population in the Plainsman Research Center Irrigated Grain Sorghum Trial.

Dryland Grain Sorghum Hybrid Performance Trial

Zane Jenkins, Sally Jones-Diamond, Brett Pettinger, & Perry Jones

Introduction:

Every year, the Plainsman Research Center conducts a dryland grain sorghum study in partnership with CSU Crops Testing to identify well-suited and highly productive hybrids in our area. This provides data to local producers to make informed decisions for their operations as well as for the participating seed company to help them identify high performing hybrids within their product line ups. This year's trial included thirty-four hybrids from eight different seed companies represented. We are grateful for their participation and partnership to conduct the hybrid performance trials.

Materials and Methods:

This year's trial was planted into wheat stubble from the 2023 crop strip-tilled in the fall to apply fertility and create a seedbed for trial (see Table 14). All hybrids were planted at 43,500 seeds/acre on May 24th with a four-row cone planter. Each hybrid had four 10' x 50' long plots in the randomized, complete block design experiment. Herbicides were applied pre-plant, and no post-emergence pesticides were needed this year. The number of plants and the number of heads were measured before harvest. The plot received 11.14" of precipitation between planting and the first freeze. Plots were harvested on December 12th with a self-propelled combine equipped with a HarvestMaster H2 Grain Gauge. Statistics were analyzed using a spatial mixed model in SAS 9.4.

Results and Discussion:

This year's dryland trial yielded an average grain yield of 47.1 bu/ac. There were statistical differences amongst hybrids in both grain yield and test weight, with the top performing hybrids for grain yield include BH3818, BH4220, M59GB57, DKS38-16, BH3701C, GA2630C, DKS29-28, SP43M80, and M62GC23 (LSD 0.30). We are excited for next year's hybrid performance trial so we can continue to provide local and relevant information to our local farmers.

SOIL AND CROP SCIENCES
COLORADO STATE UNIVERSITY

2024 Dryland Grain Sorghum Hybrid Performance Trial at Walsh

CROPS TESTING PROGRAM

Brand	Hybrid	Grain Yield[a]	Yield	Test Weight	Moisture	Plant Lodging	Emerged Plant Population	Heads at Harvest	Tillering	Maturity Group[b]	Grain Color
		bu/ac	% of test average	lb/bu	percent	percent	plants/ac	heads/ac	tillers per plant		
BH Genetics	BH3818	**58.9**	125%	61.4	12.4	0	19,000	29,000	0.5	ME	Red
BH Genetics	BH4220	**58.2**	123%	61.7	12.4	2	18,500	15,000	0.0	ME	Bronze
Dyna-Gro	M59GB57	**57.4**	122%	61.5	12.5	2	19,000	20,000	0.1	E	Bronze
Dekalb	DKS38-16	**56.6**	120%	**62.7**	12.7	2	18,500	25,500	0.4	ME	Bronze
BH Genetics	BH3701C	**54.6**	116%	61.5	12.5	1	22,500	23,000	0.0	ME	Cream
LG Seeds	GA2630C	**54.3**	115%	61.6	12.4	1	24,500	20,000	0.0	ME	Cream
Dekalb	DKS29-28	**54.2**	115%	61.8	12.5	2	19,500	24,500	0.3	E	Bronze
Sorghum Partners	SP43M80	**53.6**	114%	62.2	12.5	2	22,500	18,500	0.0	ME	Bronze
Dyna-Gro	M62GC23	**53.3**	113%	61.6	12.4	3	16,500	17,500	0.1	ME	Cream
Pioneer	86P20	51.7	110%	61.7	12.2	0	23,500	37,500	0.6	ME	Red
Dyna-Gro	M54GR24	50.5	107%	61.7	12.4	1	24,500	32,000	0.3	E	Red
Sorghum Partners	SP58M85DT	50.5	107%	61.8	12.4	1	16,500	28,000	0.7	M	Bronze
Dekalb	DKS28-05	50.3	107%	61.1	12.2	2	20,000	26,500	0.3	E	Bronze
Richardson Seeds, Ltd	G1156	49.8	106%	59.7	11.9	1	18,500	28,000	0.5	E	White
Dekalb	DKS36-07	49.3	105%	61.3	12.5	1	21,000	18,000	0.0	ME	Bronze
Dekalb	DKS28-07	49.0	104%	61.0	12.4	3	23,500	28,500	0.2	E	Bronze
Dyna-Gro	M60GB88	47.9	102%	61.2	12.6	5	16,000	23,500	0.5	ME	Bronze
Dekalb	DKS29-95	47.1	100%	61.1	12.2	2	17,500	18,000	0.0	E	Dark Red
Rob See Co	GS6455	45.5	96%	61.2	12.4	0	29,000	32,000	0.1	ME	Bronze
Rob See Co	GS5423	45.2	96%	60.4	12.1	1	23,000	27,500	0.2	E	Bronze
Dekalb	DKS28-16	44.6	95%	62.1	12.5	3	23,500	25,500	0.1	E	Bronze
Sorghum Partners	SP45A45DT	44.5	94%	62.0	12.3	0	24,500	31,500	0.3	ME	Bronze
Sorghum Partners	SPHF273DT	44.5	94%	61.7	12.5	1	20,500	36,500	0.8	-	Bronze
Dyna-Gro	M59GB94	44.0	93%	61.6	12.5	1	20,000	9,500	0.0	ME	Bronze
LG Seeds	GA2550R	43.3	92%	61.5	12.3	1	17,500	23,500	0.3	ME	Red
Sorghum Partners	SP30A30DT	42.7	91%	61.9	12.5	1	23,000	28,500	0.2	E	Bronze
Rob See Co	GS6166W	42.7	91%	61.7	12.6	1	21,000	23,000	0.1	ME	Cream
Sorghum Partners	SP251	42.5	90%	60.8	12.2	6	18,000	26,500	0.5	VE	Red
Dyna-Gro	M62GB36	42.0	89%	61.1	12.2	1	15,000	17,500	0.2	M	Bronze
Sorghum Partners	SPHF164DT	42.0	89%	61.9	12.3	1	18,000	41,500	1.3	-	Bronze
Dyna-Gro	M63GB78	35.9	76%	61.1	12.2	0	16,500	22,500	0.4	ME	Bronze
Sorghum Partners	SPHF371DT	34.3	73%	60.8	12.4	2	16,000	28,000	0.8	-	Cream
Sorghum Partners	SPHF165DT	31.6	67%	62.1	12.7	0	17,000	40,500	1.4	-	Cream
Dyna-Gro	M60GB31	30.9	66%	61.3	12.5	0	20,500	17,000	0.0	ME	Bronze
	Average	**47.1**	**100%**	**61.5**	**12.4**	**1**	**20,100**	**25,400**	**0.3**		
	[c]LSD (P<0.30)	5.7		0.3		0					
	[c]LSD (P<0.05)	10.8		0.7		1					
	Coefficient of Variation (CV)	20.7		0.4							

[a]Yields adjusted to 14% moisture and hybrids ranked by yield. Hybrid yields in bold are in the top LSD group (.30).

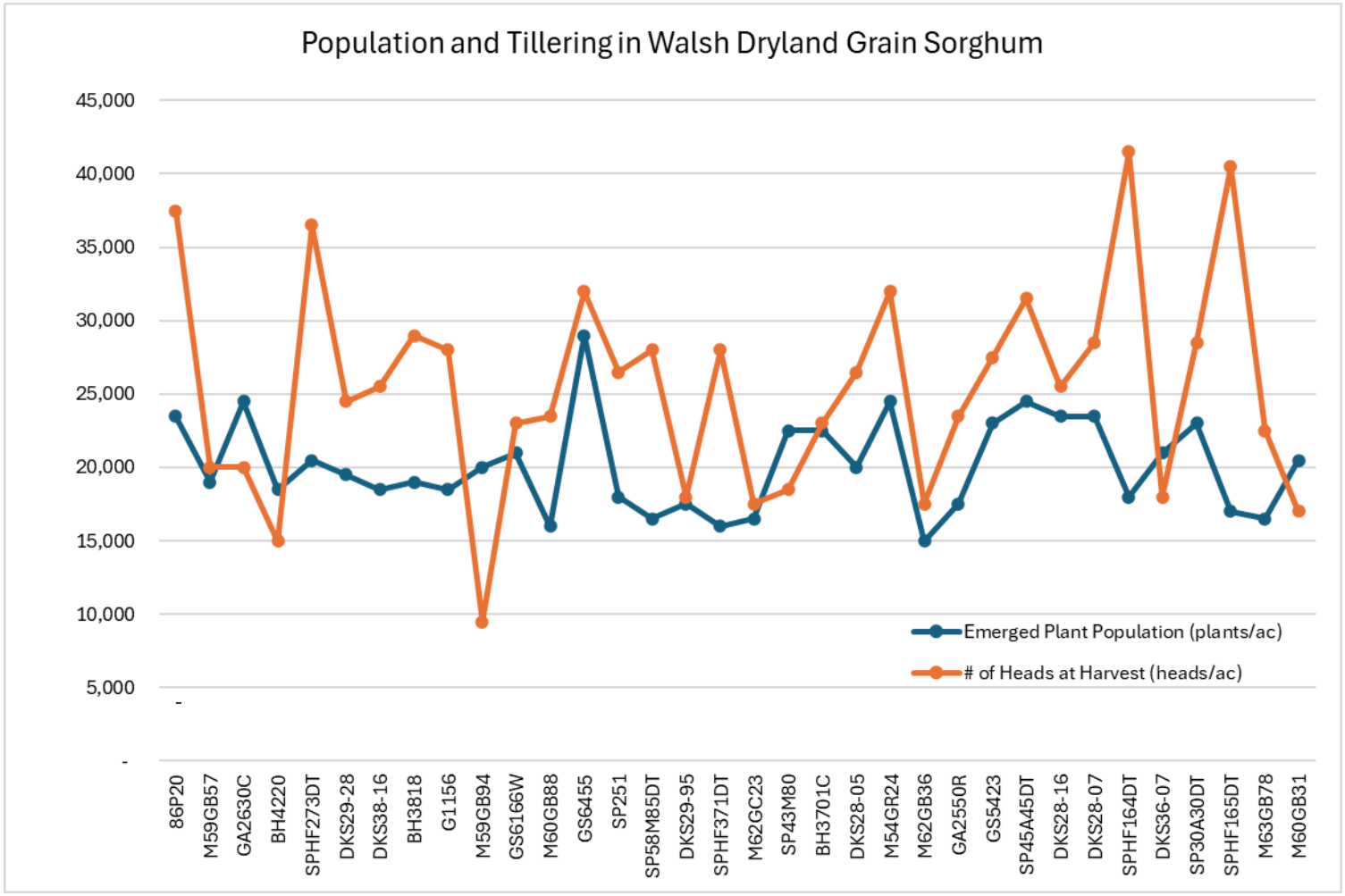
[b]Maturity Group: E=early; ME=medium-early; M=medium. Maturity groupings with two classes are trial observation/seed company description.

