Technical Report TR13-2 January 2013

Agricultural Experiment Station

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

Plainsman Research Center 2012 Research Reports

Kevin Larson, Superintendent/Research Scientist

Plainsman Research Center

Box 477

42790 Hwy 160

Walsh, CO 81090

(719) 324-5643

Kevin.Larson@colostate.edu

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This Plainsman Research Center booklet is dedicated to:

Norman Smith

One of Norman's last acts before he retired as a Plainsman Agri-Search Foundation Board Member was to designate Plainsman as the recipient of the community development grant from the Monsanto Fund.

The following year **Max Smith** won the same Monsanto Fund award and again designated Plainsman for this grant (who says lightening doesn't strike twice?) From these Smith Family grants, Plainsman purchased an automated weather station to serve the entire community with accessible weather information.

Thank you, Smith Family for your generous grant and your dedication to Plainsman. Norman, enjoy your retirement.

This Plainsman Research Center booklet is also dedicated to:

The Neill Foundation Board:

James Hume, Phil Norton, Doyle Wilson, Pat Cooper, and Larry Bishop

The Neill Foundation's generous grant will keep Plainsman abreast of technological advancements in agricultural practices. Updating our farming practices will make our research more relevant to area growers.

Thank you. We think Bernard would be proud of your funding decision. Bernard was, and still is, a huge supporter of Plainsman.

This Plainsman Research Center booklet is also dedicated to:

Lee Sommers

We can think of no one who deserves to be an honorary member of the Plainsman Agri-Search Foundation more than Lee. He has been a great supporter of Plainsman through his administrative decisions that favored Plainsman.

Lee, we wish you well in your retirement.

Lee, on a personal note, I have been blessed to have you as my boss and friend. (And to others, if you need to blame someone for my employment, remember Lee is the one who hired me).

Plainsman Research Center, 2012 Research Reports

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2012 Plainsman Research Center Staff and Personnel with Projects

Kevin Larson (719) 324-5643	Superintendent, Plainsman Research Center, Agricultural Experiment Station, Colorado State University.
Brett Pettinger (719) 324-5643	Research Associate, Plainsman Research Center, Agricultural Experiment Station, Colorado State University.
Deborah Harn (719) 324-5643	Research Associate, RWA Project, Plainsman Research Center, Agricultural Experiment Station, Colorado State University.
Calvin Thompson (719) 324-5643	Farm Coordinator, Plainsman Research Center, Agricultural Experiment Station, Colorado State University.
Jerry Johnson (970) 491-1454	Extension Crop Specialist, Crop Testing Program Leader, Soil and Crop Sciences Department, Colorado State University.
Scott Haley (970) 491-6483	Professor, Soil and Crop Sciences Department Wheat Breeder, Colorado State University.
Neil Hansen (970) 491-6804	Associate Professor, Sustainable Dryland Agroecosystem Management Project Leader, Soil and Crop Sciences Department, Colorado State University.
Mark Brick (970) 491-6551	Professor, Bean Breeder, Soil and Crop Sciences Department, Colorado State University.
Wilma Trujillo (719) 336-7734	Cropping System Specialist, Extension Southeast Area, Colorado State University.
Courtney Jahn (970) 491-6741	Assistant Professor, Dept. of Bioagricultural Sciences and Pest Management, Colorado State University.
Sally Sauer (970) 491-1914	Research Assistant/Crop Testing Program, Soil and Crop Sciences Department, Colorado State University.

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2012 Climatological Summary
Plainsman Research Center, Walsh, Colorado

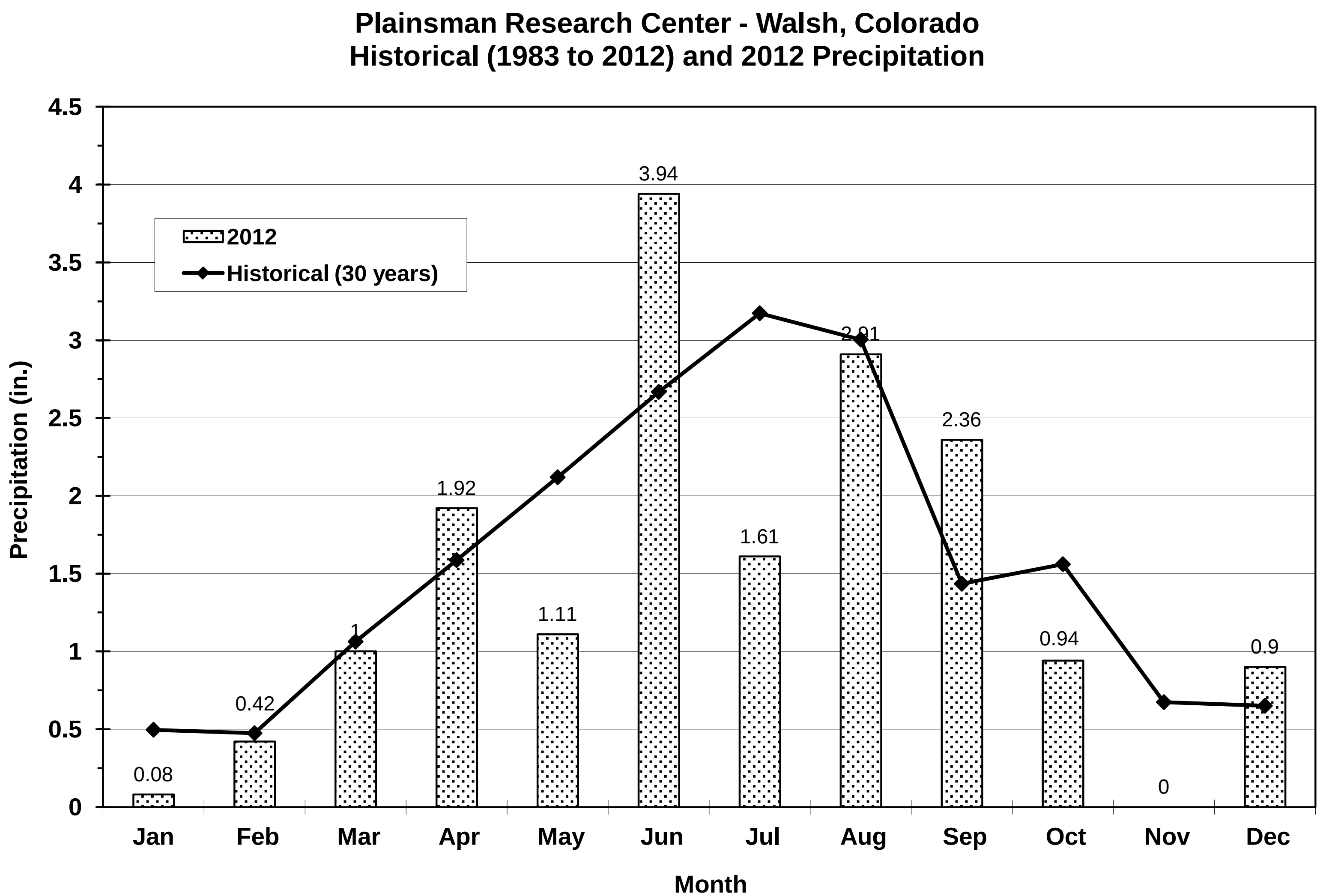
Month	Temperature Max. F	Min. F	Max. Mean F	Min. Mean F	Precip. In.	Greatest Day of Precip-atation	Snow-Fall In.	Greatest Snow Depth In.	Average Soil Temp F	Evapor-ation In.
Jan.	68	12	46.0	22.87	0.08	0.05	1.00	1.00	30.35	
Feb.	71	11	48.3	22.50	0.42	0.25	0.00	0.00	34.03	
Mar.	84	18	67.5	34.20	1.00	0.77	0.00	0.00	43.77	
Apr.	92	31	71.0	40.63	1.92	0.69	0.00	0.00	53.70	5.06
May	95	38	80.9	47.74	1.11	0.68	0.00	0.00	60.00	10.81
Jun.	106	48	92.0	60.00	3.94	2.20	0.00	0.00	71.27	14.55
Jul.	103	57	96.1	64.70	1.61	0.57	0.00	0.00	75.16	15.64
Aug.	105	46	92.3	59.20	2.91	1.85	0.00	0.00	70.55	12.10
Sep.	97	37	82.6	50.47	2.36	1.26	0.00	0.00	64.20	8.59
Oct.	88	22	66.9	37.06	0.94	0.71	1.00	1.00	48.87	2.89
Nov.	79	14	64.1	29.90	0.00	0.00	0.00	0.00	43.30	
Dec.	68	-2	47.8	20.35	0.90	0.35	6.00	2.50	33.52	
Total Annual			**71.3**	**40.80**	**17.19**		**8.00**			**69.64**

*** NOTE: Evaporation read April 15th through October 15th.
Wind velocity is recorded at two feet above ground level.
Total evaporation from a four foot diameter pan for the period indicated.

	2012	2011
Highest Temperature:	106 F on June 28	106 F on Jul 21 & Aug 25
Lowest Temperature:	-2 F on Dec 26	-13 F on Feb 3
Last freeze in spring:	31 F on April 16	31 F on May 3
First freeze in fall:	31 F on Oct 8	30 F on Oct 19
Frost free season:	175 frost free days	169 frost free days
Avg. for 30 years:	18.90 inches	

Maximum Wind:

Jan.	54 mph on the 23rd	July.	40 mph on the 9th
Feb.	54 mph on 29th	Aug.	36 mph on the 12th
Mar.	46 mph on the 19th	Sept.	33 mph on the 8th
Apr.	45 mph on the 27th	Oct.	38 mph on the 4th
May	42 mph on the 27th	Nov.	54 mph on the 11th
Jun.	45 mph on the 15th	Dec.	54 mph on the 20th



Plainsman Research Center - Walsh, Colorado
Historical (1983 to 2012) and 2012 Precipitation
2012
Historical (30 years)
Precipitation (in.)
Month
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.08
0.42
1
1.92
1.11
3.94
1.61
2.91
2.36
0.94
0
0.9

2012 Eastern Colorado Winter Wheat Variety Performance Trials

Jerry Johnson and Scott Haley

The Colorado State University Crops Testing and Wheat Breeding and Genetics programs provide current, reliable, and unbiased wheat variety information as quickly as possible to Colorado producers for making better variety decisions. CSU has an excellent research faculty and staff, a focused breeding program, graduate and undergraduate students, and dedicated agricultural extension specialists. However, wheat improvement in Colorado would not be possible without the support and cooperation of the entire Colorado wheat industry. On-going and strong producer support for our programs is critical for sustained public variety development and testing.

Our wheat variety performance trials, and Collaborative On-Farm Test (COFT), represent the final stages of a wheat breeding program where promising experimental lines are tested under an increasingly broad range of environmental conditions. As a consequence of large environmental variation, Colorado State University annually conducts a large number of performance trials and on-farm tests. These trials serve to guide producer variety decisions and to assist our breeding program to more reliably select and advance the most promising lines toward release as new varieties.

2012 Variety Performance Trials

There were excellent planting conditions at almost all dryland performance trial locations in fall 2011 resulting in good to excellent emergence and plant stands. The lone exception was Walsh which suffered from extremely dry soil conditions at planting, and poor fall stands resulted from deep planting. Low winter precipitation was received throughout eastern Colorado and all of the dryland trials suffered from spring drought except Yuma and Julesburg trials where the effects were less marked. High spring temperatures, particularly in March and April, were seen at all trial locations resulting in above average cumulative growing degree-days and accelerated plant development. For example, at Akron there were 180% of normal cumulative growing degree-days from January through May but only 49% of average precipitation for the same period. The Roggen trial suffered more than other trials from drought and high temperatures which resulted in extreme intra-plot variation preventing reliable data analysis and interpretation. Windy conditions at all locations exacerbated the effects of drought and high temperatures. Stripe rust was observed at low levels at most locations but dry conditions in May reduced disease incidence and spread. Stripe rust was most evident at Genoa, where the higher altitude and cooler temperatures favored rust development, and at Julesburg where precipitation patterns were more favorable for stripe rust infection. All trials experienced above average growing degree-days that led to very early crop development and harvest. The Sheridan Lake trial received hail in early April and the trial at Walsh was destroyed by hail prior to harvest. Brown wheat mite damage was observed at Arapahoe and insecticide was applied to control the mites. There was a significant dryland root rot infection in the Burlington trial due to very lush early spring growth and subsequent drought stress conditions.

The Irrigated Variety Performance Trials (IVPT) at Rocky Ford and Haxtun were excellent. Due to continuing problems with the irrigation system, and an abnormally dry spring, the trial at Fort Collins had inadequate moisture from jointing until heading though irrigation frequency was improved during grain filling. All three trial locations had high spring growing degree-days resulting in early trial maturity. At Rocky Ford and Haxtun, above average growing degree-days contributed to high yields though stripe rust infection adversely affected the yield potential of susceptible varieties. While fungicide was not applied at Rocky Ford, it was applied at Haxtun but the flag leaves of susceptible varieties were lost before the fungicide controlled the disease. Lodging was significant at Haxtun and varieties without good straw strength were heavily lodged. Lodging did not occur at Fort Collins and was minimal at Rocky Ford.

There were 42 entries in the dryland performance trials (UVPT) and 32 entries in the irrigated performance trials (IVPT). All trials included a combination of public and private varieties and experimental lines from Colorado, Texas, Kansas, Oklahoma, Nebraska, and Montana. All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot size was approximately 175 ft2 and all varieties were planted at 700,000 viable seeds per acre for dryland trials and 1.2 million viable seeds per acre for irrigated trials. Yields are corrected to 12% moisture. Test weight information was obtained from a combine equipped with a Harvest Master measuring system.

Summary of 2012 Dryland Variety Performance Results

Variety Origin[a] and Release Year	Variety[b]	Market Class[c]	Yield[d]	Yield	Test Weight[d]	Plant Height[d]
			bu/ac	% trial average	lb/bu	in
CSU/PG 2011	Byrd	HRW	54.9	114%	61.1	28
CSU exp	CO07W245	**HWW**	54.6	113%	61.7	28
CSU exp	CO07W722-F5	**HWW**	52.6	109%	60.7	25
AP exp	SY Exp. 1029	HRW	52.4	108%	59.9	27
CSU exp	CO050233-2	HRW	52.0	108%	60.4	27
CSU exp	CO08263	HRW	51.7	107%	60.8	26
TX/W 2005	TAM 112	HRW	51.6	107%	61.8	28
CSU/PG 2006	Ripper	HRW	51.0	105%	60.1	27
CSU exp	CO08W218	**HWW**	51.0	105%	62.2	27
CSU/PG 2011	Brawl CL Plus	HRW	50.9	105%	62.1	29
TX/AGSECO 2010	TAM 113	HRW	50.9	105%	61.7	29
CSU/PG 2004/2011	CSU Blend12	HRW	50.4	104%	61.3	26
LG 2009	T158	HRW	49.8	103%	61.6	28
AP 2011	SY Wolf	HRW	49.1	102%	61.5	28
TX/AP 2002	TAM 111	HRW	49.1	101%	61.3	29
TX/CSU 2001	Above	HRW	49.0	101%	60.4	26
CSU/PG 2011	Denali	HRW	48.9	101%	62.0	28
CSU exp	CO08W454	**HWW**	48.8	101%	61.1	27
LG 2010	T163	HRW	48.6	100%	61.8	28
CSU/AGSECO 2004	Protection	HRW	48.6	100%	59.3	29
WB 2007	Winterhawk	HRW	48.6	100%	61.9	28
CSU exp	CO05W111	**HWW**	48.5	100%	61.2	28
NE 2008	Settler CL	HRW	48.4	100%	61.1	26
TX/SS 2006	TAM 304	HRW	48.2	100%	59.8	27
CSU/PG 2004	Hatcher	HRW	48.2	100%	61.1	26
CSU/PG 2007	Bill Brown	HRW	48.0	99%	62.0	26
NE 2010	Robidoux	HRW	48.0	99%	61.2	28
CSU exp	CO08346	HRW	47.7	98%	62.4	27
CSU exp	CO08W328	**HWW**	47.2	98%	62.2	28
WB 2008	Armour	HRW	46.6	96%	60.7	27
CSU/PG 2008	Thunder CL	**HWW**	46.3	96%	60.6	26
CSU/PG 2004	Bond CL	HRW	46.3	96%	58.4	28
KSU exp	KS020319-7-3	HRW	46.2	95%	60.5	27
KSU 2011	Clara CL	**HWW**	46.0	95%	62.5	27
CSU/PG 2009	Snowmass	**HWW**	45.8	95%	60.8	29
NE 2010	McGill	HRW	45.8	95%	60.5	29
KSU 2009	Everest	HRW	45.6	94%	61.8	26
NE exp	NE05496	HRW	45.6	94%	60.8	26
CSU exp	CO08M011	HRW	45.5	94%	61.0	27
OK exp	OK05312	HRW	43.9	91%	61.9	27
NE exp	NE05548	HRW	43.6	90%	59.2	27
MT 2011	Judee	HRW	37.0	77%	60.5	26
		Average	**48.4**		**61.1**	**27**

[a]Variety origin codes: CSU=Colorado State University; TX/CSU=Joint release by Texas A&M and Colorado State Universities; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); CSU/AGSECO=Colorado State release, marketed by AGSECO; TX/AGSECO=Texas A&M release, marketed by AGSECO; TX/W=Texas A&M release, marketed by Watley Seed Co.; TX/SS=Texas A&M release, marketed by Scott Seed Co.; CSU/PG=CSU release, marketed by CWRF under the PlainsGold brand; TX/AP=Texas A&M release, marketed by AgriPro (Syngenta); MT=Montana State University; KSU=Kansas State University; LG=Limagrain Cereal Seeds; NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average yield in 2012.

[c]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[d]The 2012 average yield, test weight, and plant height are based on nine 2012 trials.

Summary of 2-Year Dryland Variety Performance Results

Variety Origin[a] and Release Year	Variety[b]	Market Class[c]	2-Year Average[d] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
CSU/PG 2011	Byrd	HRW	55.3	113%	60.4	29
CSU exp	CO07W245	**HWW**	54.7	112%	60.7	28
CSU exp	CO050233-2	HRW	51.3	105%	59.7	28
TX/W 2005	TAM 112	HRW	51.1	104%	61.1	28
CSU/PG 2006	Ripper	HRW	50.9	104%	59.2	26
CSU/PG 2011	Denali	HRW	50.2	102%	60.9	29
CSU/PG 2004	Hatcher	HRW	50.0	102%	60.2	26
TX/CSU 2001	Above	HRW	49.3	101%	59.5	27
CSU/PG 2007	Bill Brown	HRW	49.2	101%	60.8	26
AP 2011	SY Wolf	HRW	49.2	100%	60.2	28
NE 2008	Settler CL	HRW	49.2	100%	60.0	27
CSU/PG 2011	Brawl CL Plus	HRW	48.9	100%	60.8	28
CSU exp	CO05W111	**HWW**	48.7	99%	60.1	29
WB 2007	Winterhawk	HRW	48.5	99%	60.9	29
LG 2010	T163	HRW	48.5	99%	60.3	28
CSU/PG 2009	Snowmass	**HWW**	47.6	97%	59.9	29
NE 2010	Robidoux	HRW	47.3	97%	60.1	28
CSU/PG 2008	Thunder CL	**HWW**	46.5	95%	59.5	27
WB 2008	Armour	HRW	46.4	95%	59.5	26
CSU/PG 2004	Bond CL	HRW	46.4	95%	58.0	29
OK exp	OK05312	HRW	46.0	94%	60.8	27
NE 2010	McGill	HRW	45.7	93%	59.5	29
KSU 2009	Everest	HRW	45.5	93%	60.9	26
		Average	**49.0**		**60.1**	**28**

[a]Variety origin codes: CSU=Colorado State University; TX/CSU=Joint release by Texas A&M and Colorado State Universities; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); TX/W=Texas A&M release, marketed by Watley Seed Co.; KSU=Kansas State University; NE=University of Nebraska; CSU/PG=CSU release, marketed by CWRF under the PlainsGold brand; LG=Limagrain Cereal Seeds; OK=Oklahoma State University.

[b]Varieties ranked according to average 2-year yield.

[c]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[d]The 2-year average yield, test weight, and plant height are based on six 2011 trials and nine 2012 trials.

Summary of 3-Year Dryland Variety Performance Results

Variety Origin[a] and Release Year	Variety[b]	Market Class[c]	3-Year Average[d] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
CSU/PG 2011	Byrd	HRW	59.3	112%	60.3	30
CSU exp	CO050233-2	HRW	55.5	105%	60.0	29
CSU/PG 2011	Denali	HRW	55.2	104%	61.3	30
CSU/PG 2006	Ripper	HRW	53.9	102%	59.2	27
NE 2008	Settler CL	HRW	53.6	101%	60.3	28
CSU exp	CO05W111	**HWW**	53.5	101%	60.7	30
TX/W 2005	TAM 112	HRW	53.4	101%	60.9	29
CSU/PG 2004	Hatcher	HRW	53.3	100%	60.5	27
WB 2007	Winterhawk	HRW	53.0	100%	61.2	29
CSU/PG 2007	Bill Brown	HRW	52.9	100%	60.8	27
TX/CSU 2001	Above	HRW	52.4	99%	59.7	28
CSU/PG 2011	Brawl CL Plus	HRW	52.3	98%	61.0	29
CSU/PG 2009	Snowmass	**HWW**	51.8	98%	60.4	30
CSU/PG 2004	Bond CL	HRW	50.9	96%	58.2	30
WB 2008	Armour	HRW	50.9	96%	59.5	27
CSU/PG 2008	Thunder CL	**HWW**	50.8	96%	59.6	28
KSU 2009	Everest	HRW	49.8	94%	61.1	27
		Average	**53.1**		**60.3**	**29**

[a]Variety origin codes: CSU=Colorado State University; TX/CSU=Joint release by Texas A&M and Colorado State Universities; WB=WestBred (Monsanto); TX/W=Texas A&M release, marketed by Watley Seed Co.; KSU=Kansas State University; NE=University of Nebraska; CSU/PG=CSU release, marketed by CWRF under the PlainsGold brand.