[c]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Plainsman Research Center: (Zane Jenkins, Brett Pettinger, Perry Jones)
Planting Date:	May 24, 2024
Harvest Date:	December 12, 2024
Previous Crop:	Wheat
Herbicide:	Pre-plant: applied on 4/30: 32 oz/ac Makaze, 21 oz/ac Moccassin II, 5 oz/ac Carabiner, 1.1 lb/ac Atrazine 90WDG, 6.4 oz/ac Staredown
Soil Type:	Wiley Loam
GPS Coordinates:	37.434301, -102.3102
Comments:	Precipitation Planting to First Freeze: 11.14" total (May: 0.05", June: 4.80", July: 1.99", Aug: 2.64", Sep: 1.66", Oct: 0")

Figure 9. Emerged Population and Tillering in the Dryland Grain Sorghum Trial at Plainsman Research Center



SOIL AND CROP SCIENCES
COLORADO STATE UNIVERSITY

2024 Dryland Grain Sorghum Hybrid Performance Trial at Sheridan Lake

CROPS TESTING PROGRAM

Brand	Hybrid	Grain Yield[a]	Yield	2-Year Avg. Yield	Test Weight	Moisture	Emerged Plant Population	Harvest Population[b]	Tillering[c]	50% Bloom	Plant Height	Maturity Group[d]	Grain Color
		bu/ac	% of test avg.	bu/ac	lb/bu	percent	plants/ac	heads/ac	tillers/plant	days after planting	inches		
DYNAGRO	M62GC23	**56.0**	135%	-	56.9	9.1	36,400	34,900	0.0	74	28	ME	Cream
Golden Acres	GA 2630C	**51.9**	125%	84	56.7	10.2	33,700	32,600	0.0	73	32	E	Cream
BH Genetics	BH 3701C	50.5	122%	-	56.3	8.8	35,800	36,700	0.0	73	33	ME	Cream
Channel Seed	5B70	50.3	121%	89	59.2	11.6	25,500	30,700	0.2	76	33	ME	Bronze
Dyna-Gro Seed	M59GB94	50.0	121%	83	59.2	11.5	33,100	30,000	0.0	74	38	E	Bronze
Dekalb	DKS29-95	50.0	121%	79	56.3	9.3	34,400	35,900	0.1	73	31	E	Dark Red
Sorghum Partners	SP 30A30 DT	46.4	112%	80	57.8	10.6	30,500	30,900	0.0	74	30	ME	Bronze
Dekalb	DKS29-28	46.4	112%	74	58.6	10.4	37,900	39,100	0.0	71	29	E	Bronze
Dekalb	DKS36-07	44.8	108%	83	58.9	11.0	29,600	31,400	0.1	74	31	ME	Bronze
Dekalb	DKS28-07	43.4	105%	73	56.0	9.3	34,400	39,200	0.1	69	31	E	Bronze
Channel Seed	5R45	43.4	105%	-	56.6	9.3	39,400	38,700	0.0	72	32	ME	Red
Hoegemeyer Seed	H6020	43.1	104%	77	59.7	10.3	35,200	38,700	0.1	70	38	ME	Red
Hoegemeyer Seed	H6037	42.5	102%	83	60.1	10.3	31,900	31,700	0.1	72	34	ME	Red
Dyna-Gro Seed	M54GR24	42.2	102%	73	59.4	10.5	33,800	34,300	0.0	72	30	E	Red
Sorghum Partners	SPHF273 DT	41.7	101%	-	58.5	10.7	21,000	28,300	0.5	77	31	-	Bronze
Sorghum Partners	SP 58M85 DT	41.5	100%	-	57.0	9.3	31,500	30,700	0.0	71	33	M	Bronze
DYNAGRO	M62GB36	41.5	100%	-	58.3	11.0	25,200	26,800	0.1	80	33	M	Bronze
Dekalb	DKS38-16	41.3	100%	82	59.8	11.0	37,500	38,200	0.0	72	39	ME	Bronze
Dekalb	DKS28-16	41.2	99%	-	58.4	9.6	39,500	45,800	0.2	69	27	E	Bronze
Sorghum Partners	SPHF371 DT	39.9	96%	-	54.9	9.7	18,200	23,800	0.3	75	29	-	Cream
Dyna-Gro Seed	M59GB57	39.6	96%	76	58.0	9.6	31,000	38,200	0.2	69	28	E	Bronze
Channel Seed	5B29	39.5	95%	-	51.1	8.5	31,400	34,400	0.1	70	33	E	Bronze
Sorghum Partners	SP 45A45 DT	39.2	95%	81	57.5	10.6	35,900	34,500	0.0	76	29	ME	Bronze
BH Genetics	BH 3818	39.1	94%	-	55.8	9.9	30,300	28,000	0.0	75	29	ME	Red
Dyna-Gro Seed	M60GB31	39.0	94%	74	56.7	12.1	30,900	26,800	0.0	78	36	ME	Bronze
Sorghum Partners	SPHF165 DT	38.4	93%	-	58.0	10.3	14,500	27,800	0.9	69	33	-	Cream
Hoegemeyer Seed	H6006	38.2	92%	72	60.9	11.0	31,100	38,200	0.2	70	38	ME	Red
Dyna-Gro Seed	M60GB88	37.2	90%	76	55.4	9.5	31,300	32,300	0.1	72	36	ME	Bronze
Dyna-Gro Seed	M63GB78	37.0	89%	77	55.7	9.7	27,300	24,000	0.0	77	29	ME	Bronze
Dekalb	DKS28-05	36.9	89%	68	54.1	9.3	31,800	32,900	0.1	70	33	E	Bronze
Sorghum Partners	SP 43M80	36.0	87%	69	59.4	10.7	30,600	30,900	0.0	71	30	ME	Bronze
Pioneer	86P20	35.7	86%	73	57.0	9.5	39,600	36,500	0.0	70	36	ME	Red
BH Genetics	BH 3520	34.5	83%	-	53.7	8.4	31,000	31,800	0.1	70	30	ME	Red
Pioneer	89P52	34.2	83%	-	56.9	9.6	34,300	37,800	0.2	69	34	E	Red
Sorghum Partners	SPHF164 DT	33.4	81%	-	57.5	11.2	16,700	26,100	0.6	70	30	-	Bronze
Sorghum Partners	251	26.7	64%	-	55.9	9.4	30,800	36,600	0.2	69	31	VE	Red
	Average	**41.5**	**100%**	**78**	**57.3**	**10.1**	**31,200**	**33,200**	**0.1**	**72**	**32**	**-**	**-**
	[c]LSD (.30)	4.6			1.1								
	[c]LSD (.05)	8.8			2.1								
	Coefficient of Variation (CV)	9%			1%								

[a]Yields adjusted to 14% moisture and hybrids ranked by yield. Hybrid yields in bold are in the top LSD group (.30).

[b]Harvest population is the total number of grain-producing heads/panicles counted at harvest that were mature, including tillers.

[c]average number of productive (grain-containing and mature) tiller heads per plant. Does not include main plant head.

[d]Maturity group: E=early; ME=medium-early; M=medium. Maturity groups are provided by the company and may not align with the observed flowering dates in the trial due to the latitude and relatively high elevation of the trial site (3,990 feet).

[c]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator:	Scherler Farms
Planting Date:	May 18, 2024
Harvest Date:	October 15, 2024
Fertilizer:	Pre-plant: N at 50 lb/ac
Herbicide:	Brawl II at 1.33 pt/ac and glyphosate at 32 oz/ac applied on May 18. Glyphosate at 1 qt/ac on June 7 and July 22 applied with hooded sprayer.
Soil Type:	Wiley loam
GPS Coordinates:	38.5232807, -102.4708509
Trial Comments:	Planted 1.5" deep into moisture. Average stands and emergence. Heavy sandbur weed pressure, which was 70% controlled in harvested rows by pre-emerge herbicide, two applications of glyphosate with a hooded sprayer, and one round of hand-labor. Trial average flowering date of July 29th. Radar estimates showed the trial received about 7.3 inches of rain from planting to harvest, and 10.1 inches since January 1st, which was 67% of the ten-year average (year-to-date).

Dryland Forage Sorghum Hybrid Performance Trial at Walsh

Zane Jenkins, Sally Jones-Diamond, Brett Pettinger, & Perry Jones

Introduction:

Every year, the Plainsman Research Center conducts a dryland forage sorghum study in partnership with CSU Crops Testing to identify hybrids that are well-suited to and highly productive in our area. This provides information to local producers so they can make decisions for their operations and the participating seed company to help them identify high-performing hybrids within their product lineups. This year's trial included twenty-six hybrids from five different seed companies represented. We are grateful for their participation and partnership in conducting this trial.

Materials and Methods:

This year's trial was planted into wheat stubble from the 2023 crop strip-tilled in the fall to apply fertility and create a seedbed (see Table 16). All hybrids were planted at 70,000 seeds/acre on June 7th with a four-row cone planter. Each hybrid had four 10' x 50' long plots as part of a randomized complete block design experiment. Herbicides were applied pre-plant, and no post emergence pesticides were needed this year. The number of plants and plant height were measured before harvest, with forage quality samples collected after harvest. The plots received 11.09" of precipitation between planting and the first freeze. Plots were harvested on October 24th with a self-propelled silage chopper equipped with an onboard scale. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

This year's dryland trial yielded an average of 8 tons/acre (65% moisture). There were statistical differences amongst hybrids in both forage yield and dry matter yield, with the top-performing hybrids being F72FS05 and Super Sile 20 (LSD 0.30). We are excited about next year's hybrid performance trial so we can continue to provide local and relevant information to our local farmers.

SOIL AND CROP SCIENCES
COLORADO STATE UNIVERSITY

2024 Forage Sorghum Variety Performance Trial at Walsh

CROPS TESTING PROGRAM

		Yield										Forage Quality[a]												
Variety	Brand	Forage[b]	Dry Matter	Yield	Moisture	Brix	Plant Height	Plant Density	Forage Type[c]	Relative Maturity[d]	Traits[c]	RFQ	CP	aNDFom	Lignin	WSC (Sugar)	Starch	Ash	Fat	NDFD 30hr	NDFD 240hr	TDN	NEL	Milk/Ton
		tons/ac		% of test avg.	% at harvest	percent	in	plants/ac				index	percent										Mcal/cwt	lb/ton
F72FS05	Dyna-Gro Seed	**11.1**	**3.9**	138%	59	22	50	47,500	FS	ME	-	118	8.2	50	4.1	6.3	16	8	1	54	68	62	64	2828
Super Sile 20	Dyna-Gro Seed	**10.0**	**3.5**	125%	64	17	72	39,500	FS	ML	-	108	8.5	53	3.8	5.4	13	8	1	52	68	59	61	2624
Super Sile 30	Dyna-Gro Seed	9.4	3.3	118%	62	13	55	34,000	FS	ME	-	100	8.2	56	4.3	4.6	11	10	1	55	70	58	58	2446
FX24015	Dyna-Gro Seed	9.3	3.2	116%	56	14	80	42,000	-	-	-	105	9.6	50	2.8	8.4	19	12	1	56	68	57	58	2466
Fullgraze II	Dyna-Gro Seed	9.1	3.2	115%	61	19	95	44,500	SS	ML	-	77	6.4	64	4.1	4.9	3	8	1	51	65	53	54	2177
NK300	Sorghum Partners	9.0	3.2	113%	52	14	48	44,500	FS	ME	-	129	8.0	48	3.6	7.9	20	8	1	56	69	63	66	2956
F75FS13	Dyna-Gro Seed	8.8	3.1	110%	60	20	76	49,500	FS	M	-	130	8.8	48	3.8	6.2	22	7	1	54	66	63	67	2993
F71FS72 BMR	Dyna-Gro Seed	8.4	2.9	105%	56	12	58	36,500	FS	E	BMR	130	8.9	45	3.9	8.7	22	10	1	54	65	62	64	2867
SP2606 BMR	Sorghum Partners	8.2	2.9	103%	59	11	52	37,000	FS	E	BMR	137	8.0	46	3.7	7.4	21	10	1	61	71	64	65	2924
Fullgraze II BMR	Dyna-Gro Seed	8.2	2.9	103%	64	19	89	32,000	SS	ML	BMR	115	8.7	56	4.4	5.5	8	9	1	61	72	62	60	2659
SS405	Sorghum Partners	8.2	2.9	102%	64	20	78	34,500	FS	L	-	110	8.4	53	4.8	7.0	11	8	1	52	68	59	61	2618
Quick Chop	Star Seed	8.1	2.8	101%	57	14	74	35,000	FS	E	BMR	123	8.6	50	3.8	6.8	15	10	1	57	70	62	62	2744
SweetTon MS	Dyna-Gro Seed	7.9	2.8	99%	64	25	74	37,500	GS	ML	SCA	111	9.2	52	2.8	8.4	12	10	1	56	69	59	60	2579
FX24067	Dyna-Gro Seed	7.8	2.7	98%	62	16	72	33,500	-	-	-	107	7.8	53	4.6	5.7	14	9	1	52	67	58	60	2542
Cadan	Browning Seed	7.8	2.7	98%	55	10	97	41,500	SS	M	WMR	77	7.0	62	5.3	3.1	9	8	1	49	64	53	55	2202
F74FS72 BMR	Dyna-Gro Seed	7.8	2.7	97%	58	20	42	37,000	FS	M	BMR	133	9.5	52	5.2	4.4	10	8	1	62	74	65	64	2914
Drylander	Star Seed	7.7	2.7	96%	71	17	72	42,500	SS	PS	BMR	115	9.4	57	5.6	2.7	4	10	1	63	78	62	59	2587
Excel II	Star Seed	7.7	2.7	96%	65	19	77	46,500	SS	L	-	105	8.4	55	3.8	5.9	8	10	1	58	70	59	58	2476
F74FS23 BMR	Dyna-Gro Seed	7.6	2.7	95%	66	21	62	29,000	FS	M	BMR, BD	134	10.0	51	3.8	6.7	9	10	1	63	74	63	62	2781
ADVFX 193	Alta Seeds	7.4	2.6	93%	64	11	59	32,000	FS	M	BMR	119	8.8	56	4.8	4.8	8	10	1	62	72	62	60	2628
Danny Boy II BMR	Dyna-Gro Seed	7.2	2.5	91%	72	17	71	38,000	SS	ME	BMR	107	9.1	53	3.7	2.9	2	16	1	65	74	58	53	2237
SP2707 DT	Sorghum Partners	7.1	2.5	89%	56	15	38	32,000	FS	ME	DT	118	8.4	52	3.9	6.3	17	9	1	55	70	60	62	2694
3 Little Indians	Browning Seed	7.0	2.4	87%	55	13	89	32,000	FS	M	-	119	8.1	48	4.9	7.1	21	7	1	49	64	61	65	2829
Super Sweet 10	Dyna-Gro Seed	6.3	2.2	79%	60	18	80	45,500	SS	M	-	109	7.6	52	5.2	7.8	19	6	1	49	65	60	64	2797
Dynagraze II BMR	Dyna-Gro Seed	5.3	1.9	67%	60	21	78	41,500	SS	ME	BMR	125	8.5	51	4.9	7.3	16	7	1	57	70	63	65	2927
Dynagraze II	Dyna-Gro Seed	5.3	1.9	66%	62	24	83	40,500	SS	ME	-	71	6.8	63	5.4	4.6	8	10	1	50	66	50	52	1986
	Average	**8.0**	**2.8**	**100%**	**61**	**17**	**70**	**38,500**				**113**	**8.4**	**53**	**4.3**	**6.0**	**13**	**9**	**1**	**56**	**69**	**60**	**61**	**2634**
	[e]LSD (0.30)	1.1	0.4																					
	[e]LSD (0.05)	2.1	0.7																					
	Coefficient of Variation (CV)	11.1	11.1																					