[b]Varieties ranked according to average 3-year yield.

[c]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[d]The 3-year average yield, test weight, and plant height are based on nine 2010 trials, six 2011 trials, and nine 2012 trials.

2012 Dryland Winter Wheat Variety Performance Trial at Lamar

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
Ripper	53.2	60.7	25
CO07W722-F5	51.6	61.5	22
Byrd	51.2	61.5	26
CO08263	50.6	62.1	23
TAM 112	48.3	62.6	25
CO07W245	48.0	63.0	25
TAM 113	47.9	62.8	26
T158	47.2	61.8	30
SY Exp. 1029	46.5	60.7	26
Winterhawk	46.1	62.4	28
Above	45.8	61.8	25
TAM 304	45.6	61.2	27
Hatcher	45.2	61.7	22
Snowmass	45.1	61.5	27
Protection	44.9	59.5	26
Everest	44.9	62.7	27
Robidoux	44.9	61.9	26
CO08346	44.8	62.8	24
CO08W218	43.9	62.4	22
CSU Blend12	43.7	62.6	23
Bill Brown	43.5	63.0	21
T163	43.5	62.5	28
Armour	43.4	60.6	30
CO08W328	42.7	63.0	25
CO050233-2	42.2	61.1	22
CO08W454	42.1	62.2	24
Clara CL	41.8	63.2	24
Brawl CL Plus	41.7	62.8	24
Bond CL	41.4	59.5	24
NE05496	41.4	60.9	21
Thunder CL	41.4	61.0	25
Settler CL	41.2	62.3	24
CO05W111	40.6	61.2	23
TAM 111	40.6	62.1	29
Denali	40.4	62.4	24
CO08M011	40.3	62.2	23
McGill	40.2	60.8	29
KS020319-7-3	39.9	59.3	29
OK05312	39.8	62.9	25
SY Wolf	37.4	61.3	27
NE05548	36.2	59.1	21
Judee	31.7	60.8	23
Average	**43.6**	**61.7**	**25**
LSD[a]	2.9		

[a]If the difference between two variety yields equals or exceeds the LSD value, the difference is significant.

Harvest date: June 14, 2012
Planting date: September 20, 2011
Cooperators: Jensen & Meghan Stulp

2012 Dryland Winter Wheat Variety Performance Trial at Sheridan Lake

Variety	Yield bu/ac
Byrd	37.0
SY Exp. 1029	34.0
CO07W722-F5	32.1
CO08263	31.6
CSU Blend12	31.6
Robidoux	31.1
CO08346	30.0
CO08M011	29.0
Settler CL	28.3
Snowmass	28.1
T163	27.9
Hatcher	27.7
TAM 113	27.5
Bond CL	27.5
Denali	27.1
CO08W218	26.9
Bill Brown	26.9
OK05312	26.7
T158	26.5
TAM 304	26.1
CO050233-2	26.0
Brawl CL Plus	26.0
Clara CL	26.0
TAM 111	25.9
Ripper	25.8
Thunder CL	25.7
CO05W111	25.6
TAM 112	25.5
Winterhawk	25.4
CO08W454	25.3
CO07W245	25.0
NE05496	25.0
CO08W328	24.5
KS020319-7-3	24.1
Everest	23.2
SY Wolf	22.8
McGill	22.1
Protection	21.9
Armour	21.8
NE05548	21.3
Above	20.6
Judee	15.3
Average	**26.4**
LSD[a]	2.8

[a]If the difference between two variety yields equals or exceeds the LSD value, the difference is significant.

†Test weights could not be measured in a large number of plots due to insufficient grain. For those with sufficient grain, the trial average test weight was 56.1 lb/bu.

Harvest date:	June 14, 2012
Planting date:	September 20, 2011
Cooperator:	Burl Scherler

2012 Dryland Winter Wheat Variety Performance Trial at Arapahoe

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
CO050233-2	49.0	61.1	22
Byrd	48.6	61.5	26
CSU Blend12	48.1	62.6	23
Brawl CL Plus	41.9	62.8	24
TAM 112	41.5	62.6	25
T163	41.5	62.5	28
SY Wolf	41.4	61.3	27
CO07W245	41.4	63.0	25
Ripper	41.2	60.7	25
Hatcher	41.0	61.7	22
CO08W454	40.9	62.2	24
TAM 111	40.5	62.1	29
CO08263	40.1	62.1	23
CO05W111	40.0	61.2	23
CO08W218	39.6	62.4	22
Above	39.4	61.8	25
TAM 304	38.8	61.2	27
Bill Brown	37.4	63.0	21
TAM 113	37.2	62.8	26
SY Exp. 1029	36.9	60.7	26
Denali	36.8	62.4	24
CO08W328	36.4	63.0	25
Armour	36.4	60.6	30
Winterhawk	36.2	62.4	28
NE05548	36.0	59.1	21
Thunder CL	35.9	61.0	25
CO08M011	35.6	62.2	23
OK05312	35.5	62.9	25
Snowmass	35.3	61.5	27
Settler CL	35.2	62.3	24
Protection	35.1	59.5	26
CO07W722-F5	34.8	61.5	22
Clara CL	34.8	63.2	24
CO08346	34.3	62.8	24
Robidoux	34.1	61.9	26
Bond CL	33.9	59.5	24
Everest	33.5	62.7	27
KS020319-7-3	33.2	59.3	29
NE05496	33.2	60.9	21
T158	32.7	61.8	30
McGill	31.4	60.8	29
Judee	28.4	60.8	23
Average	**37.7**	**61.7**	**25**
LSD[a]	4.2		

[a]If the difference between two variety yields equals or exceeds the LSD value, the difference is significant.

Harvest date: June 19, 2012
Planting date: September 20, 2011
Cooperators: Dennis & Matt Campbell

Dryland Wheat Strips for Forage and Grain Yield at Walsh, 2012

K. Larson, B. Pettinger, and D. Harn

PURPOSE: To determine which wheat varieties are best suited for dual-purpose forage and grain production in Southeastern Colorado.

MATERIALS AND METHODS: Fifteen wheat varieties were planted on September 28 and 29, 2011 at 50 lb seed/a in 20 ft. by 800 ft. strips with two replications. We applied 50 lb N/a with a sweep and seedrow applied 5 gal/a of 10-34-0 (20 lb P_2O_5, 6 lb N/a). Ally Extra 0.4 oz/a and 2,4-D 0.38 lb/a was sprayed for weed control. Two 2 ft. by 2.5 ft. forage samples were taken at jointing (April 5) and at boot (April 27). We measure the forage for fresh weight, oven-dried the samples, and recorded dry weight at 15% moisture content. Russian Wheat Aphid did not reach the critical threshold; therefore, the field was not sprayed. The wheat crop was not harvested due to two hailstorms that completely shattered the grain.

RESULTS: The grain for this wheat study was not harvested due to hail damage. Hatcher had the highest forage yield at jointing, and Byrd had the highest forage yield at boot.

DISCUSSION: Since there was no grain harvested, the selection of the best overall dual purpose wheat variety could not be determined this year. The best overall forage wheat variety was Brawl CI with the second highest forage yield at jointing and the second highest forage yield at boot. Other varieties that had high forage yield rankings were: Hatcher, first at jointing and fifth at boot; Byrd, first at boot and fourth at jointing; and TAM 112, third at jointing and fourth at boot. If we were able to harvest for grain and any of the high ranking forage varieties produced high grain yields, than that variety with both high forage and grain yields may have been selected as the best overall forage and grain variety.

Table .Dryland Wheat Strips, Forage Yield, Walsh, 2012.

Variety	Jointing		Boot	
	Fresh Wt.	Dry Wt.	Fresh Wt.	Dry Wt.
	------------------------lb/a------------------------			
Hatcher	7402	1691	13574	3620
Brawl CL	6360	1569	14241	4051
TAM 112	6274	1479	13046	3750
Byrd	5625	1388	15303	4189
Ripper	5895	1314	11857	3381
Armour	5370	1243	11619	3108
Winterhawk	4855	1218	12145	3298
Above	4880	1189	12743	3487
Bond CL	5107	1118	14668	3759
TAM 111	4492	1105	13575	4009
Snowmass	4704	1101	12040	3337
Bill Brown	4467	1030	12081	3133
Settler CL	3831	994	11751	3146
Jagalene	3717	988	9290	2788
Prarie Red	3513	943	11724	3021
Average	5099	1225	12644	3472
LSD 0.05	1991.1	414.1	4305.8	931.8

Planted: September 28 and 29, 2011; 50 lb seed/a;
5 gal/a 10-34-0.
Jointing sample taken April 5, 2012.
Boot sample taken April 27, 2012.
Wet Weight is reported at field moisture.
Dry Weight is adjusted to 15% moisture content.

N Timing on Dryland Wheat for Protein and Yield at Manter, 2012

Kevin Larson and Lyndell Herron

The impetus for this study comes from the Con Agra program that pays protein premiums for two white wheat varieties, Snowmass and Thunder CL. Southeast Colorado tends to raise winter wheat with lower than the standard 12% protein level during years of good production. Con Agra's protein premium scale starts at 12.2% protein and ends at 15% protein (Johnson, et al., 2012). For each 0.2% protein increase, they pay a premium of $0.03 per bushel. At 13.0% protein, an additional $0.05 per bushel is added to the premium, and at 14.0% protein, an additional $0.10 per bushel is added to the premium. The maximum protein premium is $0.60 per bushel at 15% protein. In this study, we tested N application timing for potential increase of protein and yield.

Materials and Methods

We applied 40 lb N/a as 28-0-0 streamed in 18 in. spacing at three application dates: March 12 (pre-jointing), April 9 (jointing), and April 27 (boot). We also included a check with no N applied. In addition to the N timing treatments, we foliar sprayed SRN 28/70 (72% Slow Release Nitrogen) on May 2 (boot) at 2 gal/a (6 lb N/a). Lyndell Herron planted two wheat varieties, Snowmass and Danby, on October 5, 2011 at 30 lb seeds/a. The plot size was in 10 ft. by 80 ft. plots with two replications. Our plot design was split-split plot with varieties as the main plots and N timing and foliar SRN as subplots. For weed control, a tank mix of Ally Extra 0.3 oz/a and 2,4-D 0.38 lb/a was applied. We harvested the plots on June 28 with a self-propelled combine equipped with a digital scale. Grain yields were adjusted to 12% seed moisture content.

Results

Grain yields were very low, and subsequently, grain protein levels were very high. The yield average for this study was only 4.5 bu/a, but the average protein level was 17.1%. From April 25 through April 27 the high temperatures were 88F to 92F, this heat stress near boot caused leaf-burning and trapped heads. This heat stress (that mimicked freeze damage) greatly reduced grain yields and increased protein levels. The soil test analysis revealed that no N was needed for our 35 bu/a yield goal. There was very little yield change with N timing applications. The N timing yield range for Danby was 1.4 to 2.9 bu/a, and the yield range for Snowmass was 6.5 to 8.5 bu/a. The highest yield for N timing occurred at boot for Danby and at pre-jointing for Snowmass. The N timing yield response of Snowmass was relatively flat for the 0 N check, pre-jointing and jointing stages, but dropped by 1.4 bu/a at boot compared to the 0 N check.

N timing protein levels remained consistently high at 17.2% protein for Snowmass for all application stages. N timing protein levels for Danby were around 17.1% protein for all application stages with the exception of pre-jointing which dropped slightly to 16.8% protein. The 0 N check for both varieties was within 0.1% of the highest protein produced by any of the N timing applications.

The addition of the foliar application of SRN 28/70 at boot to the N timing and 0 N check treatments generally had a negative yield response. However for Snowmass, the yield response to foliar SRN increased its yield by 1.1 bu/a at the boot stage. The only other positive yield response to foliar SRN was for Danby with 0.5 bu/a increase compared to the 0 N check.

The protein levels for both varieties did not increase with foliar SRN applied at boot (with the marginal exception of Danby at pre-jointing where the addition of foliar SRN applied at boot increased the protein level by 0.1%). Since the foliar SRN treatment (6 lb N/a) was applied solely at boot to all of the N timing applications and to the 0 N check, we expected increased protein levels and no yield response for all N timing stages and the 0 N check. Instead, foliar SRN had almost no affect on yields or protein levels compared to the N timing applications without the addition of SRN.

Discussion

Heat stress in late April caused a very low yielding, but very high protein winter wheat environment. Applications of nitrogen at various developmental stages did not increase yields or protein levels to this heat stressed wheat. Since our N timing applications and foliar SRN treatments did not increase yields or protein, the cost of these N applications treatments were not recouped and produced negative incomes. The overall average net income loss for the N timing applications and foliar SRN was -$39.42/a.

This study demonstrated (albeit unplanned) that stress, in this case heat stress, produced very low grain yields with very high protein levels.

Literature Cited

Johnson, J.J., et al. 2012. Making Better Decision, 2011 Colorado Winter Wheat Variety Performance Trials. Technical Report 2012 Wheat Field Days Edition. CSU, Crop Testing Program, AES, Extension, Dept. of Soil and Crop Sciences, Colorado State University, Fort Collins.

Table . Dryland Wheat, N Timing for Protein and Yield, Manter, 2012.

N Timing	N Applied	Boot Foliar	Variety	Test Weight	Protein	Grain Yield	Protein & Grain Income	Applied N Net Income
	lb N/a	gal/a		lb/bu	%	bu/a	$/a	$/a
Check	0	None	Snowmass	59.0	17.2	7.9	0.00	0.00
Pre-jointing	60	None	Snowmass	59.5	17.2	8.5	5.58	-23.92
Jointing	60	None	Snowmass	60.0	17.2	8.4	4.75	-24.75
Boot	60	None	Snowmass	60.0	17.2	6.5	-11.02	-40.52
Average			**Snowmass**	**59.6**	**17.2**	**7.8**	**-0.02**	**-29.52**
Check	0	None	Danby	60.0	17.1	1.4	0.00	0.00
Pre-jointing	60	None	Danby	60.5	16.8	2.6	9.60	-19.90
Jointing	60	None	Danby	60.0	17.1	2.7	10.40	-19.10
Boot	60	None	Danby	60.0	17.2	2.9	12.00	-17.50
Average			**Danby**	**60.1**	**17.1**	**2.4**	**8.00**	**-21.50**
Check	0	+ 2 gal SRN	Snowmass	59.0	17.1	4.4	-28.45	-75.45
Pre-jointing	60	+ 2 gal SRN	Snowmass	60.0	17.0	5.5	-19.32	-66.32
Jointing	60	+ 2 gal SRN	Snowmass	60.0	17.0	5.5	-19.32	-66.32
Boot	60	+ 2 gal SRN	Snowmass	59.0	17.1	7.6	-1.89	-48.89
Average		**+ 2 gal SRN**	**Snowmass**	**59.5**	**17.1**	**5.8**	**-17.25**	**-64.25**
Check	0	+ 2 gal SRN	Danby	60.5	17.0	1.9	4.00	-43.00
Pre-jointing	60	+ 2 gal SRN	Danby	60.5	16.9	1.7	2.40	-44.60
Jointing	60	+ 2 gal SRN	Danby	60.5	17.0	2.1	5.60	-41.40
Boot	60	+ 2 gal SRN	Danby	60.5	17.2	2.2	6.40	-40.60
Average		**+ 2 gal SRN**	**Danby**	**60.5**	**17.0**	**2.0**	**4.60**	**-42.40**
Test Average				**59.9**	**17.1**	**4.5**	**-1.17**	**-39.42**

Income grain yield x $8.00/bu for Danby and $8.30/bu for Snowmass ($8.00/bu plus $0.30/bu premium).
Protein Premium: $0.60 for protein 15.0% and higher.
Applied N cost $0.60/lb of N as 28-0-0; SRN (28-0-0) cost $6.00/gal; application cost $5.50/a.
Applied N Net Income is applied N income of protein premium and grain income minus N and application costs.

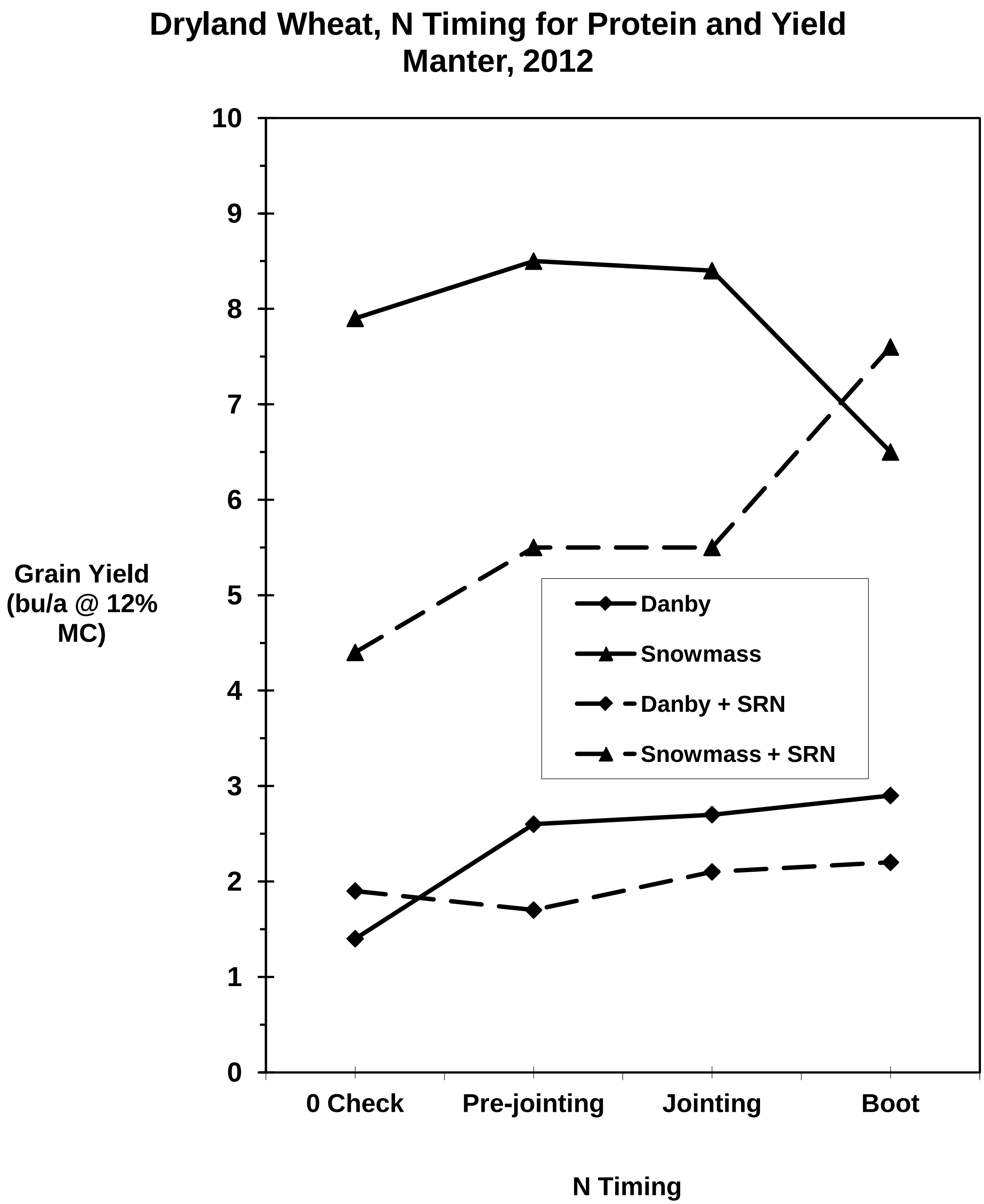


Fig. .Dryland Wheat, N Timing Yield at Manter, 2012. N Timing: Check, 0 lb/a; Pre-jointing, 40 lb/a; Jointing, 40 lb/a; Boot, 40 lb/a; and + SRN at Boot, 2 gal/a. All N Timing treatments were streamed 28-0-0, except SRN which was foliar sprayed. Planted: September 26, 2011 at 30 lb seed/a. Harvested: June 28, 2012.