[a]All forage quality analyses results are dry basis values. CP=crude protein; aNDFom=ash free neutral detergent fiber; WSC=water-soluble carbohydrates; NDFD=neutral detergent fiber digestibility; TDN=total digestable nutrients; NEL=net energy for lactation; Milk/ton=predicted amount of milk produced per ton of silage dry matter calculated using MILK2013.

[b]Forage yield adjusted to 65% moisture content based on dried samples.

[c]Forage Type: GS=grain sorghum; FS=forage sorghum; SS=sorghum sudangrass.

[d]Relative maturities are provided by the companies. E=early; ME=medium-early; M=medium; ML=medium-late; PS=Photoperiod sensitive; L=late.

[e]Traits are provided by the companies. Dashes mean conventional (no traits) or information isn't available. BD=brachytic dwarf; BMR=brown mid-rib; DT=DoubleTeam herbicide system; SCA=sugar cane aphid.

[f]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator: Plainsman Research Center (Kevin Larson, Brett Pettinger, Perry Jones, and Zane Jenkins)
Planting Date: June 7, 2024
Harvest Date: October 24, 2024
Fertilizer: Fall Strip-Till: 60-20-0 as NH3 & 10-34-0
Herbicide: Pre-Plant: Makaze applied at 32 oz/ac, Atrazine 4L at 32 oz/ac, Strellius II at 16 oz/ac, and Staredown at 6.4 oz/ac applied on May 22
Soil Type: Wiley Loam
GPS Coordinates: 37.434367, -102.310195
Trial Comments: Precipitation Planting to First Freeze: 11.09" total (June: 4.80", July: 1.99", Aug: 2.64", Sep: 1.66", Oct: 0")

Dryland Proso Millet Variety Strip Trial

Zane Jenkins & Perry Jones

Introduction:

This is the first year of having a proso millet variety trial here at the Plainsman Research Center. Proso millet has a long history of cultivation in Northeast Colorado and the Nebraska Panhandle and even as close as Kiowa County, Colorado. This year, we wanted to test multiple varieties in Baca County to further test proso millet's potential. The varieties in this trial originate from either the University of Nebraska or Dryland Genetics Inc. breeding programs. Special thanks to Chris Stum and Jason Specht for providing the seed used for this trial.

Materials and Methods:

This year's millet variety trial was drilled into wheat stubble from the 2023 crop where nitrogen in the form of 32-0-0 was broadcast preplant at 50 units of nitrogen per acre. Millet strips were drilled on June 11th at a rate of 10 lbs of seed/acre with 5 gal/acre of 10-34-0 using a John Deere 1590 drill. Plots were 20' wide by an average length of 855' long. Herbicide was applied preplant and Spodnam® was applied before harvest to prevent grain shattering from heads and to better enable direct cutting of strips. Plots were harvested on September 11th with self-propelled a combine equipped with a HarvestMaster H2 Grain Gauge. Grain yields are reported in both lb/acre and bu/acre as millet is often marketed by the cwt. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

This year's trial produced statistical differences in grain yield at the LSD 0.20 level, but not the LSD 0.05 level (P-value = 0.1457). There were no statistical differences among varieties in test weight (P-value 0.4845) at either level. An interesting observation is the two highest yielding varieties were also the two long maturity varieties based on breeding program descriptions. We are looking forward to conducting and hopefully expanding our proso millet trial next year here at the Plainsman to continue to test the viability of proso millet as an alternative crop in Baca County.

Table 17. Dryland Proso Millet Trial at Plainsman Research Center

Variety	Yield[a] lb/ac	Yield bu/ac	Yield % of avg	Moisture %	Test Weight[b] lb/bu
DLG 240	**874.1**	**17.5**	144%	11.3%	51.1
Cope	**650.9**	**13.0**	107%	9.9%	52.9
DLG 197	491.1	9.8	81%	10.5%	52.4
Huntsman	417.2	8.3	69%	11.1%	54.5
Average	**608.3**	**12.2**		**10.7%**	**52.7**
LSD 0.20	236.6				N.S
LSD 0.05	N.S				N.S
P-value	0.1457				0.4845

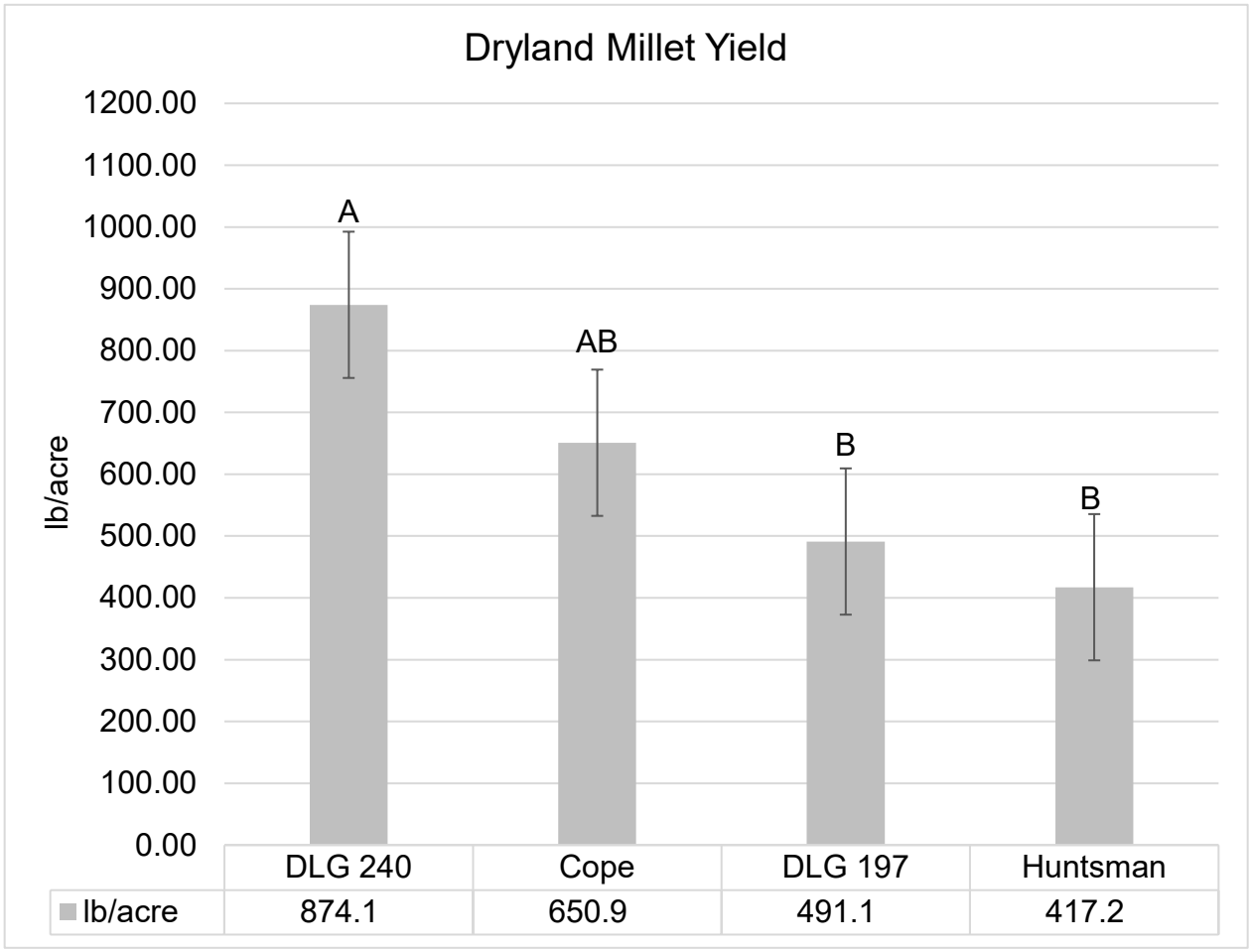
[a]Moisture adjusted to 12%

[b]50 lb/bu standard used

[c] The seeding rate for all varieties was 10 lb/acre of seed

Location: Plainsman Research Center
Planting Date: June 11th
Harvest Date: September 11th
Fertility:
Preplant Broadcast 50-0-0 as 32-0-0
Planter applied 5-20-0 as 10-34-0
Pesticides
Pre-Plant: 45 oz Makaze, 2 oz Sharpen, 6.4 oz Staredown
Post Emergence: 1pt/acre Spodnam applied
Precipitation: Total 11.01" (June 4.72", July 1.99", Aug 2.64", Sep 1.66")

Figure 10. 2024 Dryland Proso Millet Trial Grain Yield with Error Bars (LSD 0.20)



SOIL AND CROP SCIENCES
COLORADO STATE UNIVERSITY

2024 Irrigated Oil Sunflower Hybrid Performance Trial at Walsh

CROPS TESTING PROGRAM

Brand	Hybrid	Oil Type[a]	Technology Traits[b]	Grain Yield[c]	Yield	Moisture	Test Weight	Population	Plant Height	Lodging	Oil Content
				lb/ac	% of test avg.	percent	lb/ac	plants/ac	in	percent	percent
Sunrich Products	4425CL	HO	Clearfield	**1999**	135%	6.6	23.6	15,500	47	16	28
Nuseed	N4H490 E	HO	ExpressSun, DMR	1730	117%	6.5	**25.8**	19,000	55	37	36
DYNAGRO	H47HO11EX	HO	ExpressSun	1727	117%	10.8	**26.2**	13,000	55	25	33
DYNAGRO	H49HO19CL	HO	Clearfield	1671	113%	6.4	**25.7**	16,500	47	32	35
DYNAGRO	H45NS16CL	NS	Clearfield	1580	107%	6.5	25.3	14,500	46	35	33
CROPLAN	CP4255E	HO	ExpressSun	1532	103%	7.6	25.1	13,500	51	13	34
DYNAGRO	H50HO20CP	HO	Clearfield Plus	1517	102%	7.1	**26.5**	19,000	55	42	38
DYNAGRO	XH41H56CL	HO	Clearfield	1513	102%	6.2	23.6	13,500	41	0	32
DYNAGRO	H45HO10EX	HO	ExpressSun	1482	100%	7.5	22.1	11,000	42	31	31
DYNAGRO	XH41H90EX	HO	ExpressSun	1458	98%	6.7	25.1	19,000	55	26	35
CROPLAN	CP455E	HO	ExpressSun	1360	92%	7.7	**25.6**	16,500	46	65	34
CROPLAN	CP7919CL	HO	Clearfield	1308	88%	6.4	24.7	17,500	44	43	35
Nuseed	N4H422 CL	HO	Clearfield, DMR	1176	79%	8.8	24.9	18,500	54	40	33
Sunrich Products	4415HO	HO	Clearfield Plus, DMR	1105	75%	6.9	21.8	12,500	40	25	30
Nuseed	N4H205 E	HO	ExpressSun, DMR	1074	72%	9.8	24.8	16,500	46	31	34
			Average	**1482**	**100%**	**7.4**	**24.7**	**15,700**	**48**	**31**	**33**
			[d]LSD (0.30)	191			1.1				
			[d]LSD (0.05)	374			2.1				
			Coefficient of Variation (%)	19.2			2.9				

[a]Oil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

[b]Technology trait designations: Clearfield and Clearfield Plus=tolerant to Beyond herbicide; DMR=downy mildew resistance; ExpressSun=tolerant to Express herbicide.