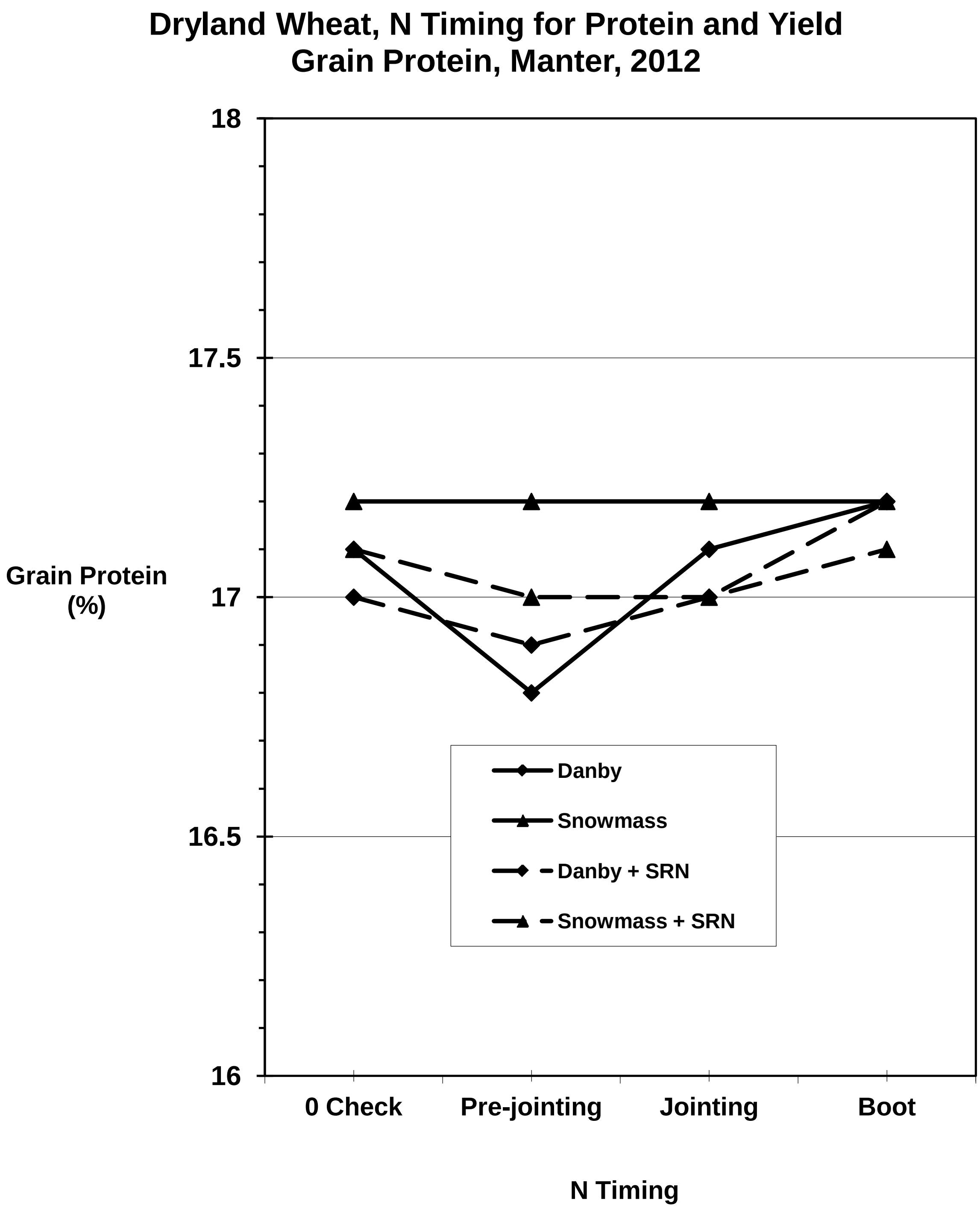


Fig. .Dryland Wheat, N Timing Protein at Manter, 2012. N Timing: Check, 0 lb/a; Pre-jointing, 40 lb/a; Jointing, 40 lb/a; Boot, 40 lb/a; and + SRN at Boot, 2 gal/a. All N Timing treatments were streamed 28-0-0, except SRN which was foliar sprayed. Planted: September 26, 2011 at 30 lb seed/a. Harvested: June 28, 2012.

Residual P on Dryland Wheat, Long Term Study at Manter, 2012

Kevin Larson and Lyndell Herron

PURPOSE: To determine the long-term effects from a one-time application of P rates on dryland wheat yields and income.

RESULTS: No more than a 1.1 bu/a separated the 0 P check and any of the P treatments. The highest producing P treatment was 33.0 bu/a with the 23 lb P_2O_5/a rate and the lowest yielding P treatment was 30.9 bu/a with the 92 lb P_2O_5/a rate. Regression analysis shows that the yield response was flat. After six wheat crops, all P rates produced positive total net returns compared to the 0 P check: 23 lb P_2O_5/a with $47.66/a, 46 lb P_2O_5/a with $34.83/a, 69 lb P_2O_5/a with $14.67/a, 92 lb P_2O_5/a with $30.40/a, and 115 lb P_2O_5/a with $43.37/a, using wheat prices of $3.50/bu for 2002, $3.20/bu for 2004, $4.75/bu for 2006, $8.00/bu for 2008, $6.50/bu for 2010, $8.00/bu for 2012 and 10-34-0 cost of $210/ton.

DISCUSSION: There was no yield response from the one-time P fertilizer rates for this sixth wheat crop after application. The lack of yield response indicates that the P fertilizer is no longer available to increase yields. This is the sixth wheat crop after we applied the one-time P fertilizer rates. For the first wheat crop following the P application, the yield response from the 46 lb P_2O_5/a rate had already paid for itself ($0.15/a return from $14.35/a yield increase minus $14.20/a P cost). By the second wheat crop, the two lowest P rates, 23 and 46 lb P_2O_5/a, produced positive net returns. For the third wheat crop, the highest net income of $3.33/a occurred with the 69 P_2O_5/a treatment. For the fourth wheat crop, all P treatments produced positive net incomes compared to the 0 P check. For the fifth wheat crop, all P rates produced similar total net returns around $40/a, except 69 lb P_2O_5/a, which returned about half as much as the other P rates. This year, the sixth crop year, there was no yield response. For the third crop year, there was no yield difference between the 0 P check and the 23 P_2O_5/a rate; however, for the fourth crop year and fifth crop year the 23 lb P_2O_5/a treatment produced 2.6 bu/a and 1.6 bu/a more, respectively, than the 0 P check. It took five wheat crops to produce similar net returns from all but one of the P applied treatments, and the sixth wheat crop was unresponsive; therefore, after five wheat crops maximum net returns from our one-time P application were achieved. The lower P rates (23 and 46 lb P_2O_5/a) achieved most of their maximum net return with the first three crops; whereas, it required all five crop years for the higher P rates (69, 92, and 115 lb P_2O_5/a) to reach their maximum net returns. With comparable variable net incomes for all P rates, a heavy one-time application of P, or smaller, more frequent P applications may be similarly profitable. If P fertilizer placement is part of the normal operation, then smaller annual P application may be preferred. However, if it requires a special, non-typical operation to apply P fertilizer, then a single, high P rate every few years may be preferred.

MATERIALS AND METHODS: For the one time P rate application, Lyndell Herron chiseled on 50 lb N/a (as NH_3) with six phosphate fertilizer treatments: 0, 5.7, 11.4, 17.2, 22.9, and 28.6 gal/a of 10-34-0 (0, 23, 46, 69, 92, and 115 lb P_2O_5/a), using a 30 ft. dual placement N and P chisel applicator with 18 in. spaced shanks on July 13, 2001. Each treatment was replicated twice. Herron planted Akron or Ankor for the first three years and Danby in 2007, 2009 and 2011 at 35 lb seeds/a in the 60 ft. by 680 ft. plots around late-September to early-October for 2001, 2003, 2005, 2007, 2009 and 2011. We harvested the plots on June 18 for 2002, June 25 for 2004, June 19 for 2006, July 3, 2008, June 29 for 2010, and June 20 for 2012 with a self-propelled combine and weighed them in a digital weigh cart. Seed yields were adjusted to 12% seed moisture.

In 2001prior to applying our fertilizer treatments, we randomly sampled the soil at 6 to 8 sites at 0 to 8 in. and 8 to 24 in. depths and sent them to the Colorado State University Laboratory for analysis. The soil was a Richfield silty clay loam. The soil test recommendation for our 35 bu/a yield goal was 0 lb N/a and 40 lb P_2O_5/a; no other nutrients were required. The soil test analysis is as follows:

Table .-Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe	Mn	Cu
		mmhos/cm	%	-------------------------			ppm	------------------------		
0-8”	7.8	0.8	1.3	11	2.1	390	0.6	5.1	15	2.5
8-24”				17						

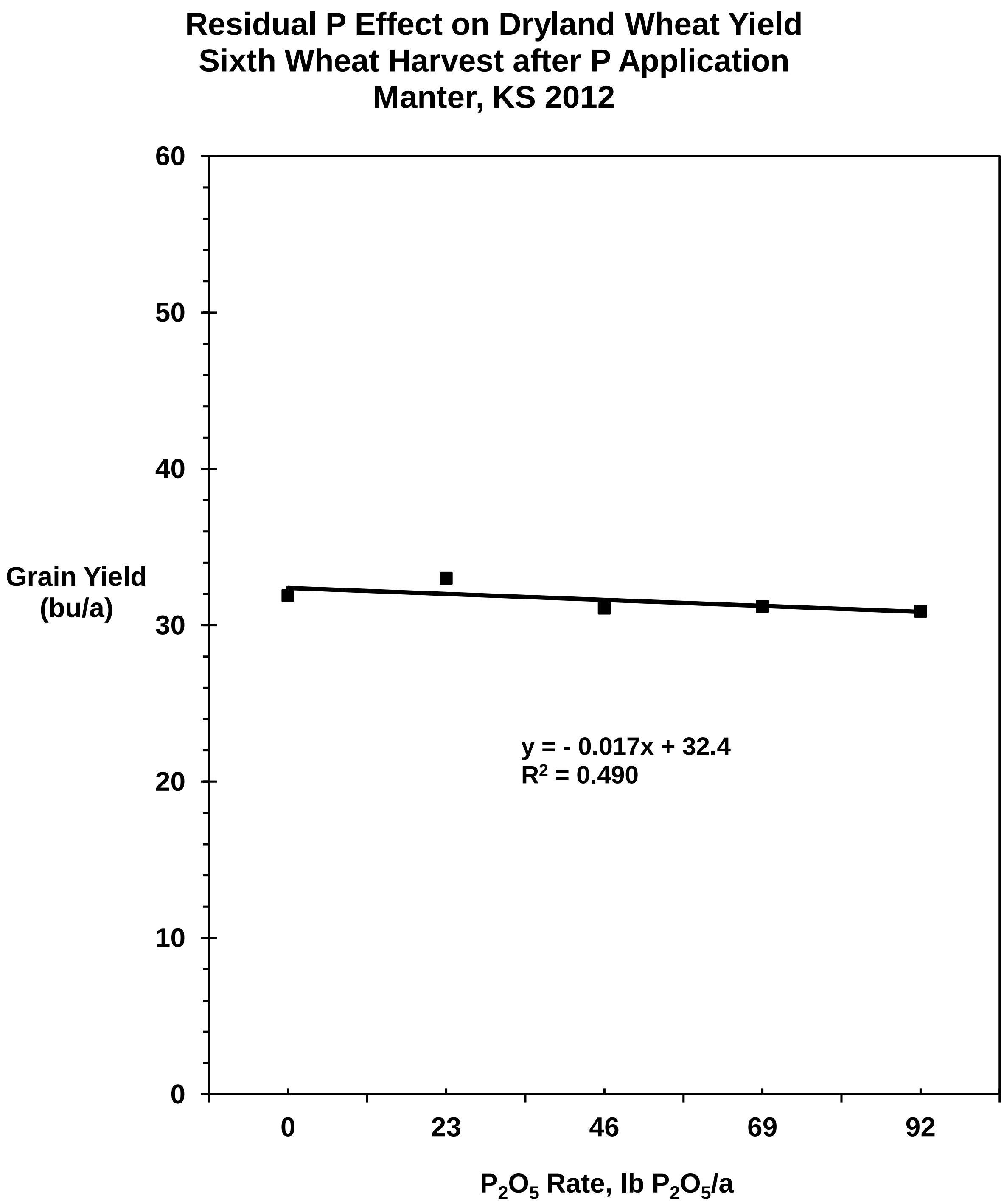


Fig. . Yield of long term P on dryland wheat, sixth wheat crop after P application, at Manter. P treatment are 0, 23, 46, 69, and 92 lb P_2O_5/a applied with a chisel with shanks 18 in. apart to a 6 in. depth on July 13, 2001. Grain yields were adjusted to 12% seed moisture content.

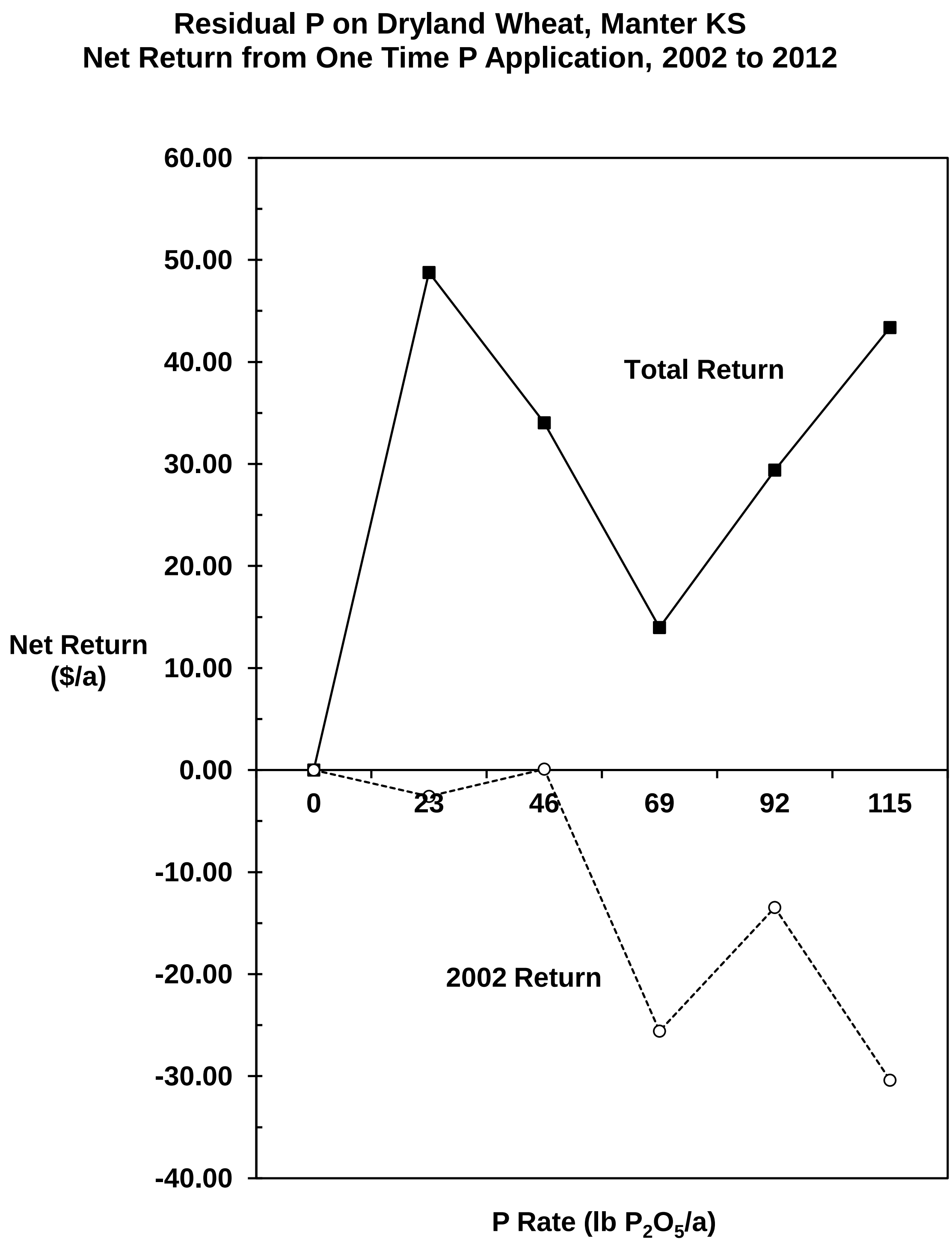


Fig. . Net return of long term P on dryland wheat, sixth wheat crop after single P application, at Manter. P treatments were 0, 23, 46, 69, 92, and 115 lb P_2O_5/a applied with a chisel with shanks 18 in. apart to a 6 in. depth on July 13, 2001. Total return is sum from 2002 to 2012 wheat crops.

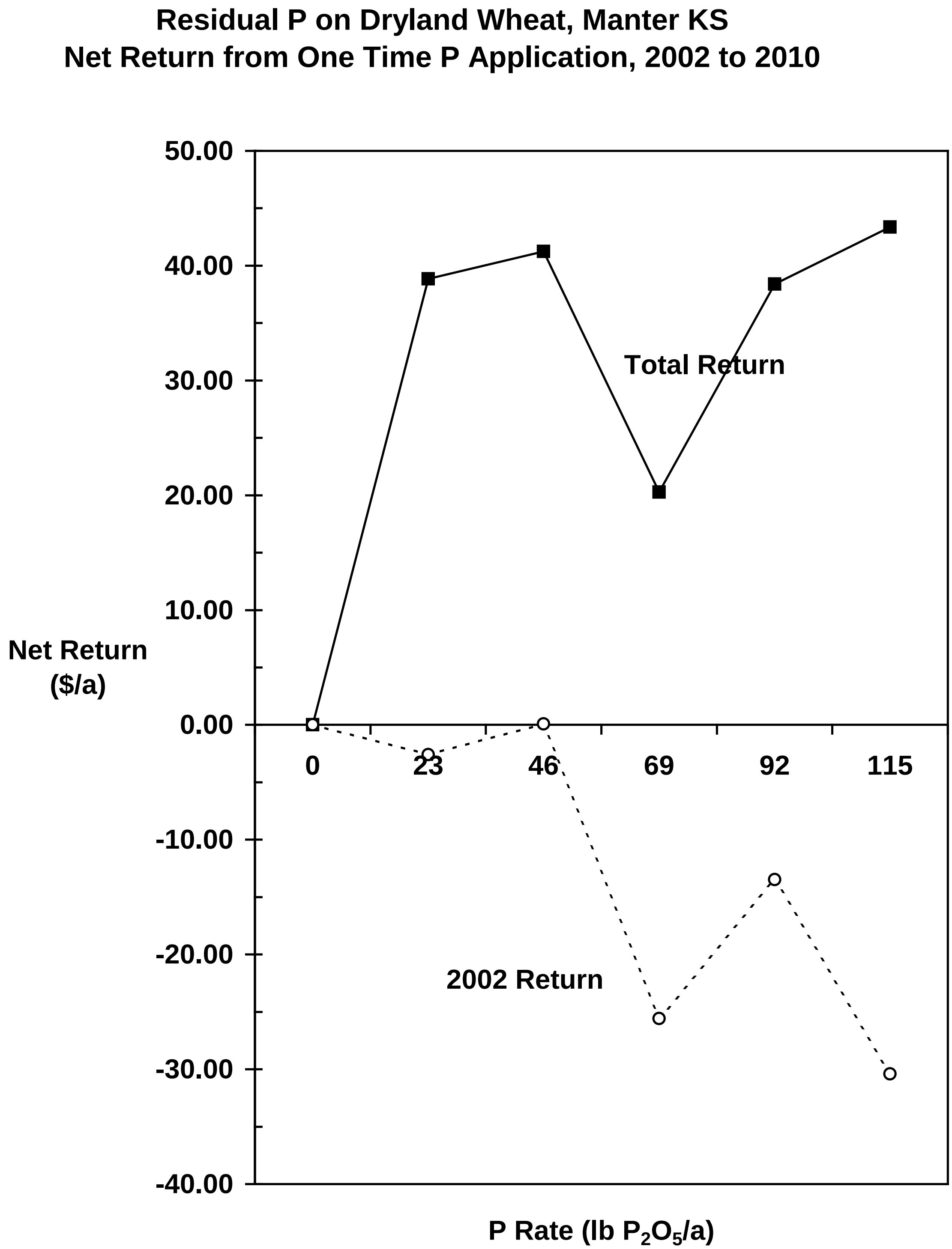


Fig. . Net return of long term P on dryland wheat, fifth wheat crop after single P application, at Manter. P treatments were 0, 23, 46, 69, 92, and 115 lb P_2O_5/a applied with a chisel with shanks 18 in. apart to a 6 in. depth on July 13, 2001. Total return is sum from 2002 to 2010 wheat crops.

Dryland Corn Seeding Rate, Walsh, 2012

Kevin Larson and Brett Pettinger

The reintroduction of dryland corn into well established dryland grain sorghum production areas in Southeastern Colorado has not been without problems. In the early 1990s, some the first adopters used relatively high seeding rates for our dryland conditions. The problem was that the high seeding rates (16,000 to 20,000 seeds/a) worked quite well during the wet decade of the 1990s. The decade of the 2000s was much drier and these high dryland corn seeding rates frequently failed to produce adequate crops. Dryland corn production practices that counter these drier times are needed. There has been little interest from corn seed companies to investigate low population corn production. This dryland corn seeding rate study is a response to growers' requests for a low seeding density trial.

Materials and Methods

We tested ten dryland corn seeding rates: 6, 7, 8, 9, 10, 12, 14, 16, 18 and 20 seeds/a X 1000. We planted Mycogen 2V715 on May 22 with an eight row John Deere vacuum planter on 30 in. row spacing into no-till wheat stubble. Plot size was four rows, 500 ft. long with two replications. To attain the low populations, we plugged alternate seed cells in four of the eight planting plates. This allowed us to plant standard seeding rates in four rows and half of the standard seeding rate in the other four rows. We fertilized the site with 50 lb N/a and we seedrow applied 5 gal/a of 10-34-0 and 0.38 lb Zn/a. Weed control was achieved with pre and post emergence herbicides (pre, glyphosate 28 oz/a, Dual Magnum 1.33 pts/a, atrazine 1.0 lb/a; post, Glystar Plus 30 oz/a, dicamba 6 oz/a). We harvested the two center rows in each plot for grain yield on October 21 with a self-propelled combine equipped with a digital scale. Grain yields were adjusted to 15.5% moisture content.

Results and Discussion

The 6,000 seeds/a rate, the lowest seeding rate tested, produced the highest yield (25 bu/a). The highest seeding rate tested, 20,000 seeds/a, produced very few ears and negligible grain yield (2 bu/a). There was a significant linear decline in grain yield with increasing seeding rates ($R^2 = 0.892$).

Rainfall for this past growing season was average (11.68 in. for 2012 and 11.83 in. for 30-year average from June to October). However, the corn crop appeared droughty, in part because the crop began with a marginal soil water profile. The previous year was one of the driest on record and it left little soil water for this year's crop. Agronomists at the Central High Plains Research Station at Akron (Nielsen, Vigil, and Benjamin, 2011), developed available water and crop yield models for many crops. For dryland corn, their model states that it takes 9.1 in. of available water before the crop produces yield. For every inch of available water beyond the 9.1 in. threshold, the corn crop produces 10.4 bu of grain yield. Using their model, we calculated that our 25 bu/a corn crop should have used 11.4 in. of water (9.1 in. for threshold and 2.4 in. for grain). This 11.4 in. of available water is quite close to our 11.68 in. of rainfall. Therefore, with average rainfall and marginal soil water profile, we should not have been surprised that our lowest seeding rate produced the highest yield of 25 bu/a. Based on the results from this year and that it required average precipitation to obtain even marginal corn yields, we recommend using low corn seeding rates (below 12,000 seeds/a) for our dryland conditions.

Literature Cited:

Nielsen, David C., Vigil, Merle F., and Benjamin, Joseph G. 2011. Evaluating decision rules for dryland rotation crop selection. Field Crops Research 120 (2011): 254-261.

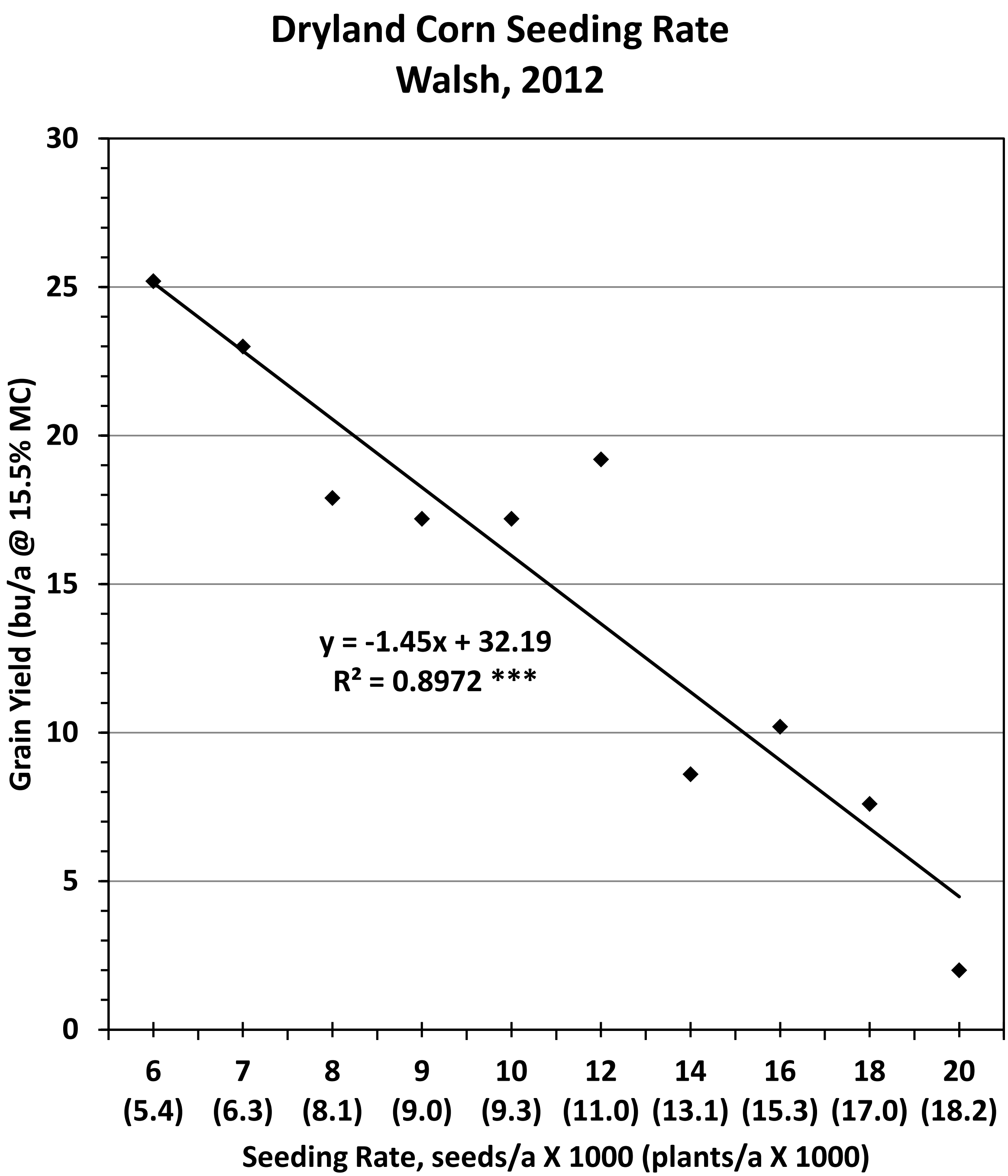


Fig. 1. Grain yield of corn seeding rate study at Walsh. Seeding rates were 6, 7, 8, 9, 10, 12, 14, 16, 18 and 20 seeds/a X1000. The corn hybrid was Mycogen 2V715 planted on May 22, 2012.

Dryland Grain Sorghum Seeding Rate and Seed Maturation, Brandon, 2012

Kevin Larson and Brett Pettinger

In Eastern Colorado, dryland seeding rates vary greatly from 20,000 to 60,000 seeds/a. Lower seeding rates are typically used in the extreme southeastern part of the state where the growing season is longer, and higher seeding rates are used northward where the growing season is shorter. With lower seeding rates, abundant tillering is expected, whereas with higher seeding rates single headed plants are desired. We have observed that the main head on a sorghum plant matures earlier and more uniformly than its tillers. To determine if there are yield and maturation benefits from increased seeding rates at a short season site, we tested a wide range of seeding rates using an early maturing and a medium early maturing grain sorghum hybrid.

Materials and Methods

The six seeding rates we tested were 20, 30, 40, 50, 60, and 70 seeds/a X 1000. We planted on June 1 with a four-row cone planter on 30 in. row spacing. The early maturing grain sorghum hybrid was Mycogen 1G557 and the medium early grain sorghum hybrid was DeKalb DK39Y. The site was fertilized with 60 lb N/a and 5 gal/a 10-24-0, 6 S, 0.1 Zn. Weed control was achieved with pre and post emergence herbicides (pre, glyphosate 32 oz/a, Metal 1.5 pts/a, atrazine 0.9 lb/a; post, 2,4-D amine 0.5 lb/a applied with drops). We harvested the study on October 29 with a self-propelled combine equipped with a digital scale. Grain yields were adjusted to 14% moisture content.

Results and Discussion

Both the early maturing hybrid and the medium early maturing hybrid had their optimum yields around 50,000 to 55,000 seeds/a (around 24,000 to 25,000 plants/a). The high seeding rate optimum is partly attributable to earlier and more uniform seed maturation from increased numbers of single headed plants. Time to maturation was shortened with increased seeding rates for both the early hybrid and the medium early hybrid. For each 10,000 seeds/a increment, between 20,000 and 70,000 seeds/a, maturation time was shortened by approximately one day. The reason this occurred was because of reduced tillering. High seeding densities produce more single headed plants than lower seeding densities, and single headed plants mature earlier and more uniformly than plants with multiple tillers.

Last year, we tested a medium early hybrid on the late side of its class and it did not mature before the first freeze. This year, we selected a medium early hybrid on the early side of its class and it matured before the first freeze. Not only did this medium early hybrid mature before the first freeze, it exhibited the shortened time to maturation response to increasing seeding rate like the early maturing hybrid. Shortening maturation time by increasing seeding rates is a tool sorghum growers can utilize when planting late, or when planting in short season conditions.

Table .-Dryland Grain Sorghum Seeding Rate Study at Brandon, 2012.

Seeding Rate	Plant Density	Flowering Date	Maturation Date	Plant Height	Plant Lodging	Test Weight	Grain Yield
seeds/a (X1000)	plants/a (X1000)	DAP	DAP	In	%	lb/bu	bu/a
Early Maturing Hybrid							
20	11.1	71.0	115.3	32	0.5	60	38.4
30	15.3	69.3	114.0	32	0.8	60	46.6
40	19.8	70.0	115.0	32	1.3	60	47.5
50	25.2	68.3	112.3	33	1.3	59	45.9
60	30.7	66.3	111.7	33	2.0	60	51.2
70	35.2	65.7	111.7	34	2.3	59	46.6
Early Average	22.9	68.4	113.3	33	1.4	59	46.0
Medium Early Maturing Hybrid							
20	9.0	72.7	118.0	32	0.5	59	36.9
30	12.8	72.0	117.3	32	0.6	58	40.8
40	18.0	71.0	116.0	33	1.5	59	54.5
50	22.2	70.3	115.7	33	1.8	58	49.5
60	26.1	69.3	113.3	34	5.0	60	48.7
70	32.0	68.0	113.0	34	4.3	59	51.8
Medium Early Average	20.0	70.6	115.6	33	2.3	59	47.0

Planted: June 1; Harvested: October 29, 2012.
Early Maturing Hybrid: Mycogen 1G557.
Medium Early Hybrid: Monsanto DK39Y.
Grain yields were adjusted to 14% seed moisture content.

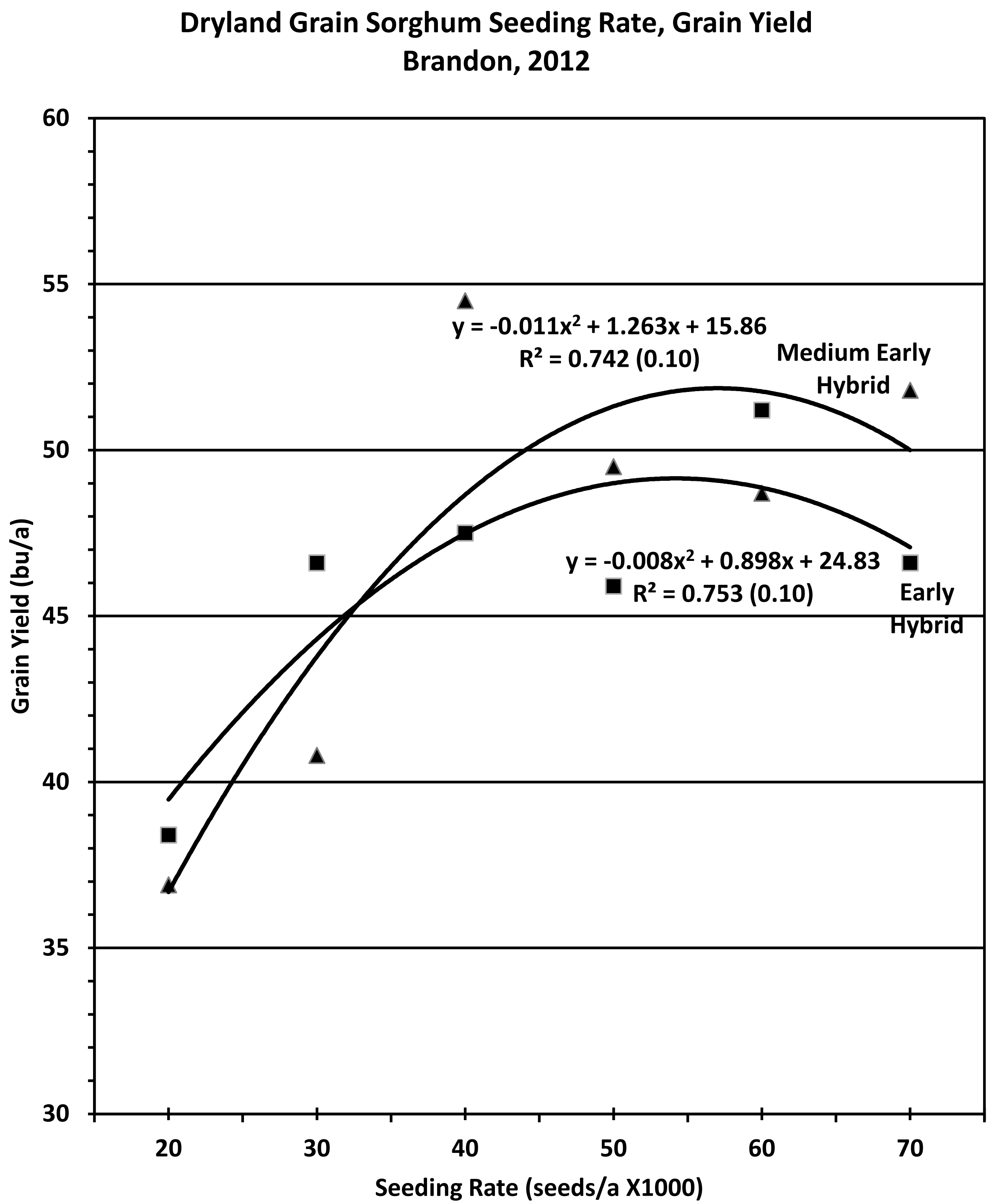


Fig. 1. Grain yield of dryland grain sorghum seeding rate study at Brandon. Seeding rates were 20, 30, 40, 50, 60, and 70 seeds/a X1000. The early maturing hybrid was Mycogen 1G557 and the medium early maturing hybrid was Monsanto DK39Y planted on June 1, 2012.

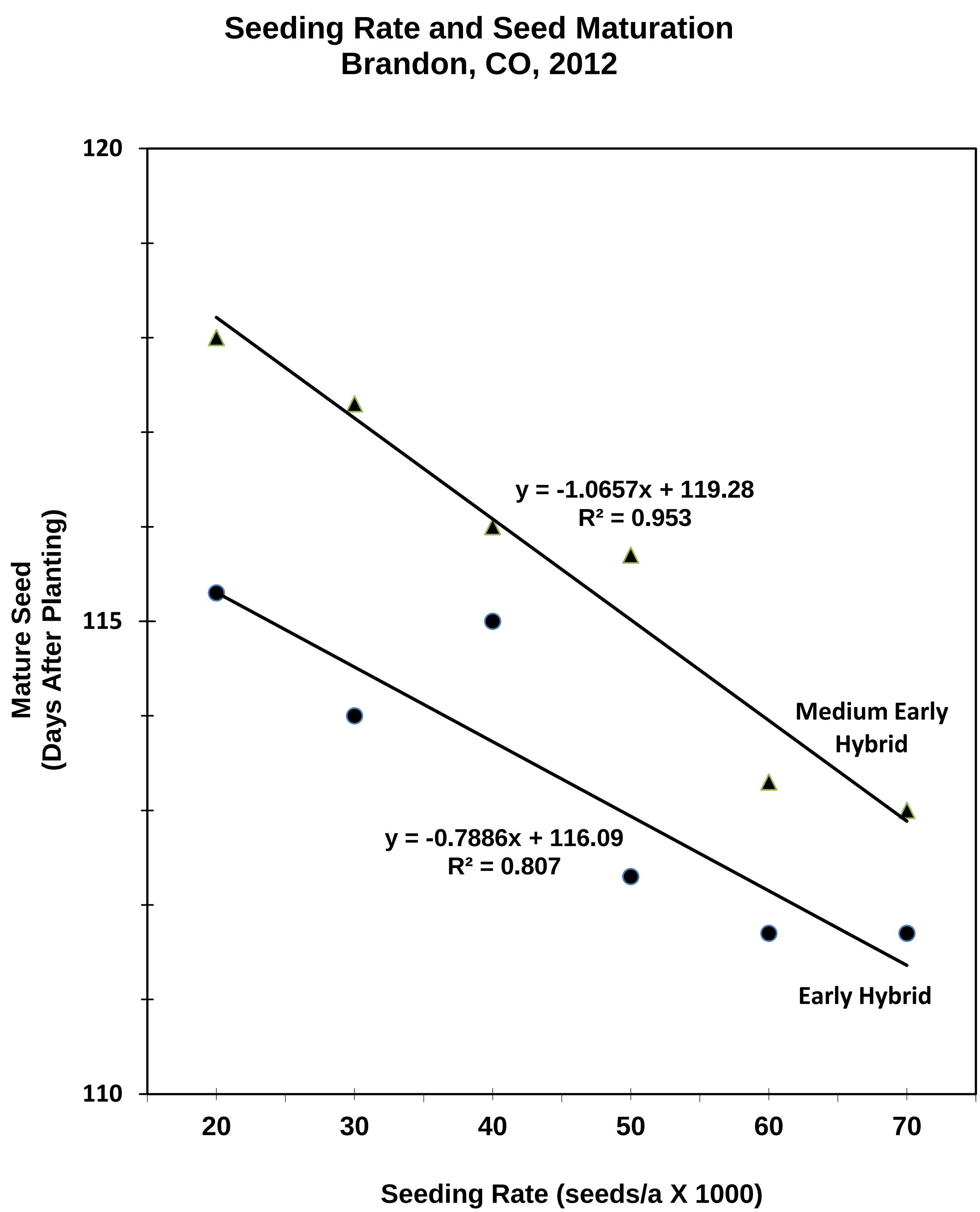


Fig. 2. Dryland grain sorghum seeding rate and days to seed maturation at Brandon. The seeding rates were 20, 30, 40, 50, 60, and 70 seeds/a (X1000). The early maturing grain sorghum hybrid was Mycogen 1G557 and the medium early grain sorghum hybrid was Monsanto DK39Y planted June 1, 2012.

Dryland Grain Sorghum Hybrid Performance Trial at Brandon, 2012

COOPERATOR: Burl Scherler, Sand Creek, Inc., Brandon, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3000 sorghum heat units in loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 43,600 seed/a. PLANTED: June 1. HARVESTED: October 29.

PEST CONTROL: Preemergence Herbicides: Glyphosate 32 oz/a, Atrazine 0.9 lb/a, Metal 24 oz/a. Post Emergence Herbicides: 2,4-D amine (with drops). CULTIVATION: None. INSECTICIDES: None.

FIELD HISTORY: Previous Crop: Wheat. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1
Chivington, Kiowa County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------no. of days--------		
June	0.99	796	20	13	30
July	0.97	926	28	19	61
August	1.21	744	22	4	92
September	0.56	525	10	0	122
October	0.00	26	0	0	124
Total	3.73	3017	80	36	124

\1 Growing season from June 2 (planting) to October 2 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture. Weed control was excellent. The growing season was very dry. No greenbug infestation. Yields and test weights were good, especially considering the lack of precipitation. Because of the dry weather, particularly late in the season, later maturing hybrids did not fully mature and subsequently had low test weights and poor yields.

SOIL: Loam for 0-8” and loam 8”-24” depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	8.0	0.4	1.4	18	6.5	993	0.3	3.6
8”-24”				14				
Comment	Alka	VLo	Mod	Hi	Lo	VHi	VLo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	20	2	0
Applied	60	20	0	0

Yield Goal: 45 bu/a.
Actual Yield: 34 bu/a.

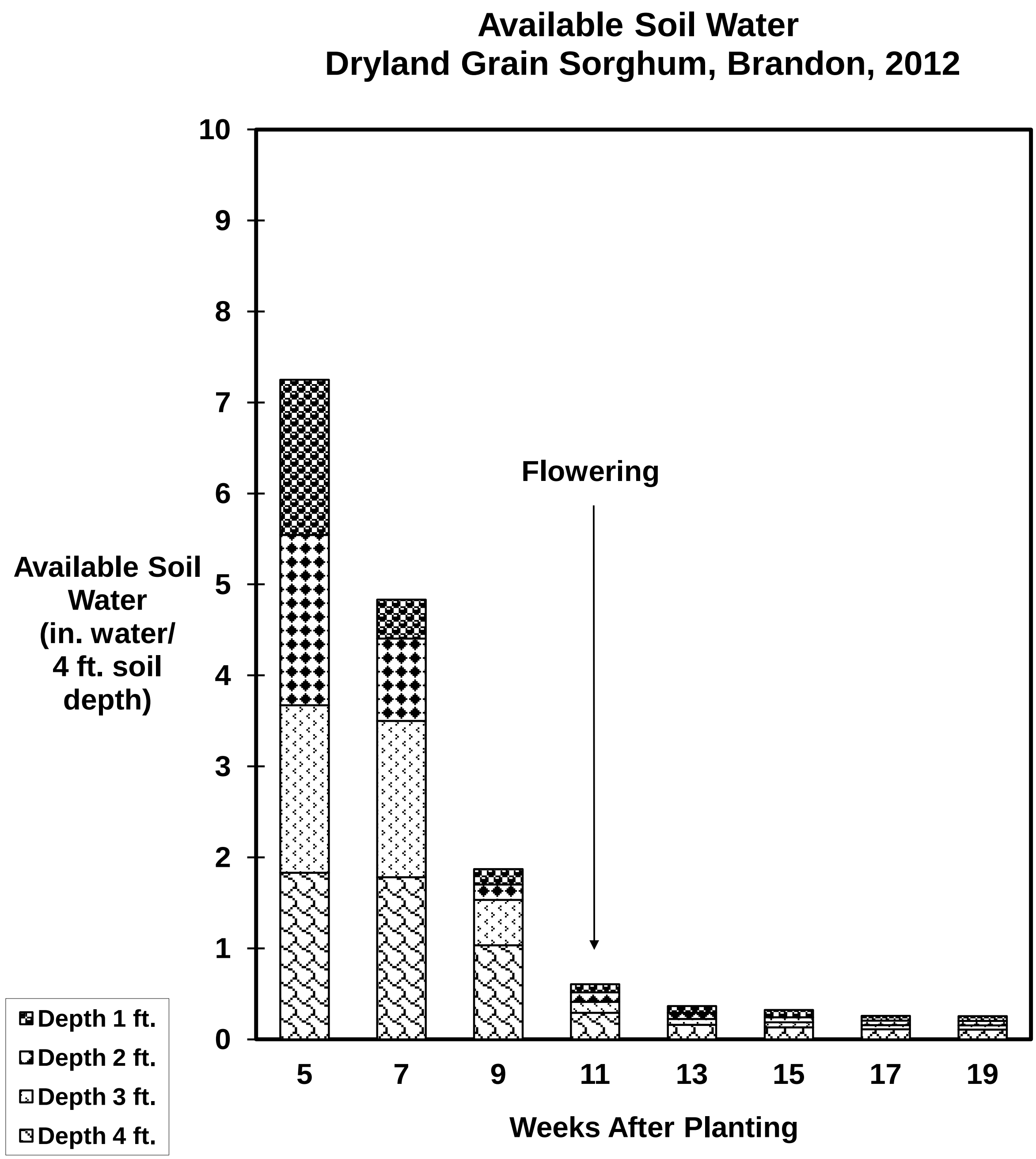


Fig. 1. Available soil water in dryland grain sorghum at Brandon. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Brandon from planting to first freeze was 3.73 in. Any increase in available soil water between weeks is from rain.