[c]Yield and oil content were corrected to 10% moisture at harvest. Hybrids in the top yield and test weight groups (P<0.30) are bolded.

[d]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

Site Information

Collaborator: Tim Hume
Planting Date: June 10, 2024
Harvest Date: October 14, 2024
Fertilizer: Pre-plant strip tilled: 106-20-0-0.25Zn lb of nutrient per acre applied; Planting in-furrow: 2-8-0 lb of nutrient per acre applied
Pesticides: 1.7 oz/ac Vantacor for head moth applied on 8/11/24
Soil Type: Wiley loam
GPS: 37.53013, -102.22059
Trial Comments: Planted into moisture. Good stands and emergence. Very good weed control throughout the season. Moderate lodging at harvest, notes are from single replicate. XH41H56CL showed evidence of deer damage to heads at harvest (this hybrid only). Evidence of sporadic stem weevil damage in plots and dectes beetle damage. Field received approximately 4" of irrigation. Radar estimates showed the trial received about 7.6 inches of rain from planting to harvest, and 12.6 inches since January 1st, which is 80% of the ten-year average (year-to-date).

Strip-Till Nitrogen Rate in Dryland Grain Sorghum

Zane Jenkins, Perry Jones, & Brett Pettinger

Introduction:

Nitrogen is one of the primary nutrients needed for crop production but can also be one of the most expensive inputs for crops. For this reason, it was decided that nitrogen rates on dryland grain sorghum needed more investigation at the Plainsman Research Center. This is this trial's second year to provide growers with more information.

Materials and Methods:

Grain Sorghum plots were planted into wheat stubble from the previous year's crop. We strip-tilled and applied NH_3 at either 60, 90, or 120 units of N/acre and 10-34-0 at 5 gal/acre on all plots in eight 30 inch rows with a length of 1200 ft in the fall of 2023. The hybrid used for this trial was Pioneer 86P20 at 34,000 seeds/acre on June 3rd, 2024, with a John Deere vacuum planter with eight 30 inch rows. Herbicides were applied both preplant and post emergence as needed to control pests. Plots were harvested with a self-propelled combine and weighed with a scale cart provided by the Plainsman Research Center, with test weight and moisture being recorded by a handheld tester (John Deere SW30300) at the time of harvest. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

This year, there were no statistical differences in grain yield or test weight between nitrogen rates. This shows that during this year's growing season, nitrogen was not the limiting factor in these parameters, as well as grain sorghum's ability to perform in a nutrient-limited condition. We will be repeating this study in 2025. We will establish a long-term location to repeat this study over an extended period to see if differences emerge between treatments over time.

Table 19. 2024 Dryland Strip-Till Nitrogen Rate Study

Nitrogen Rate	Grain Yield (bu/ac)	Moisture (%)	Test Weight (lb/bu)
60N	47.5	13.5%	56.6
120N	46.3	13.4%	56.9
90N	44.6	13.5%	56.5
Average	**46.1**	**13.5%**	**56.6**
LSD 0.05	N.S		N.S
LSD 0.20	N.S		N.S
P-value	0.5183		0.7975

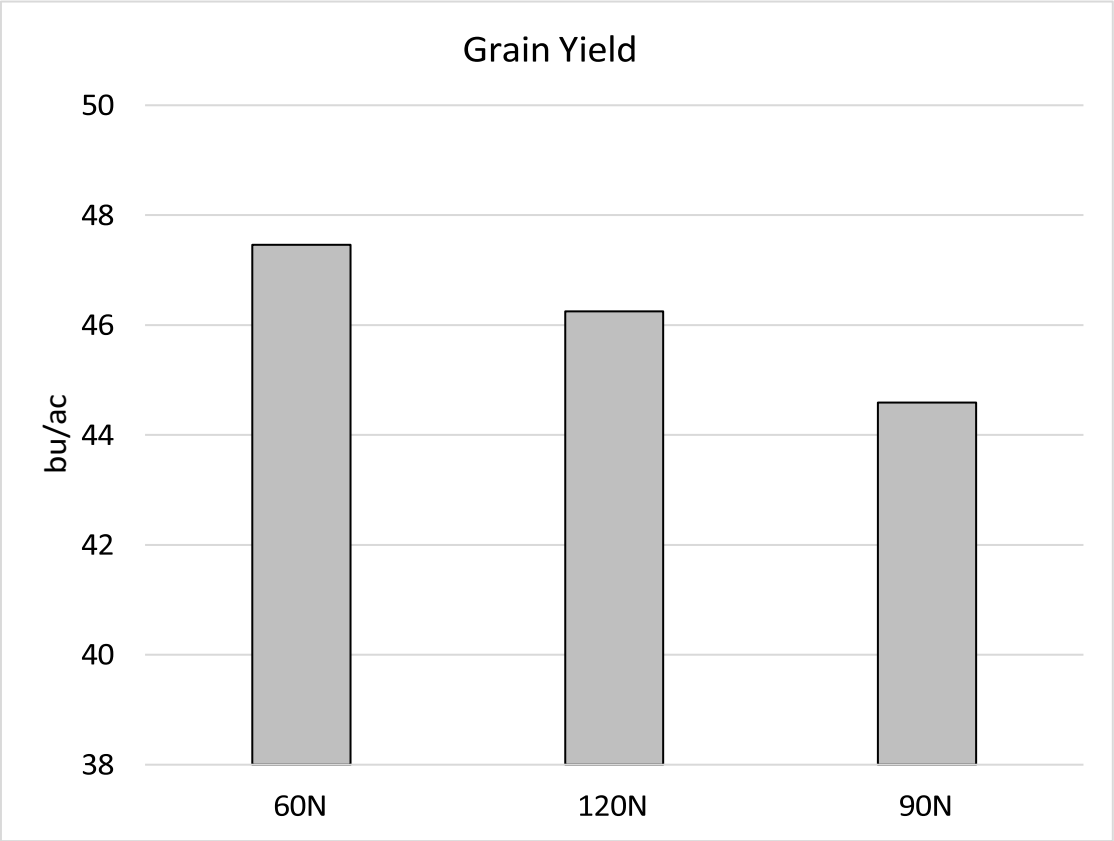


Figure 11. 2024 Grain Yield of the Dryland Strip-Till Nitrogen Rate Arranged by Grain Yield

Strip-Till and Planter Applied Phosphorus Comparison in Dryland Grain Sorghum

Zane Jenkins, Perry Jones, & Brett Pettinger

Introduction:

Two of the most common methods for applying liquid phosphate (P_2O_5) are deep placement with a strip-till implement and in-furrow placement with a planter. There are advantages to both systems. One of the advantages of strip-till applied P is that the deep placement of P allows roots to intercept P later during the growing season when total crop demand for P is higher. One of the advantages of in-furrow planter applied P is placement near the seed, which allows direct contact and uptake of P during germination and early plant growth, which are key stages to establishing a stand. We conducted this study to determine which P placement method produces the highest yields and income.

Materials and Methods:

We strip-tilled NH_3 at 60 units of N/acre in eight inches deep in the fall of 2023 into standing wheat stubble for all phosphorus (P) placement and rate study treatments. We had six different treatments in this trial (see Table 19). For placement of P using strip-till, we used a 20 ft toolbar with eight rows of Yetter Maverick strip-till units on 30” spacing. For planter P placement, we used a 20 ft John Deere 7300 vacuum planter with eight 30” rows. We planted Pioneer 86P20 on May 24, 2024, at 34,000 seeds/ acre. Herbicides were applied preplant and post emergence as needed to control weeds. We harvested 20 ft wide by 1200 ft long grain sorghum plots on November 16th with a self-propelled combine and weighed with a digital scale cart. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There was no statistical difference between treatments in grain yield (P-value = 0.7992) or test weight (P-value 0.5643). This shows that P was not the limiting factor to the grain sorghum during this growing season and that while P placement and rates strategies did not affect grain yield, they would undoubtedly impact costs by modifying rates or reducing field operations based on the available equipment. Starting in 2025, we will be repeating this study and establishing a long-term location where we can repeat this study over a more extended period to see if differences emerge between treatments over time.

Table 19. 2024 Phosphorus in Dryland Grain Sorghum Study

Phosphorus Placement & Rate Method	Grain Yield[a] (bu/ac)	Moisture (%)	Test Weight (lb/bu)
Strip-Till 5+ 1 pt 10% EDTA Zn Only	33.5	11.9%	49.5
5 gal Strip-Till & 5 gal Planter	30.7	12.0%	49.3
5 gal Planter Only	30.0	11.9%	51.2
2.5 gal Strip-Till & 2.5 gal Planter	29.4	11.9%	52.0
Control (0 gal)	28.4	11.7%	51.5
5 gal Strip-Till Only	28.3	11.8%	50.0
Average	**30.1**	**11.9%**	**50.6**
LSD 0.05	N.S		N.S
LSD 0.20	N.S		N.S
P-value	0.7992		0.5643

[a]Yield adjusted to 14% moisture and hybrids are ranked by yield. There were no significant differences in this study.

Planter Applied Zinc Fertilizer in Grain Sorghum Trial

Zane Jenkins and Perry Jones

Introduction:

Liquid zinc (Zn) is often used for in-furrow fertilizer in corn in both dryland and irrigated systems, as producers have reported a positive yield response when mixing Zn with their liquid phosphorus fertilizer. For this reason, the Plainsman Research Center wanted to see if there would be any differences in grain yield in grain sorghum. We also sought to see if there would be a difference between responses to different forms of commercially available liquid zinc fertilizers when applied in-furrow as part of a blend with 10-34-0.

Materials and Methods:

Plots consisted of 20’ wide strips planted with John Deere 7300 Vacuum Planter on June 12th, 2024, into a no-till field, with each treatment having two replications. This year, there were three commercial liquid zinc fertilizers: 10% Ammoniated Zinc, Kickstand® 9Zn by Helena, and Levesol® Zn by CHS Inc. All zinc fertilizers were blended into 10-34-0 the day of planting and applied at 1 qt/acre product and 4.75 gal/acre of 10-34-0 (5 gal/acre total fertilizer). All plots were planted at 34,000 seed/acre using Dyna-Gro M60GB20DT. Nitrogen fertility was supplied via a pre-plant broadcast of 32-0-0. Herbicide was applied pre-plant and post emergence as needed to control weeds. Plots were harvested on December 12th with a self-propelled combine equipped with a HarvestMaster H2 Grain Gauge to measure plot weight, grain test weight, and moisture at harvest time. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

No statistical difference was found in either grain yield or test weight between treatments, with the plots averaging 13.46 bu/acre (see Table 20). We believe the low yield resulted from intense weed pressure, stress during pollination, and the previous history of the field being a part of a kochia management study. This test needs to be repeated in 2025 to see if comparable results are observed under better conditions.