Table 2. 2012 Dryland Grain Sorghum Hybrid Performance Trial at Brandon.

Source	Hybrid	Grain Yield[a]	Yield Percent of Trial Average	Test Weight	Lodging	Harvest Plant Population	Plant Height	50% Bloom	GDD[b]	50% Mature[c]	Maturity Group[d]
		bu/ac	percent	lb/bu	percent	plants/ac	in	days after planting		days after planting	
Triumph	TR424	50.8	149	59	2	26,300	34	67	1886	113	E
Sorghum Partners	KS310	46.7	137	59	2	22,900	33	71	1993	115	E
Dekalb	DKS29-28	45.3	133	59	4	19,400	33	66	1852	111	E
Mycogen	1G557	44.8	131	58	1	22,300	32	68	1917	113	E
Dekalb	DKS28-05	40.4	118	58	4	21,300	33	73	2052	118	E
Asgrow	Pulsar	39.5	116	57	8	22,700	32	73	2052	119	E
Advanta	96275	36.4	107	58	2	17,200	30	66	1852	111	E
Sorghum Partners	251	32.8	96	57	1	21,500	29	63	1785	107	E
Syngenta	H-307	32.8	96	58	2	20,500	34	68	1917	113	E
Dekalb	DK39Y	31.2	91	56	1	15,900	34	72	2026	118	E
Triumph	TR438	45.0	132	57	1	17,400	37	80	2197	121	ME
Dekalb	DKS44-20	38.2	112	56	6	19,200	36	81	2215	123	ME
Mycogen	627	34.7	102	55	1	17,600	36	81	2215	123	ME
Mycogen	1G600	30.3	89	54	1	18,200	36	80	2197	122	ME
Sorghum Partners	NK5418	27.3	80	55	0	19,800	36	82	2235	122	ME
Triumph	TR452	26.2	77	54	1	19,000	36	82	2235	123	ME
Dekalb	DKS37-07	24.1	71	54	1	25,900	36	81	2215	123	ME
Mycogen	M3838	22.2	65	53	1	18,200	34	83	2260	HD	M
Triumph	TR448	18.0	53	50	1	17,200	37	87	2347	SD	M
Advanta	97524	14.7	43	53	0	16,300	36	83	2260	HD	M
Average		**34.1**		**56**	**2**	**19,940**	**34**	**75**	**2085**		
[e]LSD (P<0.05)		9.9			2.5						
[e]LSD (P<0.20)		6.4			1.6						

[a]Yields corrected to 14% moisture and hybrids ranked by yield within maturity group.

[b]GDD: Growing degree-days to 50% bloom date.

[c]Days after planting or maturation of seed at first freeze. HD=hard dough, SD=soft dough.

[d]Maturity Group: E=early; ME=medium-early; M=medium.

[e]If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Table 3. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Brandon, 2010-2012.

			Grain Yield					Yield as % of Test Average				
Brand	Hybrid	Maturity Group	2010	2011	2012	2-Year Avg	3-Year Avg	2010	2011	2012	2-Year Avg	3-Year Avg
			bu/a					%				
ASGROW	Pulsar	E	70	22	40	31	44	104	115	116	115	110
DEKALB	DKS37-07	ME	61	--	24	--	--	91	--	71	--	--
DEKALB	DKS29-28	E	69	--	45	--	--	103	--	133	--	--
DEKALB	DKS28-05	E	80	37	40	39	52	105	197	118	143	131
MYCOGEN	1G557	E	78	26	45	36	50	116	139	131	131	124
MYCOGEN	M3838	ME/M	48	13	22	18	28	71	67	65	65	69
SORGHUM PARTNERS	KS310	E	79	32	47	40	53	118	172	137	146	132
SORGHUM PARTNERS	251	E	55	11	33	22	33	81	57	96	81	83
SORGHUM PARTNERS	NK5418	ME/M	60	21	27	24	36	90	111	80	89	90
SORGHUM PARTNERS	K35-Y5	E/ME	72	25	--	--	--	108	132	--	--	--
SORGHUM PARTNERS	SP3303	E	60	10	--	--	--	89	52	--	--	--
TRUIMPH	TR424	E	76	32	51	42	53	114	172	149	154	133
TRUIMPH	TR452	ME	66	--	26	--	--	98	--	77	--	--
Average			66	19	34	27	40					

Maturity Group: E, early; ME, medium early; M, medium.

Grain Yields were adjusted to 14.0% seed moisture content.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3700 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 43,600 seed/a. PLANTED: May 29. HARVESTED: October 25.

PEST CONTROL: Preemergence Herbicides: Atrazine 1lb/a, Dual II Magnum 21 oz/a, Glyphosate, 28 oz/a; 2,4-D, 0.5 lb/a, Banvel 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Banvel 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: Once. INSECTICIDES: None.

FIELD HISTORY: Previous Crop: Wheat. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------no. of days--------		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.36	537	8	0	125
October	0.86	167	0	0	143
Total	11.68	3266	71	22	143

\1 Growing season from May 29 (planting) to October 18 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Sandbur control was poor; broadleaf weed control was good. The growing season precipitation was average, but variable (June was wet and July was dry). Grain yields were fair, but variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8” and silt loam 8”-24” depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	8.0	0.4	2.1	16	7.0	973	0.6	3.3
8”-24”				34				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 45 bu/a.
Actual Yield: 25 bu/a.

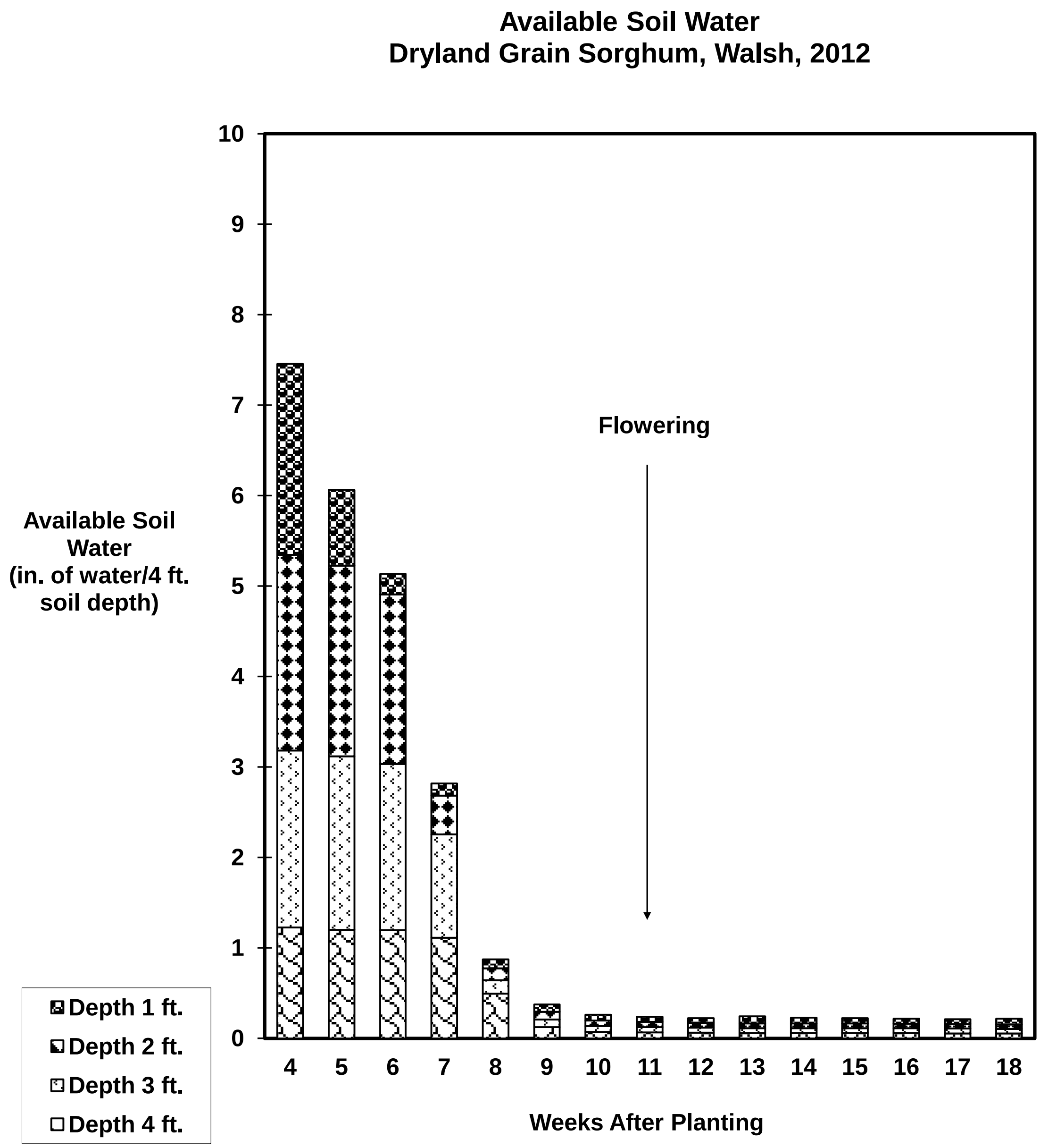


Fig. 2. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.76 in. Any increase in available soil water between weeks is from rain.

Table 4. 2012 Dryland Grain Sorghum Hybrid Performance Trial at Walsh.

Source	Hybrid	Grain Yield[a]	Yield Percent of Trial Average	Test Weight	Harvest Plant Population	Plant Height	Emergence	50% Bloom	GDD[b]	50% Mature[c]	Maturity Group[d]
		bu/ac	percent	lb/bu	plants/ac	in	days after planting	days after planting		days after planting	
Triumph	TR424	37.2	149	61	25,900	33	12	65	1812	102	E
Dekalb	DK39Y	31.2	125	62	19,800	34	13	67	1879	106	E
Advanta	96275	29.8	120	57	21,500	33	12	61	1677	99	E
Dekalb	DKS29-28	29.7	119	61	25,900	32	13	63	1745	102	E
Asgrow	Pulsar	25.7	103	61	24,200	30	12	68	1910	109	E
Dekalb	DKS28-05	25.3	102	59	25,800	25	12	68	1910	106	E
Sorghum Partners	KS310	24.4	98	59	27,100	30	12	69	1929	107	E
Mycogen	1G557	19.5	78	59	24,400	31	12	63	1745	101	E
Sorghum Partners	251	18.4	74	58	26,700	29	12	58	1584	96	E
Dekalb	DKS44-20	35.6	143	61	25,600	36	12	75	2098	119	ME
Dekalb	DKS37-07	29.2	117	56	26,300	32	12	77	2155	121	ME
Triumph	TR438	28.8	116	60	27,700	35	13	70	1955	108	ME
Triumph	TR452	25.3	102	60	25,000	36	12	76	2132	114	ME
Sorghum Partners	NK5418	21.8	88	57	22,100	35	13	77	2155	121	ME
Mycogen	627	15.0	60	58	23,600	32	13	76	2132	114	ME
Mycogen	1G600	13.2	53	57	22,300	33	12	76	2132	115	ME
Triumph	TR448	23.2	93	55	25,200	33	13	80	2233	125	M
Mycogen	M3838	20.1	81	56	27,500	36	13	78	2184	122	M
Advanta	97524	19.8	80	56	23,000	34	13	80	2233	124	M
Average		**24.9**		**59**	**24,716**	**33**	**12**	**71**	**1979**	**111**	
[e]LSD (P<0.05)		**20.6**									
[e]LSD (P<0.20)		13.3									

[a]Yields corrected to 14% moisture and hybrids ranked by yield within maturity group.

[b]GDD: Growing degree-days to 50% bloom date.

[c]Days after planting or maturation of seed at first freeze.

[d]Maturity Group: E=early; ME=medium-early; M=medium.

[e]If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Table 5. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Walsh, 2010-2012.

			Grain Yield					Yield as % of Test Average				
Brand	Hybrid	Maturity Group[a]	2010	2011	2012	2-Year Avg	3-Year Avg	2010	2011	2012	2-Year Avg	3-Year Avg
			------------------bu/a------------------					----------------------%----------------------				
ASGROW	Pulsar	E	88	--	26	--	--	98	--	103	--	--
DEKALB	DKS44-20	ME	--	56	36	46	--	--	130	143	135	--
DEKALB	DKS37-07	ME	91	48	29	39	56	102	111	117	113	108
DEKALB	DKS29-28	E	80	--	30	--	--	89	--	119	--	--
DEKALB	DKS28-05	E	80	--	25	--	--	97	--	102	--	--
MYCOGEN	M3838	ME/M	88	31	20	26	46	99	72	81	75	89
MYCOGEN	1G557	E	--	49	20	35	--	--	113	78	101	--
SORGHUM PARTNERS	KS310	E	79	43	24	34	49	89	99	98	99	94
SORGHUM PARTNERS	251	E	57	32	18	25	36	63	75	74	74	69
SORGHUM PARTNERS	NK5418	ME/M	112	63	22	43	66	126	144	88	125	126
SORGHUM PARTNERS	K35-Y5	E/ME	95	47	--	--	--	107	108	--	--	--
SORGHUM PARTNERS	SP3303	E	64	34	--	--	--	72	78	--	--	--
TRUIMPH	TR424	E	83	48	37	43	56	93	111	149	125	108
TRUIMPH	TR438	ME	100	50	29	40	60	112	115	116	116	115
TRUIMPH	TR448	M	93	--	23	--	--	104	--	93	--	--
TRUIMPH	TR452	ME	108	--	25	--	--	121	--	102	--	--
(Check)	399 X 2737	M	101	15	--	--	--	113	35	--	--	--
Average			89	43	25	34	52					

[a]Maturity Group: E, early; ME, medium early, M, medium.

Grain Yields were adjusted to 14.0% seed moisture content.

The site was pre-irrigated with furrow irrigation in 2011.

Dryland Forage Sorghum Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3250 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 69,700 seed/a. PLANTED: May 29. HARVESTED: September 28.

PEST CONTROL: Preemergence Herbicides: Atrazine 1 lb/a, Glyphosate 28 oz/a, 2,4-D 0.5 lb/a, Dicamba 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Dicamba 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: Once. INSECTICIDES: None.

FIELD HISTORY: Previous Crop: Canola. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------no. of days--------		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.16	517	8	0	123
Total	11.48	3246	71	22	123

\1 Growing season from May 29 (planting) to September 28 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Sandbur control was poor; broadleaf weed control was good, except for a late infestation of puncture vine. The growing season precipitation was average, but variable (June was wet and July was dry). Forage yields were poor and variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8" and silt loam 8"-24" depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8"	8.0	0.4	2.1	16	7.0	973	0.6	3.3
8"-24"				34				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 8 tons/a.
Actual Yield: 2.33 tons/a.

Table 10. 2012 Dryland Forage and Sweet Sorghum Variety Performance Trial at Walsh.

Source	Variety	Forage Yield[a]	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group[b]
		tons/ac	percent	in	percent at harvest		
Eastern CO Seeds	HPECS12EXP	3.76	13.9	6.8	0.0	Forage	ME
Eastern CO Seeds	HP99BMR	3.36	14.1	8.6	25.0	Forage	ME
Eastern CO Seeds	HP85BMR	2.91	14.9	8.3	0.0	Forage	E
Gayland Ward Seed	Super Sugar	2.79	18.0	15.4	75.0	Sweet	E
Richardson Seeds	X38400	2.68	13.8	18.0	50.0	Sorghum x Sudan	ME
AERC	CSSPM-7	2.59	12.1	11.9	87.5	Pearl Millet	E
Eastern CO Seeds	HP1010BMR	2.46	12.8	14.3	12.5	Forage	L
Eastern CO Seeds	HP95BMR	2.38	13.2	24.5	0.0	Forage	ME
Chromatin	FS0000HS	2.28	13.3	9.4	0.0	Forage	P
Chromatin	FS00991	2.24	13.8	11.9	0.0	Forage	L
Richardson Seeds	X36400	2.21	14.1	15.5	0.0	Hybrid Forage	L
Richardson Seeds	Silo 700D	2.06	13.6	8.8	12.5	Hybrid Forage	ML
Gayland Ward Seed	Sweet for Ever	2.01	13.3	11.6	12.5	Sweet	P
Chromatin	FS00504	1.99	12.9	17.0	12.5	Forage	L
Eastern CO Seeds	HP120BMR	1.70	14.0	11.7	0.0	Forage	L
AERC	CSSH-45	1.14	15.1	24.1	75.0	Sweet	E
Chromatin	FS0000HT	0.98	13.2	18.1	0.0	Forage	P
Average		**2.33**	**13.9**	**13.9**	**21.3**		
[c]LSD (P<0.05)		1.94					
[c]LSD (P<0.20)		1.30					

[a]Yields are adjusted to 70% moisture content based on oven-dried samples.

[b]Maturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

[c]If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2012

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3250 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 113,250 seed/a. PLANTED: May 29; replanted: June 27. HARVESTED: September 28. IRRIGATION: One furrow irrigation: July 27, total applied 8 a-in./a.

PEST CONTROL: Preemergence Herbicides: Atrazine 1 lb/a, Glyphosate 28 oz/a, 2,4-D 0.5 lb/a, Dicamba 4 oz/a. Post Emergence Herbicides: Huskie 13 oz/a, Dicamba 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: Once. INSECTICIDES: None.
FIELD HISTORY: Previous Crop: Canola. FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------no. of days--------		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.16	517	8	0	123
Total	11.48	3246	71	22	123

\1 Growing season from May 29 (planting) to September 28 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Replanted on June 27 because of herbicide drift damage. Sandbur control was poor; broadleaf weed control was good, except for a late infestation of puncture vine. The growing season precipitation was average, but variable (June was wet and July was dry). Forage yields were poor and variable due to dry weather and sandbur infestation.

SOIL: Richfield silt loam for 0-8” and silt loam 8”-24” depths from soil analysis.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	7.8	0.8	2.2	37	5.0	915	0.8	3.8
8”-24”				39				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 18 tons/a.
Actual Yield: 6.44 tons/a @ 70% MC.

Table 11. 2012 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Walsh.

Source	Variety	Forage Yield[a]	Brix (Stem Sugar)	Plant Height	Flowering	Type	Maturity Group[b]
		tons/ac	percent	in	percent at harvest		
Chromatin	FS0000HT	9.20	10.4	36.3	37.5	Forage	P
Chromatin	FS00504	9.15	11.2	39.5	75.0	Forage	L
AERC	CSSPM-7	8.55	12.5	44.2	100.0	Pearl Millet	E
AERC	CSSH-45	8.11	11.7	42.2	75.0	Sweet	E
Chromatin	FS0000HS	6.86	10.4	17.6	0.0	Forage	P
Gayland Ward Seed	Sweet for Ever	6.70	10.6	25.3	50.0	Sweet	P
Richardson Seeds	X38400	6.65	10.1	28.5	75.0	Sorghum x Sudan	ME
Eastern CO Seeds	HP99BMR	6.60	9.9	26.8	37.5	Forage	ME
Richardson Seeds	Silo 700D	6.59	12.2	24.4	37.5	Hybrid Forage	ML
Eastern CO Seeds	HP85BMR	6.15	10.2	32.9	75.0	Forage	E
Eastern CO Seeds	HP120BMR	6.06	10.6	15.8	0.0	Forage	L
Eastern CO Seeds	HP95BMR	6.03	10.3	32.1	50.0	Forage	ME
Gayland Ward Seed	Super Sugar	5.95	14.3	38.9	100.0	Sweet	E
Chromatin	FS00991	4.66	11.0	16.1	0.0	Forage	L
Richardson Seeds	X36400	4.35	11.7	17.1	0.0	Hybrid Forage	L
Eastern CO Seeds	HP1010BMR	4.19	12.1	17.0	12.5	Forage	L
Eastern CO Seeds	HPECS12EXP	3.76	12.3	12.5	0.0	Forage	ME
Average		**6.44**	**11.3**	**27.5**	**42.6**		
[c]LSD (P<0.05)		3.35					
[c]LSD (P<0.20)		2.08					

[a]Yields are adjusted to 70% moisture content based on oven-dried samples.