Table 20. Liquid Zinc Fertilizer in Dryland Grain Sorghum Study

Zinc Fertilizer Treatment	Grain Yield[a] (bu/ac)	% of Average Yield	Test Weight	Moisture at harvest
Levesol® Zn (EDDHA & EDTA)	14.5	108%	**60.6**	13.9%
10% Ammoniated Zinc	13.5	100%	**60.4**	14.0%
Kickstand® 9Zn (ETDA)	12.4	92%	**60.4**	13.9%
Average	**13.5**		**60.5**	**13.9%**
LSD 0.05[b]	N.S		N.S	
LSD 0.20	N.S		N.S	
P-value	**0.293**		**0.679**	

[a]Yield adjusted to 14% moisture and hybrids are ranked by yield. There were no significant differences in this study, this year.
[b]Researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are the same).
Note: Each treatment consisted of 1 qt/acre blended into the planter applied 10-34-0 Special thank you to Mark Heiz of CHS Inc. & Bryce Vance of Helena Agri-Enterprise for providing materials for this study.

Site Information
Collaborator: Plainsman Research Center: (Zane Jenkins & Perry Jones)
Planting Date: 6/12/24
Harvest Date: 12/14/24
Fertility:
Preplant Broadcast: 50-0-0 as 32-0-0
Planter Applied: 5-20-0 as 10-34-0
Pesticides
Pre-Plant Herbicide: 23 oz Makaze, 13.2 oz Strellius II, 2 oz Argos, 1.33 oz Sharpen, 4.33 oz Staredown, 21 oz Atrazine 4L
Post Emergence Herbicide: 16 oz Huskie, 16 oz Atrazine 4L
Post Emergence Herbicide: 10 oz First Act.
Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64”, Sep 1.66", October 0.00") Soil Type: Wiley loam
Hybrid Planted: Dyna-Gro M60GB20DT
Planting Rate: 34,000 seed/acre

Dryland Proso Millet and Wheat Rotations

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

This was the 18th cropping year for our dryland millet and wheat rotation study. We established these rotations to identify which millet, wheat, and fallow rotation sequences would be the most productive in a dryland cropping system. Each rotation represents a different fallow length. We began this dryland rotation study with these six rotations in 2006: 1) Wheat-Fallow (15-month fallow period), 2) Wheat-Wheat (3-month fallow period), 3) Millet-Millet (8-month fallow period), 4) Wheat-Millet-Fallow (23-month fallow period, 11 months between wheat harvest and millet planting, and 12 months between millet harvest and wheat planting), 5) Millet/Wheat-Fallow, (no fallow between millet harvest and wheat planting and 11 months between wheat harvest and millet planting), and 6) Wheat/Millet-Fallow (no fallow between wheat harvest and millet planting, and 11 months between millet harvest and wheat planting). The 2024 wheat will be the last harvest in this experiment as we have decided to conclude this experiment, and no millet was planted in 2024.

Materials and Methods:

This was our 18th growing seasons for the following rotations: Wheat-Fallow (WF), Wheat- Wheat (W-W), Wheat-Millet-Fallow (W-M-F), Millet/Wheat-Fallow (M/WF), and Wheat/Millet-Fallow (W/M-F). We planted winter wheat, Avery, at 50 lb/acre on September 30th, 2023. We applied 50 lb of N/acre to the study site before planting. Plots were harvested using a modified Gleaner F3 combine equipped with HarvestMaster H2 grain weighing and seed moisture system. Grain yields were adjusted to 12% moisture content for the wheat. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There was no statistical difference between wheat yields or test weight between crop rotation systems in this year’s wheat phase of the trial (see Table 21). This shows producers' ability to capitalize on favorable conditions to maximize profitability by reducing fallow periods between crops. After eighteen years, we believe it is best to conclude this study.

Table 21. 2024 Dryland Wheat Results within Different Wheat-Millet Rotations

Treatment	Grain Yield (bu/ac)	Moisture (%)	Test Weight (lb/bu)
M/WF	25.9	9.8%	60.2
WF	24.5	9.9%	59.3
W/M-F	24.4	10.2%	61.0
W-W	15.8	9.6%	59.8
W-M-F	11.8	14.7%	57.3
Average	**20.5**	**10.8%**	**59.5**
LSD 0.05	N.S		N.S
LSD 0.20	N.S		N.S
P-value	0.5891		0.4178

Table 22. 2024 Wheat Yields and Test Weights from the Use of Herbicide and Tillage for the Control of Kochia Trial

Treatment	Grain Yield (bu/ac)	Test Weight (lb/bu)	Moisture (%)
6 oz Mesotrione + 0.75 lb Atrazine	26.4	60.5	9.7%
Tillage + 16 oz Dicamba + 0.75lb Atrazine	21.6	59.9	9.7%
3 oz Flumioxine	19.8	59.6	9.5%
16 oz Dicamba + 0.75 lb Atrazine	18.3	59.9	10.0%
Average	**21.5**	**59.9**	**9.7%**
LSD 0.05	N.S	N.S	
LSD 0.20	N.S	N.S	
P-value	0.4800	0.5120	

The Use of Herbicide and Tillage for the Control of Kochia in Wheat-Sorghum-Fallow

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction

Kochia (*Kochia scoparia*) is an introduced plant that was initially grown as an ornamental but has become a pervasive weed in many cultivated fields. Soon after acetolactate synthase (ALS) inhibitors were first registered for long-term broadleaf control in cereal crops, kochia developed resistance to these sulfonylurea herbicides. In recent years, some kochia populations have become resistant to glyphosate. Continual dependence on glyphosate for broad-spectrum weed control has led to kochia becoming resistant. Since kochia has become challenging to control with glyphosate, we conducted this study to investigate alternative kochia controlling herbicides and practices. After the harvest of 2024, we decided to conclude this study, and no grain sorghum was planted.

Materials and Methods

We conducted this dryland Wheat-Sorghum-Fallow rotation study at the Plainsman Research Center. Plots consisted of two 20’ by 1050’ strips per treatment. The kochia population on this site became glyphosate resistant after extensive reliance on glyphosate for weed control for the 10-year duration of the no-till Wheat-Sunflower-Fallow rotation study. The kochia-controlling treatments prior to wheat in 2024 were: 1) flumioxazin 3.0 oz/acre; 2) mesotrione 6 oz/acre and atrazine 0.75 lb/acre; 3) dicamba 16 oz/acre and atrazine 0.75 lb/acre; and 4) dicamba 16 oz/acre and atrazine 0.75 lb/acre plus a single sweep plow tillage operation. The application date for the treatments before wheat was March 14th, 2023, for herbicide treatments and May 26th, 2023, for the sweep plow treatment. We planted wheat, Avery, at 50 lb of seed/acre on September 30th, 2023. For fertilization, we surface-broadcast 60 lb of nitrogen. We applied 50 units of N/acre preplant to the entire site and in-furrow at planting 10-34-0 at 5 gal/acre with the single disk drill used to plant the wheat. Plots were harvested using a modified Gleaner F3 combine equipped with a HarvestMaster H2 weighing and seed moisture system. Grain yields were adjusted to 12.0% seed moisture content for the wheat. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There was no statistical difference in grain yield or wheat test weight between the treatments (see Table 22). This study has run its course and provided helpful information to local producers and to the staff of the Plainsman Research Center.

Four Year (WCMF) vs Three Year Rotation (WSF)

Zane Jenkins, Kevin Larson, Brett Pettinger, & Perry Jones

Introduction:

This experiment has its roots in two studies conducted by fellow Colorado State University researchers in both both Anderson et al. (1999) and Anderson (2005). Anderson saw differences in overall productivity and weed control between traditional wheat-fallow (WF) and multi-year crop rotations such as Wheat-Sorghum-Fallow (WSF) and Wheat-Corn-Millet-Fallow (WCMF). He tested rotations of one cool-season crop followed by one warm-season crop (such as winter wheat-millet) compared to four-year rotations of two cool-season crops followed by two warm season crops. He found over multiple rotation cycles that weeds increased in the rotations of one cool-season crop followed by one warm-season crop, and weeds declined in the rotations of two cool-season crops followed by two warm-season crops.

Because of the reduction in weeds and associated weed control savings, Anderson (2005) recommended using rotations of two cool-season crops followed by two warm season crops, such as WCMF (Anderson considers fallow as a cool-season or warm-season crop alternative). After growers read of the potential production and weed control savings by switching to rotations of two cool crops and two warm crops, they suggested we conduct a study to investigate if the WCMF rotation would provide more income than our well-adapted WSF rotation.

This is the eighth cropping year for our dryland WCMF and WSF rotation comparison study. To make rotation comparisons every year, we planted all phases of the rotations. For example, each crop (including fallow) of the WCMF rotation is present yearly. Each year, there are four study plots for the W-C-M-F rotation: one plot of wheat, one plot of corn, one plot of millet, and one plot of fallow. We can compare multi-year rotations by having all rotation phases each year.

Materials and Methods:

All plots are planted into Wiley Loam soil with precipitation measured from planting to first freeze (October 16th, 2024) (see Table 38). We planted proso millet, Huntsman, at 10 lb/acre on June 11th, 2024, grain sorghum, Dyna-Gro M60GB20DT, at 34,000 seeds/acre on June 10th, 2024, and corn, Golden Harvest G10L16-DV, at 12,500 seeds/acre on May 15th. We planted wheat, Avery, at 50 lb/acre on September 30^{th,} 2023. We applied 60 lb/acre of N to the study site before planting, and all received 5 gal/acre of 10-34-0 at planting. Herbicides were applied to plots preplant, and post emergence as needed to control weed pressure within plots (see Table 23). We harvested the crops with a modified Gleaner F3 combine equipped with a HarvestMaster H2 weighing and seed moisture system. We used moisture-adjusted

weighing and seed moisture system. We used moisture-adjusted grain yields for comparisons: wheat, 12%; millet, 12 %; grain sorghum, 14%; and corn, 15.5%. We recorded production costs and yields to determine rotation revenues. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There were no significant differences in grain yield between the wheat in the WCMF and WSF systems for the 2024 season. It is important to test if there are differences in the one common crop between the rotations as an indicator of the system's productivity. Wheat grain yield between the two rotations averaged 34.58 bu/acre, the most productive of all the crops in this growing season. Grain yields of all three other crops being tested were well below historic averages due to environmental factors during the summer growing season. This, along with less-than-desirable grain prices, resulted in all phases of the rotations outside of the wheat being unprofitable based on the returns gained through grain sales compared to input costs (see Table 24). We will continue these rotation experiments as we advance to see if improved yields and grain prices will result in different outcomes.

Literature Cited

Anderson, R.L., R.A. Bowman, D.C. Nielsen, M.F. Vigil, R.M. Aiken, and J.G. Benjamin. 1999. Alternative crop rotations for the central Great Plains. J. Prod. Agric. 12:95-99.

Anderson, R.L. 2005. A multi-tactic approach to manage weed population dynamics in crop rotations. Agron. J. 97:1579-1583.

Table 23. 2024 Moisture Adjusted Grain Yields of All Crops in the WSF & WCMF

Grain Yield (bu/ac)

	Wheat	Grain Sorghum	Millet	Corn
WSF	34.5	4.4	-	-
WCMF	34.7	-	15.1	13.7
Average	**34.6**	**4.4**	**15.1**	**13.7**
LSD 0.05	N.S			
LSD 0.20	N.S			
P-value	0.9777			

Table 24. Economic Results of Growing Each Crop in the WSF & WCMF Study During 2024

WMCF and WSF Rotation Comparison Study, Walsh, 2024.

	Seeding Rate per acre	Seeding Cost per acre	Herbicide Cost per acre	Fertilizer Cost per acre	Grain Yield (bu/ac)	Price per bushel	Gross Income per acre	Variable Net Income per acre
Wheat								
WCMF	50 lbs.	$10.83	$22.14	$52.61	34.7	$5.00	$173.45	$ 87.87
WSF	50 lbs.	$10.83	$22.14	$52.61	34.5	$5.00	$172.30	$ 86.72
Corn								
WMCF	12,500 seeds	$42.97	$70.84	$52.97	13.67	$4.43	$60.56	$(106.22)
Millet								
WMCF	10 lbs.	$1.80	$23.30	$50.99	15.1	$4.50	$68.09	$ (8.00)
Grain Sorghum								
WSF	34,000 seeds	$19.21	$54.52	$50.99	4.4	$4.02	$17.53	$(107.19)
Fallow	---	---	$45.48	---	---	---	$ (45.48)	$ (45.48)
Average		**$17.13**	**$39.74**	**$52.03**			**$74.41**	**$(15.38)**

Comparison of Three-Year Cropping Systems

Zane Jenkins, Kevin Larson, Brett Pettinger, & Perry Jones

Introduction:

These rotations studies are part of the long-term evaluation of different crop rotation systems and can be seen as a sister study to the Wheat Corn Millet Fallow vs Wheat Sorghum Fallow (WSF) study discussed previously. This year, we compared the following rotations: WSF, Wheat Corn Fallow (WCF), Sorghum Millet Sorghum (SMS), and the final rotation, Wheat Double Crop Millet Fallow (W/M-F) that was added in 2006. All plots were planted into Wiley loam soil with precipitation measured from planting to first freeze (October 16th, 2024) (see Table 38).