[b]Maturity Group: E=early; ME=medium-early; ML=medium-late; L=late, P=Photoperiod sensitive.

[c]If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

Weed Control Efficacy of Huskie in Grain Sorghum at Walsh, 2012

COOPERATORS: Bayer CropScience; Kevin Larson, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To evaluate Huskie for post emergence weed control in grain sorghum.

RESULTS: The 16 oz/a treatment of Huskie provided 98% to 100% control of Russian thistle, kochia, and devil's claw compared to the untreated control. Huskie treatments caused slight crop injury (bleaching of leaves) but the effects were only about half as noticeable 15 days after treatment. There was no significant yield difference between the Huskie treatments and the untreated control.

PLOT: Four rows with 30" row spacing, 50 ft. long with 3 replications. SEEDING DENSITY: 40,000 seeds/a. PLANTED: May 29. HYBRID: Mycogen 627. HARVESTED: November 5, 2012.

SITE PEST CONTROL: CULTIVATION: Once. INSECTICIDE: None.

TREATMENT APPLICATION: Backpack CO_2 sprayer at 20 psi and 20 gal/a. All treatments applied July 10, grain sorghum 12 in. tall with 7 leaves.
FIELD HISTORY: Last Crop: Wheat.
FIELD PREPARATION: No-till.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
May	0.00	37	0	0	3
June	3.94	783	15	9	33
July	1.61	942	27	7	64
August	2.91	800	21	6	95
September	2.36	537	8	0	125
October	0.86	167	0	0	143
Total	11.68	3266	71	22	143

\1 Growing season from May 29 (planting) to October 18 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in adequate soil moisture for seed germination and stand establishment. Huskie performed well on Russian thistle and devil's claw providing at least 88% control 35 days after application. Kochia was present in about one plot per treatment; therefore, the kochia control is observation only. The growing season was dry (79% of 30 year average) and viable. Grain yields were poor and variable due to dry weather and sandbur infestation.

SOIL: Silty Clay Loam for 0-8" and Silty Clay Loam 8"-24" depths from soil analysis.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8"	8.0	0.4	2.1	16	7.0	923	0.6	3.3
8"-24"				34				
Comment	Alka	VLo	VHi	Hi	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 45 bu/a.
Actual Yield: 8 bu/a.

Table .--Huskie on Grain Sorghum, Crop Injury, Plainsman, Walsh, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	4 DAT Crop Injury %	10 DAT Crop Injury %
1 Untreated				0	0
2 Huskie	256.875	13	oz/a	7	4
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	11	5
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	6	4
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	7	5
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	10	4
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	8	4
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	10	5
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				7	4
LSD 0.05				2.3	1.9

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Table .-Huskie on Grain Sorghum, Russian Thistle Control, Walsh, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	15 DAT RT Control %	35 DAT RT Control %
1 Untreated				0	0
2 Huskie	256.875	13	oz/a	90	87
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	100	100
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	99	93
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	94	88
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	65	50
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	60	53
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	80	72
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				74	68
LSD 0.05				26.2	15.7

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Table .--Huskie on Grain Sorghum, Devil's Claw Control, Walsh, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	15 DAT DC Control %	35 DAT DC Control %
1 Untreated				0	0
2 Huskie	256.875	13	oz/a	100	100
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	100	100
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	98	100
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	100	100
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	65	45
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	67	67
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	87	80
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				77	74
LSD 0.05				17.8	19.7

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Table .--Huskie on Grain Sorghum, Kochia Control, Walsh, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	15 DAT K Control %	35 DAT K Control %
1 Untreated				0	0
2 Huskie	256.875	13	oz/a	N/A	N/A
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	98	100
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	60	60
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	75	50
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	65	40
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	30	10
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	40	30
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				46	36
LSD 0.05			Only single plot observations		

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Table .--Huskie on Grain Sorghum, Sandbur Control, Walsh, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	15 DAT SB Control %	35 DAT SB Control %
1 Untreated				0	0
2 Huskie	256.875	13	oz/a	10	0
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	13	0
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	8	0
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	10	0
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	0	0
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	0	0
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	0	0
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				5	0
LSD 0.05				2.3	

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Table .--Huskie on Grain Sorghum, Grain Yield and Test Weight,
Plainsman Research Center, Walsh, Colorado, 2012.

Treatment	AI Conc.	Product Dosage	Dosage Unit	Test Weight lb/bu	Grain Yield bu/a
1 Untreated				58	6.9
2 Huskie	256.875	13	oz/a	57	7.2
2 Atrazine	480	1	pt/a		
2 Ammonium Sulfate	21	1	lb/a		
3 Huskie	256.875	16	oz/a	58	8.4
3 Atrazine	480	1	pt/a		
3 Ammonium Sulfate	21	1	lb/a		
4 Huskie	256.875	13	oz/a	58	8.6
4 Atrazine	480	1	pt/a		
4 2,4-D Ester	480	4	oz/a		
4 Ammonium Sulfate	21	1	lb/a		
5 Huskie	256.875	13	oz/a	58	7.5
5 Atrazine	480	1	pt/a		
5 Banvel	480	4	oz/a		
5 Ammonium Sulfate	21	1	lb/a		
6 Atrazine	480	1	pt/a	59	10.0
6 Bucktril 2EC	240	1	pt/a		
7 Atrazine	480	1.5	pt/a	56	4.6
7 Banvel	480	4	oz/a		
7 Crop Oil		1	qt/a		
8 Atrazine	480	1.5	pt/a	58	11.4
8 2,4-D Ester	480	4	oz/a		
8 Crop Oil		1	qt/a		
Average				58	8.1
LSD 0.05					9.13

Planted: May 29, 2012, grain sorghum hybrid Mycogen 627 at 40,000 seeds/a. Treatments applied: July 10, 2012, 10 ft. by 50 ft. with 3 replications. Grain sorghum: 7 leaves, 12 in. tall; Russian thistle: 6 in. tall, 7% coverage; kochia: 7 in. tall, 2% coverage; devil's claw: 4 in. tall, 4% coverage; sandbur: 5 in. tall, 22% coverage.

Sprinkler Irrigation Grain Sorghum Study at Walsh, 2012

COOPERATORS: Plainsman Agri-Search Foundation; K. Larson, B. Pettinger, D. Harn, C. Thompson, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify grain sorghum hybrids that produce highest yields given sprinkler irrigation.

RESULTS: The yield ranged from 33 bu/a for Sorghum Partners SP3303 to 115 bu/a for Channel 7B30. A late application of 2,4-D caused a large disparity between 2,4-D sensitive and tolerant hybrids. Hybrids sensitive to 2,4-D had low test weights and poor yield.

PLOT: Four rows with 30” row spacing, at least 600’ long. SEEDING DENSITY: 82,000 seeds/a. PLANTED: June 8. HARVESTED: November 2.

PEST CONTROL: Preemergence Herbicides: Glyphosate 28 oz/a, Sharpen 3.0 oz/a, Atrazine 1.0 lb/a; Post Herbicides: 2,4-D amine 10 oz/a. CULTIVATION: None. INSECTICIDE: None.

FIELD HISTORY: Previous Crop: Sorghum. FIELD PREPARATION: Disc.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in	--------no. of days--------			
June	1.57	0.00	618	13	9	22
July	1.61	2.50	942	27	7	53
August	2.91	10.00	800	21	6	84
September	2.36	5.00	517	8	0	114
October	0.86	0.00	167	0	0	132
Total	9.31	17.50	3044	69	22	132

\1 Growing season from June 8 (planting) to October 18 (freeze, 29F).
\2 Total in-season water from irrigation and precipitation was 26.81 in/a.
\3 GDD: Growing Degree Days for sorghum.
\4 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture for seed germination and stand establishment. Weed control was good; however, a late 2,4-D application caused head sterility and very low seed set on 2,4-D sensitive hybrids. The growing season precipitation was average, but variable (June was wet and July was dry). Grain yields and test weights were poor to good depending on the 2,4-D tolerance of the hybrid.

SOIL: Silty Clay Loam for 0-8” and Silty Clay Loam 8”-24” depths from soil analysis.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	7.8	0.7	1.7	39	2.0	937	0.7	4.4
8”-24”				57				
Comment	Alka	Vlo	Hi	VHi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	40	2	0
Applied	100	20	0.3	0

Yield Goal: 90 bu/a.
Actual Yield: 70 bu/a.

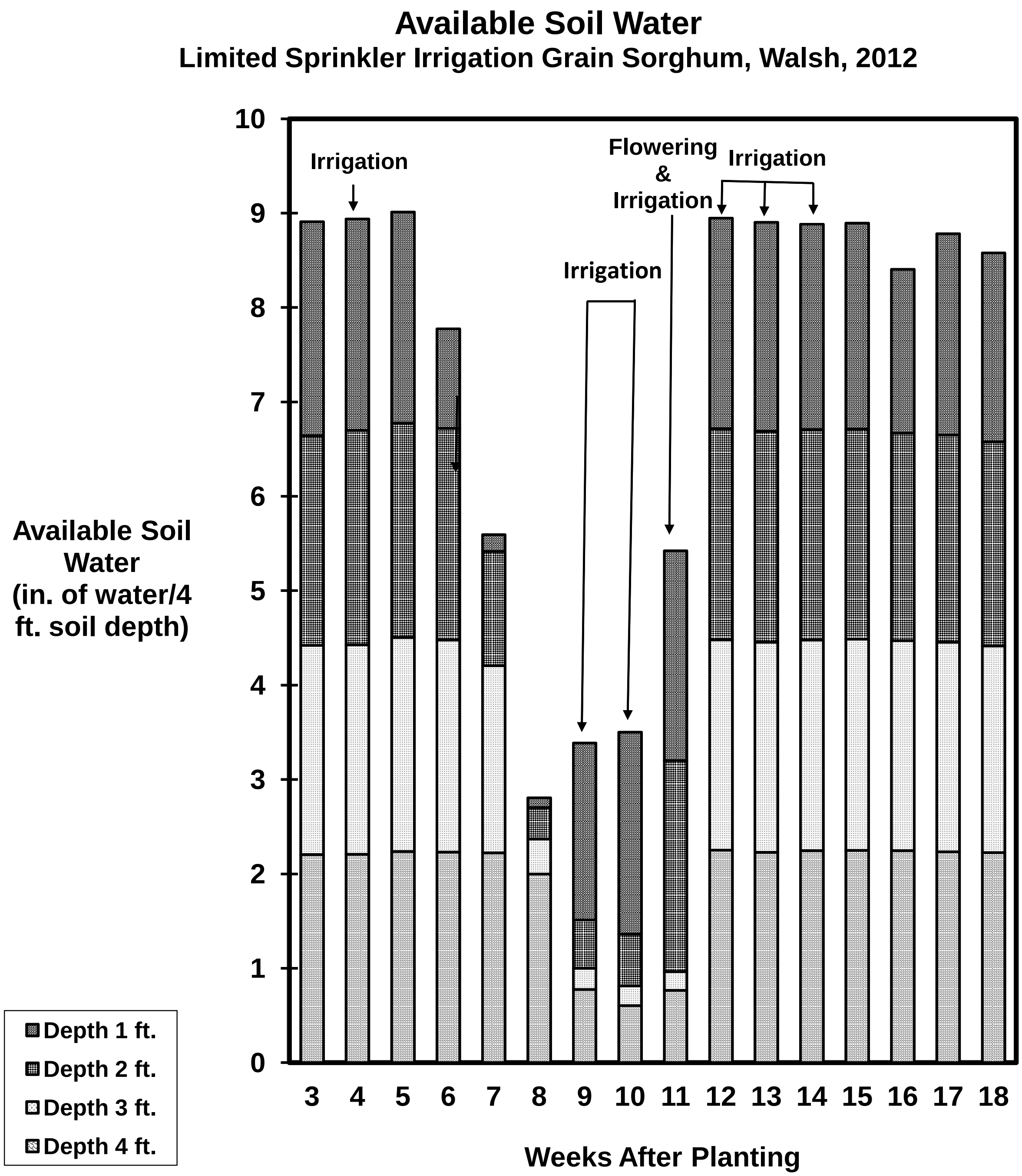


Fig. . Available soil water in limited sprinkler irrigation grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 9.31 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table .Sprinkler Irrigation Grain Sorghum, Plainsman Research Center, Walsh, 2012.

Brand	Hybrid	Grain Yield	Seed Moisture Content	Test Weight	Plant Density	Plant Height	50% Flowering Date	50% Maturity Date
		bu/a	%	lb/bu	plants/a (1000X)	in		
CHANNEL	7B30	115	13.0	60	55.3	45	8/16	10/2
MYCOGEN	627	108	11.7	59	48.9	44	8/15	9/30
SORGHUM PARTNERS	NK5418	100	13.1	60	52.1	43	8/17	10/6
TRIUMPH	TR438	86	12.2	59	50.9	44	8/9	9/24
CHANNEL	7B11	85	13.9	60	49.3	47	8/19	10/8
TRIUMPH	TR420	82	10.8	60	45.3	41	8/3	9/18
MONSANTO	DK39Y	72	11.0	56	48.1	39	8/6	9/22
TRIUMPH	TR424	67	11.0	57	48.9	40	8/3	9/18
SORGHUM PARTNERS	KS585	65	13.7	56	51.7	43	8/19	10/7
MYCOGEN	M3838	46	13.4	51	38.5	44	8/15	10/10
TRIUMPH	TR448	46	13.0	52	41.3	45	8/17	10/11
CHANNEL	6B50	37	13.6	49	49.3	45	8/15	10/7
SORGHUM PARTNERS	KS310	35	9.9	49	53.7	44	8/6	9/21
SORGHUM PARTNERS	SP3303	33	10.9	52	48.9	42	8/7	9/25
Average		70	12.2	56	48.7	43	8/11	9/29
LSD 0.20		8.2						

Planted: June 8; Harvested: November 2, 2012.
50% Flowering Date: minimum date on which a hybrid flowers on half of its population.
50% Maturity Date or maturation of seed at first freeze.
Hybrids with low yields and test weights were sensitive to a late application of 2,4-D.
The sprinkler irrigation grain sorghum received 17.5 acre-in of applied water.
Yields are adjusted to 14.0% seed moisture content.

Sprinkler Irrigation Corn Study at Walsh, 2012

COOPERATORS: Plainsman Agri-Search Foundation; K. Larson, B. Pettinger, D. Harn, C. Thompson, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify corn hybrids that produce highest yields given sprinkler irrigation.

RESULTS: The average yield for all 17 hybrids tested in this trial was 200 bu/a. All four seed firms (Garst, Mycogen, Channel, and Triumph) entered in this trial had one hybrid each that produced between 210 bu/a to 216 bu/a.

PLOT: Four rows with 30” row spacing, at least 600’ long. SEEDING DENSITY: 27,000 seeds/a. PLANTED: May 3. HARVESTED: October 22.

PEST CONTROL: Preemergence Herbicides: Balance 1.75 oz/a, Glyphosate 28 oz/a, Sharpen 3.0 oz/a, Atrazine 1.0 lb/a; Post Herbicides: Glyphosate 28 oz/a, Dicamba 8 oz/a. CULTIVATION: None. INSECTICIDE: None.

FIELD HISTORY: Previous Crop: Corn. FIELD PREPARATION: Disc.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in	--------no. of days--------			
May	1.11	0.00	469	7	0	28
June	3.94	7.50	783	15	9	58
July	1.61	10.00	942	27	7	89
August	2.91	10.00	800	21	6	120
September	2.36	2.50	517	8	0	150
October	0.86	0.00	167	0	0	168
Total	12.79	30.00	3678	78	22	168

\1 Growing season from May 3 (planting) to October 18 (freeze, 29F).
\2 Total in-season water from irrigation and precipitation was 42.79 in/a.
\3 GDD: Growing Degree Days for sorghum.
\4 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture for seed germination and stand establishment. Weed control was good. The growing season precipitation was average, but variable (June was wet and July was dry). Grain yields and test weights were very good. The study was not limited irrigated: we applied 30 in/a of irrigation.

SOIL: Silty clay loam for 0-8” and silty clay loam 8”-24” depths from soil analysis.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	7.9	0.6	1.6	58	1.5	869	0.6	4.0
8”-24”				33				
Comment	Alka	Vlo	Hi	VHi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	40	2	0
Applied	150	20	0.4	0

Yield Goal: 150 bu/a.
Actual Yield: 200 bu/a.

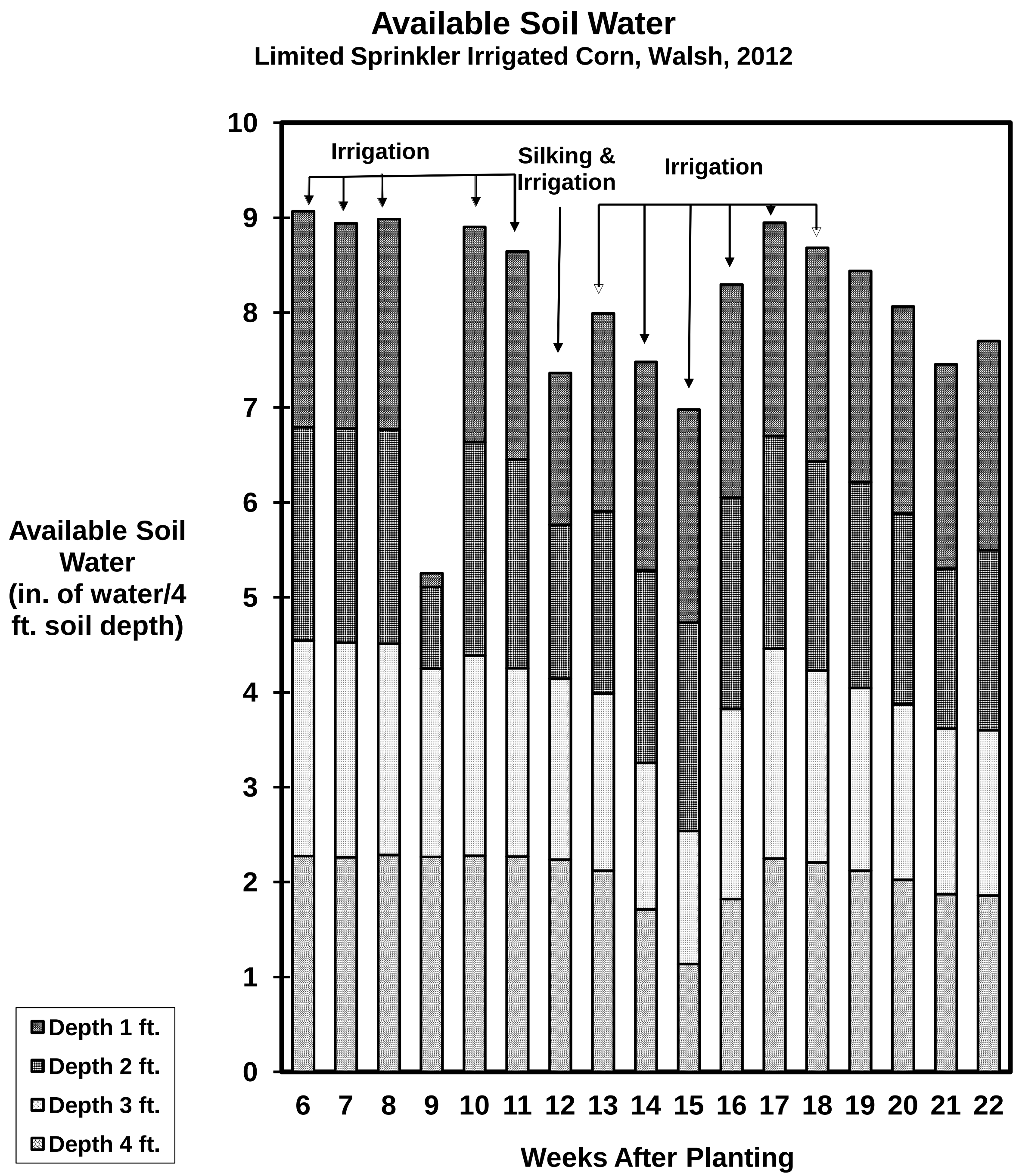


Fig. . Available soil water in limited sprinkler irrigation corn at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 12.79 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table .Sprinkler Irrigation Corn, Plainsman Research Center, 2012.

Firm	Hybrid	Grain Yield	Seed Moisture	Test Wt.	Plant Density	50% Silking Date
		bu/a	%	lb/bu	plants/a (X 1000)	
GARST	83S06-3111	216	16.4	59	26.8	19-Jul
MYCOGEN	2V707	212	15.9	60	26.4	19-Jul
CHANNEL	211-99VT3P	210	15.1	60	26.8	16-Jul
TRIUMPH	1217S	210	16.8	60	25.4	19-Jul
TRIUMPH	1329H	209	16.8	59	26.2	19-Jul
MYCOGEN	2T777 (non Bt)	208	16.0	60	26.4	17-Jul
CHANNEL	213-40VT3P	202	17.7	60	27.2	18-Jul
GARST	82H82-3111	202	18.4	60	26.4	19-Jul
MYCOGEN	2K757	201	17.3	58	26.0	19-Jul
GARST	83E90-3111	200	18.9	56	25.2	19-Jul
MYCOGEN	2T809	199	17.0	62	26.2	18-Jul
GARST	83R38-3000GT	196	18.1	59	27.4	18-Jul
TRIUMPH	1157X	194	16.5	59	27.0	19-Jul
TRIUMPH	1002S	194	15.0	59	25.4	17-Jul
MYCOGEN	2V715	190	15.6	58	25.8	19-Jul
MYCOGEN	2D747	186	15.6	60	26.2	18-Jul
CHANNEL	208-48VT3P	170	14.7	62	26.8	15-Jul
Average		200	16.6	59	26.3	18-Jul
LSD 0.20		5.2				

Planted: May 3; Harvested: October 22, 2012.
Grain Yield adjusted to 15.5% moisture content.
This corn trial received a total of 30 acre-in./acre of water.

Corn Borer Resistant and Nonresistant Hybrid Comparisons, Walsh, 2012

K. Larson, B. Pettinger, D. Harn, and C. Thompson

PURPOSE: To evaluate corn borer resistant (Bt gene insertion) and nonresistant hybrids under sprinkler irrigation.

RESULTS: Only the nonresistant corn borer hybrid displayed any second-generation corn borer lodging and this lodging damage was very minor. Two corn borer resistant hybrids had second-generation corn borer damage, but their damage was minimal. Grain yields were very good, averaging 200 bu/a.

DISCUSSION: All 16 Bt hybrids tested showed excellent resistance to corn borer compared to the nonresistant hybrid. The nonresistant corn borer hybrid had 3% of plants lodged due to corn borer damage. This low level of corn borer lodging is comparable to recent corn borer damage levels since Bt corn hybrids became widely accepted. The low level of corn borer damage may be attributable to our region's extensive use of corn borer resistant hybrids. Even with a few years of low corn borer levels, we still advocate the use of corn borer resistant hybrids. Nonetheless, if these low infestation levels continue, it may be economical to replace some acreage with less expensive nonresistant corn borer hybrids. Growers can monitor the corn borer infestation levels in their refuges to indicate if switching is warranted. Corn borer resistant Bt hybrids continue to be a very effective tool against corn borer damage. Therefore, to keep Bt hybrids effective in controlling corn borer, always remember to plant nonresistant hybrids as a mating refuge to help delay corn borer resistance to the Bt events.

This study was not limited irrigated. We applied 30 in/a of irrigation because this study was part of another irrigation study, a diurnal irrigation study.

Table .Sprinkler Irrigated Corn, Corn Borer Ratings, Plainsman Research Center, 2012.

Firm	Hybrid	Grain Yield	Test Weight	1st Gen Shot Holes	2nd Gen Stalk Holes	2nd Gen Plant Lodging	Plant Density	50% Silking Date
		bu/a	lb/bu	plants/a	plants/a	plants/a	plants/a (X 1000)	
GARST	83S06-3111	216	59	0	0	0	26.8	19-Jul
MYCOGEN	2V707	212	60	0	0	0	26.4	19-Jul
CHANNEL	211-99VT3P	210	60	0	0	0	26.8	16-Jul
TRIUMPH	1217S	210	60	0	0	0	25.4	19-Jul
TRIUMPH	1329H	209	59	0	0	0	26.2	19-Jul
MYCOGEN	2T777 (non Bt)	208	60	3	20	3	26.4	17-Jul
CHANNEL	213-40VT3P	202	60	0	0	0	27.2	18-Jul
GARST	82H82-3111	202	60	0	0	0	26.4	19-Jul
MYCOGEN	2K757	201	58	0	3	0	26.0	19-Jul
GARST	83E90-3111	200	56	0	0	0	25.2	19-Jul
MYCOGEN	2T809	199	62	0	0	0	26.2	18-Jul
GARST	83R38-3000GT	196	59	0	0	0	27.4	18-Jul
TRIUMPH	1157X	194	59	0	0	0	27.0	19-Jul
TRIUMPH	1002S	194	59	0	0	0	25.4	17-Jul
MYCOGEN	2V715	190	58	0	8	0	25.8	19-Jul
MYCOGEN	2D747	186	60	0	0	0	26.2	18-Jul
CHANNEL	208-48VT3P	170	62	0	0	0	26.8	15-Jul
Average		200	59	0.2	1.8	0.2	26.3	18-Jul
LSD 0.05		5.2		1.82	3.96	1.82		

Planted: May 3; Harvested: October 22, 2012.
Grain Yield adjusted to 15.5% moisture content.
This corn trial received a total of 30 acre-in./acre of water.

Diurnal Sprinkler Irrigation on Corn and Grain Sorghum

Kevin Larson and Brett Pettinger

We theorize that crop yields may increase by reducing water stress through managing night and day sprinkler irrigation frequency. Increasing nighttime rotation speed so that crops receive effective water more often may increase yields. It makes common sense that nighttime sprinkler irrigations are more effective than daytime irrigations because there is greater evaporative loss during the day. In order to determine the nighttime rotation speed, we need to measure the effectiveness of sprinkler irrigations at night compared to sprinkler irrigations during the day. We conducted this sprinkler irrigation on corn and grain sorghum to quantify the production increase from continual nighttime irrigations as an initial step toward managing diurnal irrigation frequency.

Materials and Methods

For the corn site, we planted two hybrids, Mycogen 2V715 and Mycogen 2D747, at 27,000 seeds/a on May 3. For the grain sorghum site, we planted Mycogen 627 at 80,000 seeds/a on June 8. We seedrow applied 5 gal/a of 10-34-0 and 0.38 lb/a of Zn chelate to both crops at planting. We streamed on 32-0-0 at 150 lb N/a to the corn site and 100 lb N/a to the grain sorghum site. For weed control in the corn, we applied preemergence herbicides: Balance 1.75 oz/a, glyphosate 28 oz/a, Sharpen 3.0 oz/a, atrazine 1.0 lb/a; and post emergence herbicides: glyphosate 28 oz/a, dicamba 8 oz/a. For weed control in the grain sorghum, we applied preemergence herbicides: glyphosate 28 oz/a, Sharpen 3.0 oz/a, atrazine 1.0 lb/a; and a post emergence herbicide: 2,4-D amine 10 oz/a. All diurnal irrigations were applied to the same plot site either during the day (9:00am to 9:00pm) or during the night (9:00pm to 9:00am) at 2.5 in/a per irrigation. The corn crop received 30 in/a in total irrigation and the grain sorghum crop received 17.5 in/a in total irrigation. We harvested the corn plots on October 18 and the grain sorghum plots on November 2 with a self-propelled combine and weighed the grain in a digital scale cart. Grain yields were adjusted to 15.5% seed moisture content for corn and 14% seed moisture content for grain sorghum.

Results and Discussion

Sprinkler irrigation produced significantly higher yield (6 bu/a more) than daytime irrigation for grain sorghum, but for corn there was no significant yield difference between the diurnal irrigations.

We expected larger yield differences between nighttime sprinkler irrigation and daytime sprinkler irrigation. For corn, the yield difference between nighttime irrigation and daytime irrigation was not significantly different. We believe the reason we did not have significant yield differences between nighttime and daytime irrigations was because of the large amount of water we applied. Our frequent and abundant irrigation schedule may have masked daytime evaporative losses, reducing nighttime and daytime yield differences. This suggests that the reason grain sorghum produced significantly more yield with nighttime irrigations than with daytime irrigations was because it received only about half as much total irrigation as the corn (17.5 in/a for grain sorghum and 30 in/a for corn). We will conduct this study next year, but we will use a more limiting irrigation schedule to reveal potential nighttime and daytime irrigation differences.

Table .--Diurnal Sprinkler Irrigation on Corn, Walsh, 2012.

Treatment	Grain Yield	Test Weight	Moisture
	bu/a	lb/bu	%
<u>**Diurnal**</u>			
Night	206.3	57.8	16.0
Day	202.6	58.2	16.0
Diurnal LSD 0.05	NS		
<u>**Hybrid**</u>			
Mycogen 2D747	208.3	57.0	16.0
Mycogen 2V715	200.6	59.0	16.0
Hybrid LSD 0.05	NS		
Average	**204.5**	**58.0**	**16.0**

Planted: May 2; Harvested: October 18.
The study received 30 in. of irrigation.
Night irrigations were applied 9:00pm to 9:00am with 2.5 in/a each time.
Day irrigations were applied 9:00am to 9:00pm with 2.5 in/a each time.

Table .--Diurnal Sprinkler Irrigation on
Grain Sorghum, Walsh, 2012.

Treatment	Grain Yield	Test Weight	Moisture
	bu/a	lb/bu	%
Night	113.4	60.5	12.2
Day	107.3	60.5	12.2
Average	110.4	60.5	12.2
LSD 0.05	5.00		

Planted: June 8; Harvested: November 2.
The study received 17.5 in. of irrigation.
Night irrigations were applied 9:00pm to 9:00am with 2.5 in/a each time.
Day irrigations were applied 9:00am to 9:00pm with 2.5 in/a each time.

Long-Term N Effects on Irrigated Sunflower-Corn Rotation, Walsh, 2012

K. Larson, B. Pettinger, and D. Harn

Purpose: To study the long-term N fertilizer effects on irrigated Sunflower-Corn and Corn-Corn (continuous corn) rotations where N rates are applied to the same treatment site for multiple years.

Materials and Methods: All crop phases (corn and sunflower) of Sunflower-Corn and Corn-Corn rotations were planted each year, except this year. We did not plant sunflowers because we mistakenly applied corn herbicides over all the plots, including the plots reversed for sunflower planting. We planted corn, Mycogen 2V715, on May 4 at 24,500 seeds/a. Our typical sunflower and corn rotations are: Corn-Corn (continuous corn), Sunflower-Corn (corn following sunflower), and Corn-Sunflower (sunflower following corn). This year, without sunflowers in the rotations, our rotations were: continuous corn (corn following corn for multiple years), Sunflower-Corn (corn following sunflower), and Corn-Corn (corn following corn following sunflower). For our N treatments, we streamed liquid N (32-0-0) at 100, 150, or 200 lb/a with two replications. We seedrow applied 20 lb P_2O_5/a and 0.38 lb/a of Zn chelate. We disked the site prior to planting. For weed control, we applied a pre-emergence tank mix of glyphosate 28 oz/a, 0.5 lb/a of 2,4-D, and dicamba 6 oz/a; and a pre-emergence tank mix of Balance Pro 2.0 oz/a, Sharpen 3.0 oz/a, atrazine 1.0 lb/a, and COC 16 oz/a. For postemergence weed control, we applied two applications of Glystar Plus at 30 oz/a. The corn received approximately 18 in./a of drip irrigation. This study was damaged by hail from two separate hailstorms. The second hailstorm on June 17, which completely devastated all of our wheat studies and most of our bulk production wheat, left the corn in this N corn study as leafless, stubby, stalks. We continued to irrigate this hail-damaged corn hoping it would recover. We harvested two replications of the 20 ft. by 650 ft. corn plots on October 23 with a self-propelled combine and weighed the grain in a digital weigh cart. Corn yields were adjusted to 15.5%.

Results and Discussion: The corn in the all of the sunflower and corn rotations recovered from the hail damage and produced better than expected yields considering the severity of the hail damage. The yield response to increasing N was similar to past years for two of the rotations, Sunflower-Corn and Corn-Corn. This year, like many of the results from previous years, showed higher yields with the Sunflower-Corn rotation than the Corn-Corn rotation. Moreover like past years, the yield for the Corn-Corn rotation increased linearly with higher applied N. The results from past years showed the corn in the Sunflower-Corn rotation had no or little response to increasing N rates. This year, the yield response of the Sunflower-Corn rotation was curvilinear with an optimum N rate at 150 lb N/a. The production response of the continuous corn rotation to increasing N rate is difficult to explain. Base yield of the continuous corn rotation was higher than the Corn-Corn and Sunflower-Corn rotations. We expected the continuous corn rotation to have the lowest base yield, not the highest base yield. Typically from past results, we found that having sunflower in the rotation increased base yield. Remember, the Corn-Corn rotation was actually Sunflower-Corn-Corn and the continuous corn has been corn following corn for multiple years. The higher base yield and greater yield response of the continuous corn rotation does not follow past patterns.

No N fertilizer was recommended for our yield goal. Our yield goal for the corn was 150 bu/a, our actual average grain yield was 120 bu/a. We achieved 80% of our yield goal despite the severe hail damage.

Table .-Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe	Mn	Cu
		mmhos/cm	%	--------------------------ppm-------------------------						
0-8"	7.9	0.6	2.0	41	1.0	1280	0.7	3.7	6.8	2.8
8-24"				30						

This is the seventh year of this long-term N on Sunflower-Corn rotation study. We started this study because of 1) the lack of N response for dryland sunflower in our long-term N on Wheat-Sunflower-Fallow study, 2) the role of N in reducing oil yield, and 3) reports from growers that their irrigated corn following sunflower often produced their highest yields. This year, the difference in average corn yield between the Sunflower-Corn and continuous corn rotations was 11 bu/a with the continuous corn producing higher yields than the corn following sunflower. The higher continuous corn production recorded this year is contrary to our previous results and to growers observations.

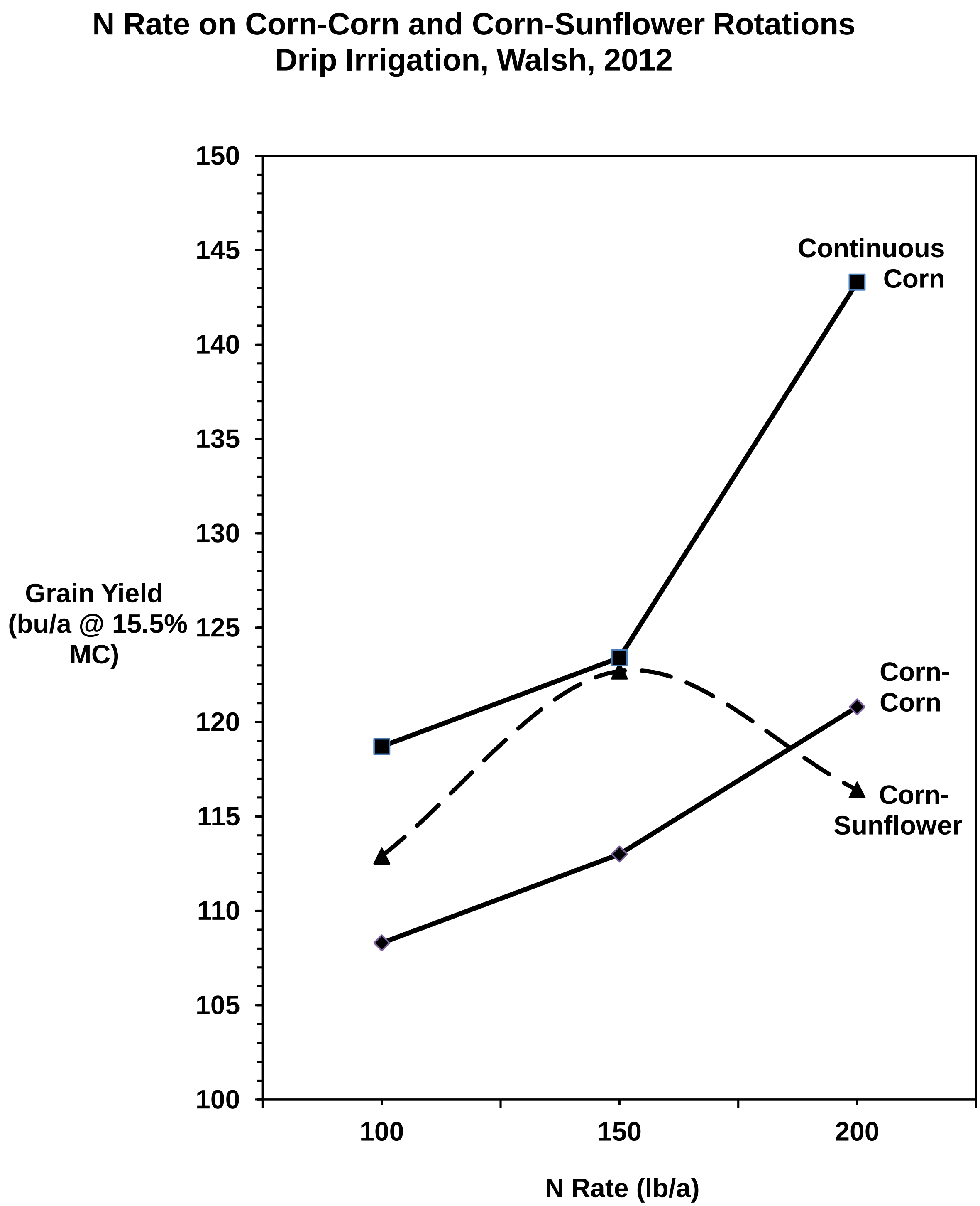


Fig. . N rate on drip irrigated sunflower and corn in Sunflower-Corn rotations at Walsh. The N rates were 100, 150, and 200 lb N/a as 32-0-0. The corn hybrid was MYCOGEN 2V715 planted at 24,500 seeds/a.

Long-Term N Effects on Wheat-Sunflower-Fallow Rotation, Walsh, 2012

K. Larson, B. Pettinger, and D. Harn

Purpose: To study the long-term N fertilizer effects on a wheat-sunflower-fallow rotation where N is applied to the same treatment plots for multiple years.

Materials and Methods: We planted wheat, Hatcher, at 50 lb seed/a on October 5, 2011, and sunflower on June 22, 2012 at 16,000 seeds/a using Mycogen 8H449CLDM. We banded liquid N (28-0-0 or 32-0-0) at 0, 30, 60, and 90 lb N/a to the treatment plots with two replications to both N and N residual sides on March 16, 2012 for wheat, and on July 31, 2012 to the sunflower. We seedrow applied 5 gal/a of 10-34-0 (20 lb P_2O_5/a) at planting to the wheat, but not the sunflowers. For weed control in the wheat, we applied pre-emergence glyphosate 28 oz/a, dicamba 4.0 oz/a, and 2,4-D 0.5 lb/a and post emergence Express, 0.33 oz/a and 2,4-D, 0.38 lb/a. For weed control in the sunflower, we applied pre-emergence glyphosate 30 oz/a, Spartan 2 oz/a, and Aim 1.5 oz/a. The wheat was hailed out and not harvested. We harvested two replications of the 20 ft. by 1100 ft. plots on November 11 for sunflower with a self-propelled combine and weighed the seed in a digital weigh cart. Yields were adjusted to 10% for sunflower.

Results: Sunflower yields significantly decreased with applied N rates at a rate of 1 lb seed/a to 1 lb N/a, ($R^2 = 0.966$). Sunflower yields were low, ranging from 436 lb/a to 535 lb/a. The percent oil in the sunflower seeds was variable but generally decreased with increasing N rates, although this was not significant. Because of severe hail damage, the wheat was not harvested.

Discussion: This is the eleventh harvest year of this long-term N on wheat-sunflower-fallow rotation study. We started this study to test reports of no yield response from applied N on dryland sunflower (Vigil and Bowman, 1998).

This year sunflower yields linearly declined with increasing N rate. Obviously, the net return from N fertilizer application was negative for all N rates. For most years of this study, sunflower yields increased with increasing N rates; however the yield response failed to offset the cost of the N fertilizer. The no N fertilizer treatment produced the highest income every year of sunflower production (there was no sunflower crop in 2002, 2008, and 2011 because of drought). This lack of N response suggests that N fertilizer is not needed for dryland sunflower production if the expected yield is 1200 lb/a or less.

This year the oil content was widely scattered with a slight declining trend with increasing N rates. Generally in previous years, we observed no response or a decline in oil content with increasing N rates. This negative correlation of oil content with N rate has been previously reported (Vigil and Bowman, 1998).

This year the wheat was lost to hail just prior to harvest. Last year, the wheat had a slightly negative response to applied N. Only one time in ten years did the wheat positively respond to applied N. The lack of response of wheat yields to increasing N rates for nine out of ten years can be explained by sufficient residual N for the first year and low to average yields for the subsequent years. In 2007, there was sufficient winter moisture to produce very good wheat yields (over 50 bu/a), and in 2009 the wheat responded to N rates. However in 2009, this positive response to applied N was not economical. Generally, however, moisture has been the primary yield-limiting factor for this study, not N.

With the exception of 2007, we have reported no wheat yield response to N rates since establishing this wheat-sunflower-fallow rotation study. For nine out of ten years, wheat yields in this rotation were very low to average, 6 to 33 bu/a. The low to average wheat yields can be attributed to the lack of moisture remaining after the sunflower crops extracted all available soil water and to insufficient soil water replenishment due to dry conditions during fallow.

Literature Cited

Vigil, M.F., R.A. Bowman. 1998. Nitrogen response and residue management of sunflowers in a dryland rotation. 1998 Annual Report, Central Great Plains Research Station. ARS, USDA.