Materials and Methods:

We planted proso millet, Huntsman, at 10 lb/acre on June 11th, 2024; grain sorghum, Dyna-Gro M60GB20DT, at 34,000 seeds/acre on June 10th, 2024; and corn, Golden Harvest G10L16-DV, at 12,500 seeds/acre on May 15th. We planted wheat, Avery, at 50 lb/ac on September 30th, 2023. We applied 60 lb/acre of N to the study site before planting, and all received five gal/ac of 10-34-0 at planting. Herbicides were applied to plots preplant, and post emergence as needed to control weed pressure within plots (see Table 38). We harvested crops with a modified Gleaner F3 combine equipped with a HarvestMaster H2 weighing and seed moisture system. We used moisture-adjusted grain yields for comparisons: wheat, 12%; millet, 12 %; grain sorghum, 14%; and corn, 15.5%. We recorded production costs and yields to determine rotation revenues. LSD and P-Values were generated using a Generalized linear model in SAS 9.4.

Results and Discussion:

There were no significant differences in grain yield between the wheat or grain sorghum in which both crops were present for the 2024 season. It is important to test if there are differences in these common crops across the rotations as an indicator of the system's productivity. Wheat grain yield average of the three rotations was 39.3 bu/acre, the most productive of all the crops in this growing season. The grain yields of all three other crops being tested were low due to poor growing conditions during the summer growing season. This, along with less than desirable grain prices, resulted in all phases of the rotations outside of wheat being unprofitable based on the returns

gained through grain sales compared to input costs (see Table 26). Going forward, we will continue these rotation experiments to see if improved yields and grain prices will result in different outcomes. This will also be the last year for the M/WF rotation as we have found the double crop millet too unreliable under dryland conditions t. We will, however, be looking for alternative crop rotations to fill this area and be evaluated.

Table 25. 2024 Moisture Adjusted Grain Yields across Different Crop Rotations

Rotations- Grain Yield (bu/ac)

	Wheat	Grain Sorghum	Millet	Corn
SMS	-	5.0	10.5	-
WSF	39.0	6.2	-	-
WCF	45.0	-	-	15.6
M/WF	34.0	-	-	-
Average	**39.3**	**5.6**	**10.5**	**15.6**
LSD 0.05	N.S	N.S		
LSD 0.20	N.S	N.S		
P-Value	0.5834	0.8282		

Table 26. Economics Results of Growing Each Crop Across Crop Rotations During 2024

Three Year Crop Rotation Comparison Study, Walsh, 2024

	Seeding Rate per acre	Seeding cost	Herbicide Cost	Fertilizer Cost	Grain Yield	Price per bushel	Gross Income	Variable Net Income
Wheat								
WCF	50 lbs.	$ 10.83	$ 22.14	$ 52.61	44.95	$ 5.00	$ 224.75	$ 139.17
WSF	50 lbs.	$ 10.83	$ 22.14	$ 52.61	39.04	$ 5.00	$ 195.20	$ 109.62
M/WF	50 lbs.	$ 10.83	$ 22.14	$ 52.61	33.99	$ 5.00	$ 169.95	$ 84.37
Corn								
WCF	12,500 seeds	$ 42.97	$ 70.84	$ 52.97	15.61	$ 4.43	$ 69.15	$ (97.63)
Millet								
WMCF	10 lbs.	$ 1.80	$ 23.30	$ 50.99	10.46	$ 4.50	$ 47.07	$ (29.02)
Grain Sorghum								
WSF	34,000 seeds	$ 19.21	$ 54.52	$ 50.99	6.21	$ 4.02	$ 24.96	$ (99.76)
SMS	34,000 seeds	$ 19.21	$ 54.52	$ 50.99	5.02	$ 4.02	$ 20.18	$ (104.54)
Fallow	---	---	$ 45.48	---	---	---	$ (45.48)	$ (45.48)
Average		**$ 16.53**	**$ 39.39**	**$ 51.97**				**$ (4.81)**

Comparison of Twin Row vs Traditional Row Spacing in Wheat and Grain Sorghum

Kevin Larson, Brett Pettinger, Zane Jenkins, & Perry Jones

Introduction:

The origins of this study trace back to a wheat spacing done by the Plainsman Research Center in the past and has now evolved to become a stand-alone study to investigate the effects of the use of a twin-row planter with both wheat and grain sorghum, and also the impacts of this equipment when integrated into a no-till cropping system.

Materials and Methods:

For our row spacing and crop sequencing treatments in a Wheat-Sorghum-Fallow (WSF) rotation, we tested three-row spacing arrangements: 1) twin 7.5 in. rows of wheat followed by twin 7.5 in. rows of grain sorghum planted in the unplanted areas (22.5 in. gaps) between the twin-row wheat stubble, (Twin W: Twin GS); 2) twin 7.5 in. rows of wheat followed by single uniformly spaced 30 in. rows of grain sorghum planted between the twin rows and in the unplanted areas (22.5 in. gaps) between the wheat stubble, (Twin W: Single GS); and 3) single uniformly spaced 10 in. rows of wheat followed by single uniformly spaced 30 in. rows of grain sorghum planted in the single uniformly spaced 10 in. rows of wheat stubble, (Single W: Single GS). All plots were planted into a Wiley loam soil with precipitation measured from planting to first freeze (see Table 38). Herbicides were applied preplant and post emergence as needed to control weeds
(see Table 38). We applied 60 lb/ac of N to the study site preplant. We used our fabricated 20 ft, double disc, twin-row planter with eight sets of 7.5 in. twin rows for the twin-row planting. For the uniform 10 in. spacing single-row wheat planting, we used a 20 ft John Deere 1590 single disc drill with 10 in. spacing. For the uniform 30 in. spacing single-row grain sorghum planting, we used a 20 ft John Deere 7300 vacuum planter with eight rows spaced 30 in. apart. This is the sixth year we harvested grain crops from established rotations for complete row-spacing interactions. We planted Avery wheat at 50 lb/acre on September 30th, 2023, for the single disk, 10 in., and for the twin, 7.5 in. treatment. We planted grain sorghum, Dyna Gro M60GB20DT, at 34,000 seeds/acre on June 10th for single, 30 in. and at 40,000 seeds/acre on Jun 12th for twin, 7.5 in. treatments. We harvested the wheat crop on July 11th and the grain sorghum crop on December 14th with a self propelled combine equipped with a HarvestMaster H2 automated grain weighing system. We used 12% for wheat and 14% for grain sorghum for moisture-adjusted grain yield.

LSDs and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There was no significant difference in grain yield or test weight in wheat or grain sorghum between planter combinations (see Table 27 and Table 28). Next year, we will integrate all these plots into a fall strip-tilled field for the grain sorghum phase of this experiment to see if that would improve seeding depth compared to no-till. The 2025-2026 wheat phase was drilled into a no-till environment.

Table 27. 2024 Wheat Grain Yields Across Cropping Systems

Wheat Yields

Treatment	Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)
Traditional Spacing WSF	48.2	59.2	9.7%
Twin Row Wheat - Twin Row Sorghum	35.5	58.9	9.8%
Twin Row Wheat - Single Row Sorghum	28.6	57.5	9.8%
Average	**37.4**	**58.5**	**9.8%**
LSD 0.20	N.S	0.9076	
LSD 0.05	N.S	N.S	
P-value	0.426	0.1257	

[a]Grain yields adjusted to 12% moisture

Table 28. 2024 Grain Sorghum Grain Yields Across Cropping Systems

Grain Sorghum Yields

Treatment	Yield[a] (bu/ac)	Test Weight (lbs./bu)	Moisture (%)
Twin Wheat- Single Row Sorghum	15.5	60.1	11.8%
Single Row Wheat- Twin Row Sorghum	10.4	60.4	12.2%
Traditional Spacing WSF	9.2	60.1	11.9%
Average	**11.7**	**60.2**	**11.9%**
LSD 0.20	N.S	N.S	
LSD 0.05	N.S	N.S	
P-Value	0.856	0.7972	

[a]Grain yields adjusted to 14% moisture

Comparison of Strip-Till and No-Till Production in Dryland Grain Sorghum

Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

The predominant planting system for irrigated row crop production is strip-till, while in dryland row crop production, it is no-till. The main advantages of no-till are that it causes the least disruption of residue from the previous crop and conserves more soil and water than strip-till or conventional tillage. However, no-till requires using either liquid or dry fertilizer broadcast on the field surface. Strip-till allows the use of NH_3, a less expensive option for nitrogen fertilizer, and allows deeper placement of phosphate fertilizer in a concentrated band.

Materials and Methods:

All treatments had two replicated strips 20' by 1150' planted into wheat stubble from the 2023 wheat crop. For the strip-till treatment, we applied NH_3 at 60 lb N/acre and 10-34-0 at 5 gal/acre in eight, 30 in. rows to a depth of 8 in. during the fall of 2023. For the no-till treatments, we surface applied liquid 32-0-0 in streams 20 in. apart at the same 60 lb of N/acre rate during the fall of 2023. For the no-till treatment, 10-34-0 was applied at 5 gal/acre when planting in-furrow. We planted the strip-till and no-till treatment using Pioneer 86P20 at 34,000 seeds/acre on June 3rd, 2024, eight, 30 in. rows using a John Deere 7300 vacuum planter. Herbicide was applied as needed pre-plant and post emergence as necessary to control weed pressure (see Table 28). We harvested grain sorghum plots on November 16th with a Case-IH 2388 combine using a modified corn head with ARRO conversions and weighed them using a digital scale cart owned by the Plainsman Research Center. Grain samples were collected for seed moistures and test weights using a John Deere SW30300 handheld tester. Grain yields were adjusted to 14% seed moisture content. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

There were no statistical differences between the grain yields (P-value = 0.9015) achieved by the no-till compared to the strip-tilled grain sorghum in this year's trial. There was, however, a difference in test weight at the LSD 0.20 level (P-value 0.1392). This continues to show that both systems can be productive under dryland conditions.

Table 29. 2024 Grain Sorghum Results by Tillage Systems

Treatment	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)
No Till	47.3	55.5	13.0%
Strip-Till	45.4	56.4	12.9%
Average	**46.4**	**55.9**	**12.9%**
LSD 0.05	N.S	N.S	
LSD 0.20	N.S	0.6155	
P-value	0.9015	0.1392	

[a]Yield adjusted to 14% moisture and hybrids are ranked by yield. Yields and Test Weights in bold are in the top LSD (0.20) and are not significantly different.

Location: Plainsman Research Center

Planting Date: 6/3/24

Harvest Date: 11/16/24

Fertility:

65-20-0 Strip-Till

60-0-0 Fall Preplant and 5-20-0 Planter Applied No-Till & Drilled

Pesticides Used:

Preplant: 32 oz Makaze, 21 oz Moccasin II, 5 oz Carabiner, 1.1 lb Atrazine 90WDG, 6.4 oz Staredown

Post-Emerge: 16 oz Huskie, 16 oz Atrazine 4L

Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64”, Sep 1.66", Oct 0.00")

Soil Type: Wiley loam

Hybrid Planted: Pioneer 86P20

Planting rate: 34,000seeds/acre

John Deere 7300 Vacuum Planter

Evaluation of Vacuum Planter and Single Disk Drill in Grain Sorghum

Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

In the Southern High Plains, the predominant planting equipment for no-till production of grain sorghum is either vacuum planters or drills such as single disk drills. Both have advantages and disadvantages, but we at the Plainsman Research Center wanted to test the productivity of these planters.

Materials and Methods:

All treatments had two replicated strips 20’ by 1150’ planted into no-till wheat stubble from the 2023 wheat crop. We planted Pioneer 86P20 at 34,000 seeds/acre on June 3rd, 2024, using a John Deere 7300 vacuum planter with 30” row spacing. The drilled treatments were planted the same day using a John Deere 1590 Single Disk Drill with 10" spacing at an estimated 79,000 seed/acre of Pioneer 86P20. Herbicide was applied as needed.
(see Table 30). Grain sorghum plots were harvested on November 16th with a Case-IH 2388 combine using either a modified corn head with ARRO for the plots on 30” spacing for the vacuum planter plots and a flex head for the drilled plots. Plots were weighed using a digital scale cart, and grain samples were collected for seed moisture and test weights using a John Deere SW30300 handheld tester. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

Grain yields between the grain sorghum drilled vs planted with the vacuum planter showed a statistical difference (P-value 0.0214). At the same time, there was no statistical difference in test weight between the planter types (P-value 0.7952). Part of the yield difference was due to the inability of our flex header to thoroughly pick up lodged plants in the drilled grain sorghum plots. It is doubtful that this problem alone would made up the difference in grain yield between treatments, but it is important to highlight some of the challenges that can occur in narrower row spacing systems. Espcially after the crop experiences high stress levels during the growing season.

Table 30. 2024 Grain Sorghum Results by Planter Type

Planter Type	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)
Vacuum Planter	**47.3**	55.5	13.0%
Single Disk Drill	23.8	55.8	13.5%
Average	**35.5**	**55.6**	**13.3%**
LSD 0.05	10.049	N.S	
LSD 0.20	2.4339	N.S	
P-value	0.0214	0.7952	

[a]Yield adjusted to 14% moisture. Yield in bold is significantly different.
Location: Plainsman Research Center
Planting Date: 6/3/24
Harvest Date: 11/16/24
Fertility: 60-0-0 Fall Preplant and 5-20-0 Planter Applied No-Till & Drilled
Pesticides Used:
Preplant: 32 oz Makaze, 21 oz Moccasin II, 5 oz Carabiner, 1.1 lb Atrazine 90WDG, 6.4 oz Staredown
Post-Emergence: 16 oz Huskie, 16 oz Atrazine 4L
Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64", Sep 1.66", Oct 0.00")
Soil Type: Wiley loam
Hybrid Planted: Pioneer 86P20
Planting rate: 34,000seeds/acre Vaccuum Planter; Drilled 79,000 seeds/acre
Planters: John Deere 1590 Drill; John Deere 7300 Vacuum Planter

Effects of Planting Proximity to Strip-Till Zone on Dryland Grain Sorghum

Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

Many producers have begun using strip-till equipment in dryland conditions to more efficiently and cost-effectively band fertility for row crops such as grain sorghum. However, some producers have been concerned about the drying effect caused by the tillage operation that created the seed bed. This drying effect can result in poor stands during dry conditions at planting time, so planting into a no-till system might be more desirable. In this study, we set out to see if it is possible to capitalize on the capability of strip-till systems to band fertility while planting into a no-till zone between the created strips and contrast how it compares to grain sorghum planted into the seedbed created by the strip-till operation.

Materials and Methods:

We planted two replicated strips 20’ by 1150’ into a Wiley loam soil in which the previous crop was wheat. For the strip-till treatment, we applied anhydrous N at 60 lb N/ acre and 10-34-0 at 5 gal/acre in eight 30 in. rows to a depth of 8 in. in the fall of 2023. Pioneer 86P20 was planted at 34,000 seeds/acre on June 3rd, 2024, with a John Deere vacuum planter with eight 30 in. rows on the strip-till zone (On Zone treatment) and eight in. beside the strip-till zone (Off Zone treatment). Herbicide was applied preplant and post emergence to control weeds with the plot as needed (see Table 31). We harvested grain sorghum plots on November 16th with a Case-IH 2388 combine using a modified corn head with ARRO conversions and weighed them using a digital scale cart owned by the Plainsman Research Center. Grain samples were collected for seed moistures and test weights using a John Deere SW30300 handheld tester. Grain yields were adjusted to 14% seed moisture content. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results:

This year’s proximity to the strip-till zone showed differences between the On vs. Off strip zone planted differences at the LSD 0.20 level (P-value = 0.1154) in grain yield and no statistical differences in test weight (P-value= 0.489). The on-strip grain sorghum yielded 42.30 bu/acre, while the off-strip planted grain sorghum yielded 40.96 bu/acre. This result is the inverse of the last two years' results where the off-strip yielded more than the on-strip treatment (41.1 bu/acre off strip vs. 38.4 bu/acre on the strip in 2023 and 81.9 off strip vs. 65.1 bu/acre on the strip in 2022). We will continue repeating this study in 2025 to see if there is a difference between these treatments after this wet fall and winter.

Table 31. 2024 Grain Sorghum Results by Proximity to Strip-Till Zone

Planting Proximity	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	moisture (%)
On Strip	**42.3**	55.6	13.0%
8" Off Strip	41.0	56.3	12.6%
Average	**41.6**	**55.9**	**12.8%**
LSD 0.05	N.S	N.S	
LSD 0.20	0.7566	N.S	
P-value	0.1154	0.4890	

[a]Yield adjusted to 14% moisture and hybrids are ranked by yield. Yield in bold is significantly different.

Location: Plainsman Research Center

Planting Date: 6/3/24

Harvest Date: 11/16/24

Fertility: Fall Strip-Till 65-20-0

Pesticides Used:

Preplant: 32 oz Makaze, 21 oz Moccasin II, 5 oz Carabiner, 1.1 lb Atrazine 90WDG, 6.4 oz Staredown

Post-Emergence: 16 oz Huskie, 16 oz Atrazine 4L

Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64", Sep 1.66", Oct 0.00")

Soil Type: Wiley loam

Hybrid Planted: Pioneer 86P20

Planting rate: 34,000seed/acre

Cover Crops in Wheat-Fallow and Wheat-Sorghum-Fallow as an Alternative to Fallow

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

One of the Natural Resource Conservation Service's (NRCS) current focuses is on cover crops and their effects on soil health. Much of this recent work with cover crops is from much higher precipitation areas across the country than Southeast Colorado. Only a few cover crop studies have been conducted on dryland rotations in low moisture, high evaporation climates such as we experience in our region, and the reports from these dryland cover crop studies have been less than favorable (Larson, 1995; Schlegel and Havlin, 1997; Vigil and Nielsen, 1998). We began this study to measure the effects of cover crops on yields of standard dryland crop rotations in our semi-arid climate, where water conservation is the key to successful dryland crop production.

Materials and Methods:

We tested cover crops and N rates in two standard crop rotations: Wheat Fallow (WF) and Wheat Sorghum Fallow (WSF) on the plot fields on SW quarter section 18 township 30 range 43 of Baca County in a Wiley loam soil. Our treatments for this cover crop study were four spring and four winter cover crops, three N rates, and two crop rotations (see Table 32). All cover crop seeds were from Green Cover Seed in Bladen, Nebraska, and planted at recommended rates (see Table 31). Our three N rates were 0, 25, and 50 lb/acre stream applied as 28-0-0 or 32-0-0 preplant. No N was applied to plots that had cover crops in their rotation. After establishing the rotations, all phases of each rotation were present each year. Herbicide was applied as needed to terminate cover crops and to control weeds both preplant and post emergence in plots. After the wheat harvest, we planted the WF winter cover crops on September 19th, 2023. This winter cover crop was terminated on June 4th, 2024. For the wheat phase of the WSF rotation, we planted the spring cover crops in the WSF rotation on March 29th, 2024, during the fallow period after the sorghum harvest. Biomass samples were gathered from a 1’x1’ area before termination. We terminated the spring cover crops on May 5th, 2024, and planted wheat into the residue that will be a part of the 2026 annual report. We planted the winter cover crops before sorghum planting in the WSF rotation on September 19th, 2023, into wheat stubble. This winter cover crop was terminated on June 4th, 2024. We seeded Avery wheat at 50 lb/acre of seed with 5 gal/acre of 10-34-0 applied to all treatments on September 30th. For the grain sorghum plots, we planted Dyna-Gro M60GB20DT at 34,000 seeds/acre on June 10th, 2024, and in-furrow applied 5 gal/acre 10-34-0 at planting to all treatments.

Wheat was harvested in the WF and WSF rotations on July 12th, 2024. We harvested the WSF grain sorghum on December 12th, 2024, with a modified Gleaner F3 combine equipped with a HarvestMaster H2 weighing and seed moisture system. Grain yields were adjusted to 12% seed moisture content for wheat and 14% seed moisture content for grain sorghum. Results will be grouped by crop rotation (WF and WSF), and LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There were no significant differences in either grain yield or test weight of the wheat between any of the treatments in either the WF (P-value = 0.5699) or the WSF (P-value = 0.9900) (see Table 32). This is likely the result of above-average precipitation received in the months after cover crop termination and adequate snowfall received during the dormancy period of this year's wheat.

There was, however, a statistical difference in grain sorghum yields between the treatments (P-value = 0.0002). This difference can be seen as a difference between all the treatments within the nitrogen rate component compared to all the treatments of the cover crop component of this study (see Table 33). We could not gather test weight data from any of the plots following cover crops due to low yields that prevented the HarvestMaster from gather an adequate sample (see Table 33). This is likely the result of a later-than-normal cover crop termination for this trial, compounded by the stresses experienced during the growing season compared to years past. Cover crop termination date varies across climatic regions, with some areas of the U.S. planting green into growing or recently terminated cover crops to provide a constant host to microorganisms living within the soil in the form of plant roots. However, this is not a recommended management strategy in our area, and cover crops should be terminated earlier in the season before planting. We will be continuing this study into 2025.

Literature Cited

Larson, K. J., 1995. Legumes for cover and N in Wheat-Fallow and continuous grain sorghum at Walsh, 1993-94. *In*: Plainsman Research Center, 1994 Research Results, Larson, et al. CAES, CE, CSU, Fort Collins, Colorado.

Schlegel, Alan J. and John L. Havlin. 1997. Green fallow for the Central Great Plains. Agron. J. 89:762-767.

Vigil, Merle F. and David C. Nielsen. 1998. Winter wheat depression from legume green fallow. Agron. J. 90:727-734.

Table 32. Wheat Results WF & WSF Following Winter Cover Crops and by Nitrogen Rate

Wheat Yields in WSF Rotations

Treatment	Yield[a]	Test Weight	Moisture
0N	40.0	59.4	9.4%
25N	40.0	59.7	9.7%
50N	33.6	59.3	9.6%
Broadleaf	35.3	59.5	9.7%
Grass	38.7	59.4	9.9%
Legume	38.1	60.1	9.8%
Mix	34.8	59.6	9.8%
Average	37.2	59.6	9.7%
LSD 0.05	N.S	N.S	
LSD 0.20	N.S	N.S	
P-Value	0.9900	0.2500	

Wheat Yields in WF Rotations

Treatment	Grain Yield[a]	Test Weight	Moisture
0N	61.4	61.1	10.2%
25N	58.5	61.3	10.2%
50N	56.2	61.4	10.4%
Broadleaf	55.4	60.6	10.1%
Grass	46.9	60.1	9.9%
Legume	59.5	60.2	10.0%
Mix	49.7	59.9	9.7%
Average	55.4	60.6	10.1%
LSD 0.05	N.S	0.615	
LSD 0.20	N.S	0.383	
P-Value	0.5699	0.0007	

[a]Grain yield is adjusted to 12% moisture for both WF and WSF
Location: Plainsman Research Center SW 18-30-43
Planting Date: 9/30/23
Harvest Date: 7/12/24

Fertility:

Nitrogen cost $0.54 per Unit
Planter Applied: 5-20-0 as 10-34-0

Pesticides Used:

Pre-Plant: 32 oz Makaze, 6.4 oz Staredown, 16 oz LV6, 8 oz Dicamba, 1 qt/100 gal NIS, 1.7 lb/acre AMS

Precipitation: 12.74" total (Sept 0.00", Oct 4.24", Nov 0.30", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20", April 0.09", May 2.98", June 1.70")
Soil Type: Wiley loam
Variety Planted: Avery
Planting rate: 50 lbs./seed

Table 33. Grain Sorghum Yields in WSF Following Winter Cover Crops and by Nitrogen Rate

Treatment	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)
25N	**24.3**	59.6	11.8%
0N	**22.8**	59.2	11.8%
50N	**22.0**	59.9	11.6%
mix	1.0	-	11.2%
broadleaf	0.9	-	11.3%
grass	0.6	-	11.4%
legume	0.3	-	11.4%
Average	**11.8**	**59.6**	**11.5%**
LSD 0.05	10.53		
LSD 0.20	6.56		
P-Value	0.0002		

[a]Grain yields adjusted to 14% moisture

Location: Plainsman Research Center SW 18-30-43

Planting Date: 6/10/24

Harvest Date: 12/14/24

Fertility:

Nitrogen $0.65 per Unit

Planter Applied: 5-20-0 as 10-34-0

Pesticides Used:

Preplant: 45 oz Makaze, 20 oz Medal EC, 32 oz Atrazine 4L, 6.4 oz Staredown

Post-Emerge: 10 oz First Act

Post-Emerge: 16 oz Huskie, 16 oz Atrazine 4L

Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64," Sep 1.66", Oct 0.00")

Soil Type: Wiley loam

Hybrid Planted: Dyna-Gro M60GB20DT

Table 34 Recommended Cover Crop Planting Rates by Green Cover Seed

Winter Cover Crop: Planted 9/19/23 Terminated 6/4/24
Seeding Rates: Winter N Mix 60 lb/acre, Hairy Vetch 30 lb/acre, Rapeseed 5 lb/acre, Wheat 50 lb/acre 60 lb/acre Winter N Mix = 26 lb Winter Rye, 20 lb Winter Barley, 5 lb Winter Peas, 17 lb Hairy Vetch, 2 lb Rapeseed, 2 lb Sweet Clover.
Seed Costs: Winter N Mix $45.70/acre, Hairy Vetch $57/acre, Rapeseed $4.75/acre, Wheat $12.50/acre

Spring Cover Crop: Planted 3/29/24 Terminated 5/3/24
Seeding Rates: Spring N Mix 65 lb/acre, Hairy Vetch 30 lb/acre, Rapeseed 5 lb/acre, Oats 60 lb/acre
65 lb/acre Spring N Mix = 15 lb/acre Spring Barley, 10 lb/acre Common Vetch, 15 lb/acre spring forage pea, 15 lb/acre oats, 2 lb/acre rapeseed, 2 lb/acre Nitro Radish, 2 lb/acre Crimson Clover, 3 lb/acre Flax Seeding Cost: Spring N Mix $45.50/acre, Hairy Vetch $57/acre, rapeseed $4.75/acre, Oats $12.60

Table 35 Dry Weight Biomass (lb/acre) Produced by Cover Crop Treatments by Crop Rotation System

	WSF-WCC	WSF-SCC	WF-WCC
Legume	7,693	2,000	11,326
Broadleaf	0	2,039	0
Grass	16,347	3,019	29,809
Mix	15,289	2,423	22,597

Spring Cover Crops in Dryland Corn Compared to Fallow or Continuous Corn

Zane Jenkins & Perry Jones

Introduction:

Beginning in 2020, The Plainsman Research Center began testing the productivity of different cropping rotations focused on dryland corn and how to integrate cover crops into these systems compared to other cropping systems. The three treatments in the study are Continuous Corn (C-C), Corn Fallow Corn (CFC), and Corn Spring Cover Crop Corn (CSCC). This study directly compares the results of having either a cover crop, a fallow period, or a corn crop prior to this year's corn.

Materials and Methods:

Each treatment consists of two replicated plots 20' by 500', with each phase of the crop rotation replicated each year. The Spring N Mix from Green Cover Seed in Bladen, Nebraska, was planted at their recommended rate (see Table 36) on March 29th, 2023, and terminated on July 22nd, 2023. We planted G10L16-DV at 12,500 seeds/acre using a John Deere 7300 Vacuum Planter on May 15th, 2024. To control weeds in the plots, herbicides were applied preplant and postemergence as needed. LSDs and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

Statistical differences in grain yield were observed between the crop rotations in this year's study (P-value = 0.0476). This was seen between the highest yield achieved between the corn following spring cover crop of 20.53 bu/acre and the yield achieved by the continuous corn rotation of 5.60 bu/acre—the difference between CSCC and the CFC rotations (see Table 36). We will be continuing this study in 2025 and are excited to announce that we will be integrating a soil moisture sensor into this study. These sensors were installed in November of 2024 and will be used to monitor the soil moisture levels at three different depths before and during next year's corn growing season.

Table 36. 2024 Results of Dryland Corn by Cropping System

Corn Crop Rotation Study

Treatment	Grain Yield (bu/ac)	Test Weight (lb/bu)	Moisture (%)
Corn-Cover	**20.5**	56.3	10.9%
Corn-Fallow	15.1	55.9	11.3%
Corn-Corn	5.6	55.8	11.4%
Average	**13.7**	**56.0**	**11.2%**
LSD 0.05	10.278	3.2944	
LSD 0.20	4.5045	1.4438	
P-Value	0.0476	0.8013	

[a] Grain Yields adjusted to 15.5% moisture

Site Information

Site: Plainsman Research Center
Collaborators: Zane Jenkins & Perry Jones
Planting Date: 5/15/24
Harvest Date: 10/29/24, Harvest Area was 10' by 480' (Average length)
Planted population: 12,500
Precipitation from planting to first freeze: Total 13.13" (2.04" May, June 4.80", July 1.99", Aug 2.64", Sept 1.66", Oct 0.00")
Soil Type: Wiley loam

Fertility:

Pre-Plant: 50-0-0 32-0-0 broadcast
Planter Applied 5-20-0-0.5 Zn and (5 gal/acre 10-34-0, 1 pt/acre 10% EDTA Zn)

Pesticides Applied:

Pre-Plant Herbicide: 32 oz Makaze, 21 oz Moccassin II, 5 oz Carabiner, 1.1 lb Atrazine 90WDG, 6.4 oz Staredown
In-Furrow Insecticide: 1 pt/acre Sniper LFR
Post-Emergence Herbicide: 32 oz Mad Dog 5.4, 7.5 oz Status, 16 oz Atrazine 4L Hybrid
Planted: G10L16-DV
Seeding Rate: 12,500/acre

Long Term Evaluation of Converting CRP Back into Crop Production.

Kevin Larson, Zane Jenkins, Brett Pettinger, & Perry Jones

Introduction:

The Conservation Reserve Program has been one of the most important USDA programs for Colorado. It has added millions of dollars to Colorado farm income, regardless of weather and commodity fluctuations. In 2011, Colorado had 1.87 million acres in CRP, and of that total, 571,000 acres expired in October 2012 (USDA, FSA, 2011). Many CRP acres were converted back into crop production because of high commodity prices and funding uncertainty for CRP extensions during that time. CRP has provided soil erosion protection by growing perennial grass cover. We developed this study to identify which CRP grass conversion method, chemical (no-till) or tillage, provides the highest variable net return over multiple years for two standard crop rotations, Wheat-Fallow (WF) and Wheat-Sorghum-Fallow (WSF).

Materials and Methods

We are testing our long-term CRP conversion in two standard crop rotations: Wheat-Fallow (WF) and Wheat-Sorghum-Fallow (WSF). After establishing the rotations, all phases of each rotation were present each year. We began our long-term CRP conversion study on March 29, 2012, using chemical or tillage. Because we were still establishing crop rotations, grain sorghum was the only crop studied for the 2012 cropping season. For the 2013 cropping season, we were able to harvest the first wheat crops and the extended-fallow grain sorghum crop. For chemical CRP conversion prior to wheat and extended-fallow grain sorghum crops, we applied glyphosate at 128 oz/ acre and ammonium sulfate (AMS) at 2 lb/acre on six application dates: March 29, April 25, May 18, and June 21, July 27, and October 3, 2012. For tillage CRP conversion prior to wheat and extended-fallow grain sorghum crops, we disked four times with an offset disk on four dates: March 29, April 23, May 18, and June 21, 2012, and swept two times on July 27 and October 9, 2012. Since March of 2015, we have stopped incorporating tillage and have begun treating all plots the same.

This is the thirteenth cropping season for this experiment and will be the last. No grain sorghum was planted this year in this study, so the only harvest will be wheat, which was planted in 2023. Avery wheat was drilled on September 30th, 2023, using a John Deere 1590 Single Disk drill with 5 gal/acre of 10-34-0. Plots were harvested on July 11th, 2024, using a modified Gleaner F3 combine equipped with a HarvestMaster H2 weighing and seed moisture system. Seed moisture content for the yields were adjusted

to 12% for wheat. LSD and P-values were generated using a generalized linear model in SAS 9.4.

Results and Discussion:

There were no statistical differences in grain yield or test weight of the wheat between treatments (see Table 37). This shows that the effects of past tillage operations no longer affect the crops in either crop rotation system. We have found that this study provided valuable information to both local farmers and CSU faculty on reverting CRP into dryland crop production.

Table 37 Wheat Yield & Test Weight by Treatment in the CRP Conversion Study

Treatment	Grain Yield[a] (bu/ac)	Test Weight (lb/bu)	Moisture (%)
WSF Tillage	24.0	59.6	9.7%
WF Chemical	22.2	59.5	9.9%
WF-Tillage	19.1	59.2	9.3%
WSF Chemical	16.3	60.1	9.8%
Average	20.4	59.6	9.7%
LSD 0.05	N.S	N.S	
LSD 0.20	N.S	N.S	
P-value	0.6144	0.8684	

[a] Grain Yields are moisture adjusted to 12%.
Location: Plainsman Research Center
Planting Date: 9/30/23
Harvest Date: 7/11/24
Fertility:
Preplant: 50-0-0 broadcast 32-0-0
Planter Applied: 5-20-0 as 10-34-0
Pesticides Uses:
Pre-Plant: 32 oz Makaze, 6.4 oz Staredown, 16 oz LV6, 8 oz Dicamba, 1 qt/100 gal NIS, 1.7 lb/acre AMS
Precipitation: 12.69" total (Sept 0.00, Oct 4.24", Nov 0.30", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20", April 0.09", May 2.98", June 1.70") Soil Type: Ulysses and Norka silt loams
Variety Planted: Avery
Planting rate: 50 lb of seed/acre

Table 38. Herbicide and Precipitation by Crop for All Plots on SW 18-30-43 Except Cover Crop Studies

Proso Millet

Pesticide Used

Pre-Plant: 45 oz Makaze, 2 oz Sharpen, 6.4 oz Staredown, 1 gal/100 MSO, 2.5 lb/acre

AMS **Precipitation:** Total 11.01" (June 4.72", July 1.99", Aug 2.64," Sep 1.66")

Grain Sorghum

Pesticides Uses:

Preplant: 32 oz Makaze, 20 oz Strellius II, 32 oz Atrazine 4L, 6.4 oz Staredown, 3 oz Argos, 1 gal/100 gal MSO, 2.5 lb/acre AMS

Post-Emerge: 10 oz First Act

Post-Emerge: 16 oz Huskie, 16 oz Atrazine 4L

Precipitation: Total 11.09" (June 4.80", July 1.99", Aug 2.64", Sep 1.66", October 0.00")

Corn

Pre-Plant Herbicide: 32 oz Makaze, 21 oz Moccassin II, 5 oz Carabiner, 1.1 lb Atrazine 90WDG, 6.4 oz Staredown, 1 gal/100 MSO, 1.7 lb/acre AMS

In-Furrow Insecticide: 1 pt/acre Sniper LFR

Post-Emerge Herbicide: 32 oz Mad Dog 5.4, 7.5 oz Status, 16 oz Atrazine 4L

Precipitation: Total 13.13" (May 2.04", June 4.80", July 1.99", Aug 2.64", Sept 1.66", Oct 0.00")

Winter Wheat

Pesticide Used

Pre-Plant: 32 oz Makaze, 6.4 oz Staredown, 16 oz LV6, 8 oz Dicamba, 1 qt/100 gal NIS, 1.7 lb/acre AMS

Precipitation: 12.69" total (Sept 0.0, Oct 4.24", Nov 0.3", Dec 0.97", Jan 1.58", Feb 0.68", Mar 0.20", April 0.09", May 2.98", June 1.70")