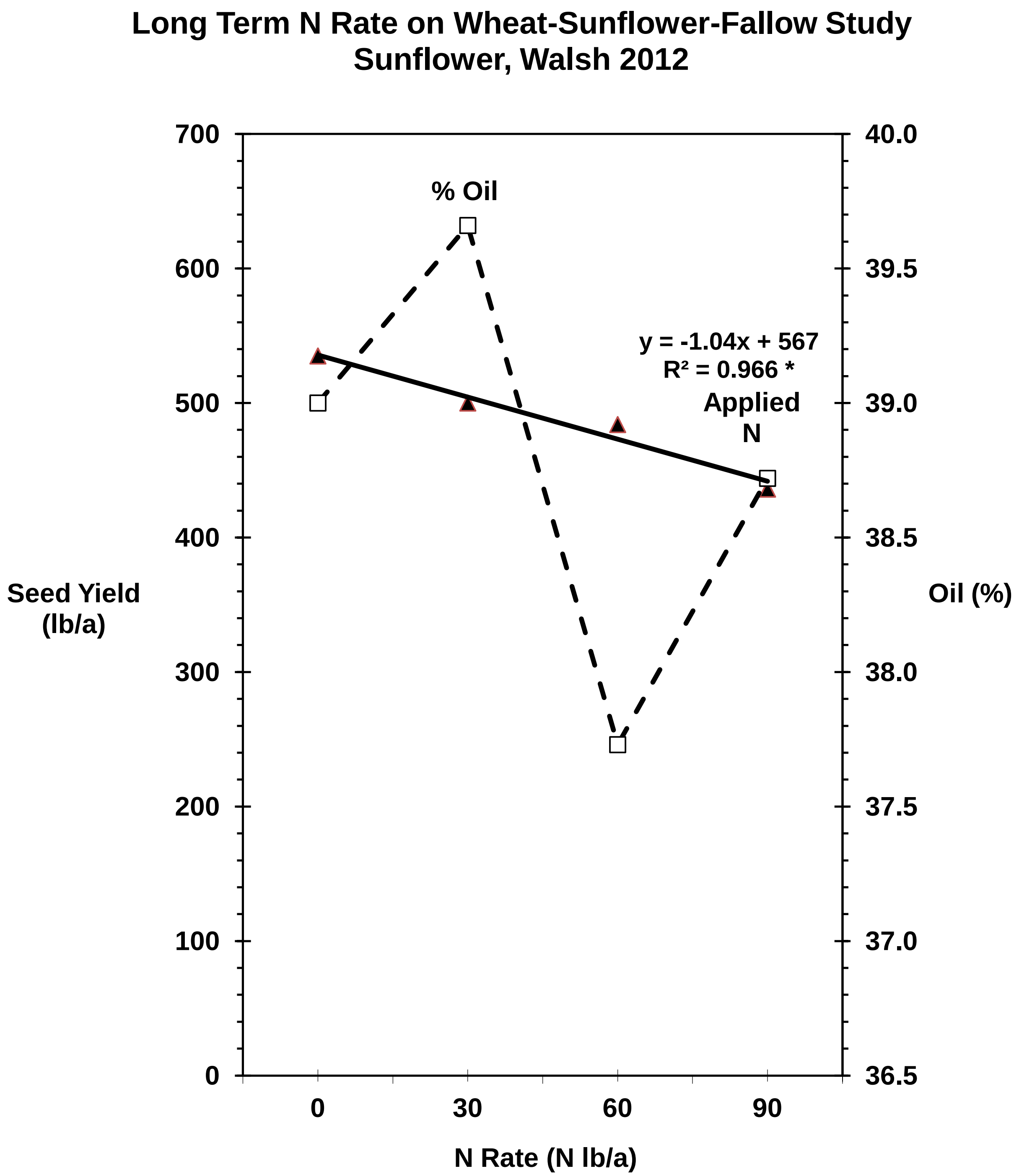


Fig. . N rate on dryland sunflower in Wheat-Sunflower-Fallow rotation at Walsh. The N rates were 0, 30, 60, and 90 lb N/a as 32-0-0. Applied N is N applied to the sunflowers in the current season. The sunflower hybrid was MYCOGEN 8H449CLDM at 16,000 seeds/a.

Crop Rotation Sequencing

Kevin Larson and Brett Pettinger

Crops differ in their utilization of water and nutrients. Some crops, such as sunflower, are believed to mine nearly all available soil water and nutrients and leave little for subsequent crops. Whereas, other crops, such as millet, use only a portion of the available water and nutrients, leaving residual water and nutrients for subsequent crops. There are other advantages from crop rotation, including abatement of weeds, insects and diseases. The purpose of this study is to determine the crop rotation sequences that produce highest yields and incomes.

Materials and Methods

We tested fallow and five spring crops: sunflower, grain sorghum, corn, millet, and mung bean. Annually, each crop follows itself and every other crop. We planted corn (Mycogen 2V715) on May 16 at 12,500 seed/a, sunflower (Mycogen 8H449CL) on June 22 at 16,500 seed/a, grain sorghum (Mycogen 627) on June 8 at 30,000 seed/a, mung bean (Berken) on June 12 at 17 lb/a, and proso millet (Huntsman) on June 25 at 18 lb/a. Before planting we sprayed two applications of glyphosate at 28 oz/a, LoVol at 0.5 lb/a, and dicamba 4 oz/a. For in-season weed control, we chose herbicides that should not interfere with crop rotations: millet, dicamba 4 oz/a and 2,4-D amine 10 oz/a; grain sorghum, Sharpen 2.0 oz/a, atrazine 0.75 lb/a, dicamba 4 oz/a, 2,4-D amine 10 oz/a; corn, Balance Pro 2.0 oz/a, Sharpen 2.0 oz/a, COC 16 oz/a, atrazine 0.75 lb/a, and two applications of Glystar Plus 30 oz/a; mung bean, Raptor 5 oz/a, COC 16 oz/a; sunflower, Spartan 2 oz/a and glyphosate 30 oz/a; and fallow, glyphosate 30 oz/a, dicamba 4 oz/a and LoVol 0.5 lb/a (two applications). We harvested the crops with a self-propelled combine equipped with a digital scale: millet, October 10; grain sorghum, November 6; corn, October 24; mung bean, October 11; and sunflowers were not harvested.

This is the eighth cropping year of this dryland crop rotation sequencing study. In 2003, the first year the rotations were started, all crops were planted in fallow. The second year, 2004, the crops were planted into the five crop stubbles and fallow. In 2005, we decided to change the rotations, based on the 2004 results, to obtain the highest potential yield and income, and still have all five crops and fallow represented. We planted the 2005 crops in the different locations where the 2003 crops were originally planted: 2005 grain sorghum in 2003 millet, 2005 millet in 2003 mung bean, 2005 corn in 2003 fallow, 2005 mung bean in 2003 corn, 2005 sunflower in 2003 grain sorghum, and 2005 fallow in 2003 sunflower. In 2006, 2007, 2009, and 2010 we went back to the original rotations where all crops followed themselves and every other crop. No crops were harvested in 2008 and 2011 because of drought.

Results and Discussion

The two-year rotation sequence with the highest variable net income was Sorghum-Sorghum with $518.67/a. The rotation that had the second highest variable net income for the previous two cropping years was Sorghum-Millet and its reciprocal Millet-Sorghum together produced an average variable net income of $342.82/a. This year the grain sorghum following fallow had the highest variable net income of $79.06/a, and grain sorghum following millet had the second highest variable net income of $60.29/a. Sunflower, mung bean, corn, and fallow all produced negative net income averages for 2012 because mung bean and corn had low yields, sunflower had very poor stand and was not harvested, and fallow has no crop. The four-year rotation that produced the highest variable net income was continuous grain sorghum with $773.41/a. The four-year rotation and reciprocal rotation combination that had the second highest variable net income was Sorghum-Millet with $614.37/a. Not surprisingly, the worst four-year rotation was continuous sunflower, which was even worse than continuous fallow. Continuous sunflower produced the lowest four-year rotations with -$165.26/a, because three out of four sunflower crops failed due to chemical damage and poor stands. Growing season precipitation for 2012 was average; however, crop yields were poor. 2011 was one of the driest years on record, causing the 2012 season to begin with only marginal soil water profile. Average precipitation in 2012 was insufficient to compensate for the lack of soil water profile and crops suffered. Currently, grain sorghum and millet have the highest overall variable net incomes and sunflower the lowest variable net income of the five crops and fallow tested in our dryland rotation sequencing study.

Table .-Crop Rotation Sequence Study, Yield Summary 2012.

	2012 Crop						2012 Average Total
Previous Crop	Grain Sorghum	Corn	Millet	Mung Bean	Sunflower	Fallow	Production
	---lb/a---						
Fallow	862	554	52	38	0	0	301
Grain Sorghum	689	504	169	87	0	0	290
Millet	717	246	158	90	0	0	242
Mung Bean	202	157	11	14	0	0	77
Corn	168	78	36	25	0	0	61
Sunflower	106	78	0	3	0	0	38
Average	457	270	71	43	0	0	168
LSD 0.20	487.8	371.3	105.8	72.5			

The sunflower crop was not harvested due to poor stand and puncture vine infestation.

Table .-Two-Year Crop Rotation Sequence, Variable Net Income Summary for 2010 and 2012.

2010 Crop	Total Variable Net Income for 2010 and 2012 Crops 2012 Crop (2010 Stubble) Grain Sorghum	Millet	Fallow	Mung Bean	Sunflower	Corn	Average 2-Year Variable Net Income
	$/a						
Grain Sorghum	518.67	478.02	407.41	224.47	297.03	310.07	372.61
Millet	207.62	148.95	95.84	95.92	92.82	31.43	112.10
Corn	183.49	163.15	105.84	87.25	54.06	-67.22	87.76
Mung Bean	87.75	94.71	38.77	-35.63	10.46	-29.97	27.68
Fallow	54.50	-26.58	-54.20	-53.72	-72.90	-53.86	-34.46
Sunflower	-61.61	11.54	-71.29	-37.61	-104.24	-144.85	-68.01
Average	165.07	144.96	87.06	46.78	46.21	7.60	82.95

Variable Net Income: Gross Income - Seed Cost - Weed Control Cost.
No crops were harvested in 2011 because of drought.
The highest two-year variable net income of $518.67 was the Sorghum-Sorghum rotation.

Table .-Four-Year Crop Rotation Sequence, Variable Net Income Summary for 2007, 2009, 2010 and 2012.

2007 and 2010 Crops	Total Variable Net Income for 2007, 2009, 2010 and 2012 Crops 2009 and 2012 Crops Grain Sorghum	Millet	Fallow	Corn	Mung Bean	Sunflower	Average 4-Year Variable Net Income
	$/a						
Grain Sorghum	818.68	773.41	536.74	520.19	270.41	356.39	545.97
Millet	455.33	378.13	198.59	159.53	183.29	146.11	253.50
Corn	364.09	283.02	166.49	-29.06	137.96	55.30	162.97
Mung Bean	236.61	238.10	55.80	67.57	-21.04	3.18	96.70
Fallow	237.64	105.45	-101.16	37.12	-68.57	-144.07	11.07
Sunflower	36.66	169.48	-102.45	-115.30	-58.80	-165.26	-39.28
Average	358.17	324.60	125.67	106.68	73.87	41.94	171.82

Variable Net Income: Gross Income - Seed Cost - Weed Control Cost.
No crops were harvested in 2008 and 2011 because of drought.
The highest four-year variable net income of $818.68 was the GS-GS-GS-GS rotation.

Table .-Grain Sorghum: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	2012 Grain Sorghum Seed Yield	2012 Grain Sorghum Gross Income	2012 Grain Sorghum Variable Net Income	2010 Grain Sorghum Variable Net Income	2009 Grain Sorghum Variable Net Income	2007 Grain Sorghum Variable Net Income	4-Year Average Variable Net Income
	bu/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	15	111.60	79.06	437.05	203.34	156.09	218.88
Grain Sorghum	12	89.20	56.66	462.01	197.49	102.52	204.67
Corn	3	21.75	-10.79	346.33	94.79	80.57	127.73
Millet	13	92.83	60.29	451.93	145.17	112.19	192.39
Sunflower	2	13.72	-18.82	345.37	84.72	110.33	130.40
Mung Bean	4	26.15	-6.39	245.05	97.07	53.79	97.38
Average	8	59.21	26.67	381.29	137.09	102.58	161.91
LSD 0.20	8.7	63.15	30.61	137.17	113.84	54.45	

Planted: Grain Sorghum (Mycogen 627) on June 8, 2012 at 30,000 seed/a.
Grain Sorghum Seed Cost: $4.50/a ($2.10/lb).
Harvested: Grain Sorghum November 6, 2012.
Grain Sorghum Market Price $7.25/bu.
Weed Control: Sharpen 2.0 oz, atrazine 0.75 lb, dicamba, 4 oz; 2,4-D amine, 10 oz.
Chemical Cost: $17.04/a; Application Cost $11.00/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Millet: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	2012 Millet Grain Yield	2012 Millet Gross Income	2012 Millet Variable Net Income	2010 Millet Variable Net Income	2009 Millet Variable Net Income	2007 Millet Variable Net Income	4-Year Average Variable Net Income
	bu/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	1	12.43	-2.02	125.48	152.23	129.51	101.30
Grain Sorghum	3	40.54	26.09	147.33	183.20	102.54	114.79
Corn	1	8.52	-5.93	103.63	42.86	113.67	63.56
Millet	3	37.92	23.47	125.48	132.63	96.55	94.53
Sunflower	0	0.00	-14.45	141.16	144.39	104.26	93.84
Mung Bean	0	2.62	-11.83	115.98	95.00	81.57	70.18
Average	1	17.00	2.55	126.51	125.05	104.68	89.70
LSD 0.20	1.9	25.39	10.94	13.96	61.45	19.53	

Planted: Millet (Huntsman) on June 25, 2012 at 18 lb/a.
Millet Seed Cost: $5.31/a ($16.50/bu).
Harvested: Millet on October 10, 2012.
Millet Market Price $13.44/bu.
Weed Control: Banvel, 4 oz; 2,4-D amine, 10 oz.
Chemical Cost: $3.64/a; Application Cost $5.50/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Corn: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	2012 Corn Seed Yield	2012 Corn Gross Income	2012 Corn Variable Net Income	2010 Corn Variable Net Income	2009 Corn Variable Net Income	2007 Corn Variable Net Income	4-Year Average Variable Net Income
	bu/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	10	77.16	-29.30	135.48	111.18	118.44	83.95
Grain Sorghum	9	70.20	-36.26	194.28	129.55	136.81	106.09
Corn	1	10.86	-95.60	28.38	-26.45	-19.19	-28.22
Millet	4	34.26	-72.20	169.08	14.43	21.69	33.25
Sunflower	1	10.86	-95.60	102.40	23.80	31.06	15.42
Mung Bean	3	21.87	-84.59	118.68	53.05	60.31	36.86
Average	5	37.54	-68.92	124.71	50.93	58.19	41.23
LSD 0.20	6.6	51.71	54.75	43.50	49.88	14.37	

Planted: Corn (Mycogen 2V715) on May 16, 2012 at 12,500 seed/a.
Corn Seed Cost: $58.63/a ($4.69/1000 seeds).
Harvested: Corn on October 24, 2012.
Corn Market Price $7.80/bu.
Weed Control: Balance Pro 2.0 oz, Sharpen 2.0 oz, COC 16 oz, Atrazine 24 oz, Glystar Plus 30 oz (two applications).
Chemical Cost: $36.83/a; Application Cost $11/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Mung Bean: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	2012 Mung Bean Seed Yield	2012 Mung Bean Gross Income	2012 Mung Bean Variable Net Income	2010 Mung Bean Variable Net Income	2009 Mung Bean Variable Net Income	2007 Mung Bean Variable Net Income	4-Year Average Variable Net Income
	lb/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	38	6.65	-29.16	68.41	5.35	-10.81	8.45
Grain Sorghum	87	15.23	-20.59	94.14	-7.85	-19.61	11.52
Corn	25	4.38	-31.44	54.62	2.50	-12.71	3.24
Millet	90	15.75	-20.06	106.54	5.80	-10.51	20.44
Sunflower	3	0.53	-35.29	58.80	-6.65	-18.81	-0.49
Mung Bean	14	2.45	-33.36	-2.27	-9.50	-20.71	-16.46
Average	43	7.50	-28.31	63.37	-1.73	-15.53	4.45
LSD 0.20	72.5	12.69	23.12	42.33	0.57	13.86	

Planted: Mung Bean (Berken) on June 12, 2012 at 17 lb/a.
Mung Bean Seed Cost: $6.80/a ($40/cwt).
Harvested: Mung Bean on October 11, 2012.
Mung Bean Market Price $0.175/lb.
Weed Control: Raptor 5oz, COC 16oz.
Chemical Cost: $23.51/a; Application Cost $5.50/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Sunflower: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	2012 Sunflower Seed Yield	2012 Sunflower Gross Income	2012 Sunflower Variable Net Income	2010 Sunflower Variable Net Income	2009 Sunflower Variable Net Income	2007 Sunflower Variable Net Income	4-Year Average Variable Net Income
	lb/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	0	0.00	-48.34	-41.65	-50.97	-4.40	-36.34
Grain Sorghum	0	0.00	-48.34	-42.79	-50.97	13.55	-32.14
Corn	0	0.00	-48.34	-49.25	-50.97	5.75	-35.70
Millet	0	0.00	-48.34	25.99	-50.97	13.55	-14.94
Sunflower	0	0.00	-48.34	-55.90	-50.97	-10.05	-41.32
Mung Bean	0	0.00	-48.34	-2.32	-50.97	-14.54	-29.04
Average	0	0.00	-48.34	-27.65	-50.97	0.64	-31.58
LSD 0.20				50.64		10.39	

Planted: Sunflower (Mycogen 8H449CL) on June 22, 2012 at 16,500 seed/a.
Sunflower Seed Cost: $24.75/a ($1.50/1000 seeds).
Harvested: Sunflowers not harvested.
Sunflower Market Price $0.37/lb.
Weed Control: Spartan, 2 oz; Glystar 30 oz.
Chemical Cost: $18.09/a; Application Cost $5.50/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Fallow: Crop Rotation Sequencing Study, Walsh, 2012.

Previous Crop	Seed Yield	Gross Income	2012 Fallow Variable Net Income	2010 Fallow Variable Net Income	2009 Fallow Variable Net Income	2007 Fallow Variable Net Income	4-Year Average Variable Net Income
	bu/a	$/a	$/a	$/a	$/a	$/a	$/a
Fallow	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Grain Sorghum	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Corn	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Millet	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Sunflower	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Mung Bean	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
Average	0	0.00	-29.64	-24.56	-26.76	-20.20	-25.29
LSD 0.20							

Weed Control: Glystar 30 oz; 2,4-D ester 0.5 lb, dicamba 4 oz/a (two applications).
Chemical Cost: $18.64/a; Application Cost $11/a.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Dryland Crop Rotation Study

Kevin Larson and Brett Pettinger

This is the sixth cropping year for our dryland rotation study. We established these rotations because of results from our dryland rotation sequencing study and growers' desire to include winter wheat in the rotations. The dryland rotation sequencing study was designed for spring crops, and the inclusion of winter wheat with its fall planting and early summer harvesting times would not fit into the design pattern of the sequencing study. To include winter wheat into a dryland rotation study, we began a new dryland rotation study with these three rotations in 2005: 1) Wheat-Sorghum-Fallow, 2) Wheat-Sunflower-Fallow, and 3) Sorghum-Millet. In 2006, we added a fourth rotation, Millet/Wheat-Fallow, to this rotation study.

Materials and Methods

This is our sixth year in testing the following rotations: Wheat-Grain Sorghum-Fallow (W-S-F), Wheat-Sunflower-Fallow (W-Sun-F), and Sorghum-Millet (S-M). We added a fourth rotation of Millet/Wheat-Fallow (M/W-F) in 2006. In 2008 and 2011, no crops were harvested because of drought. We planted wheat, Hatcher, at 50 lb/a on October 5, 2011; Proso millet, Huntsman, at 18 lb/a on June 25, 2010; grain sorghum, Mycogen 627, at 30,000 seeds/a on June 8, 2012; and sunflower, Mycogen 8H449CL, at 16,500 seeds/a on June 2, 2012. We applied 50 lb/a of N to the study site. Before planting we sprayed two applications of glyphosate at 28 oz/a, LoVol at 0.5 lb/a, and dicamba 5 oz/a. For in-season weed control, we chose short-residual herbicides that should not interfere with crop rotations: wheat, Express 0.33 oz/a, LoVol 0.38 lb/a, and Penetrant II 8 oz/a; millet, dicamba 4 oz/a and amine 10 oz/a; grain sorghum, atrazine 0.75 lb/a, Sharpen 2.0 oz/a, dicamba 4 oz/a, and 2,4-D amine 10 oz/a; sunflower, glyphosate 30oz/a, Spartan 2 oz/a; and fallow, glyphosate 28 oz/a, dicamba 4 oz/a and LoVol 0.5 lb/a two times. We harvested the crops with a self-propelled combine equipped with a digital scale: millet, October 10; and grain sorghum, November 6. The wheat crop was not harvested because of hail damage and the sunflower was not harvested because of a poor stand. We recorded cost of production and yields in order to determine rotation revenues.

Results and Discussion

For 2012, the S-M rotation and the W-S-F rotation produced similar total rotation productions of around 1560 lb/a. Even though the S-M and W-S-F rotations produced similar total production, the S-M rotation returned the highest annual rotation variable net income of $98.38/a for 2012. One of the reasons S-M had higher average annual rotation income than W-S-F was because S-M had a crop each year, whereas W-S-F has two crops in three years. Less fallow, more crops, more income. The other reason S-M had higher average annual rotation income was because the yield from the W-S-F was all from grain sorghum (the wheat was lost to hail), whereas the yield from the S-M rotation was a combination of the less valuable grain sorghum and the higher priced millet. Because we have all phases of each crop rotation present each year, we can compare annual rotation production and income even without a full crop rotational cycle. For example, the 2012 total production for the S-M rotation was 1563 lb/a. The crop rotational phases were: grain sorghum, 1187 lb/a; millet 376 lb/a. The annual rotation production would be 782 lb/a, which is half the total production because the S-M rotation takes two years to complete.

The M/W-F had the second highest annual rotation income of $52.97/a because it included millet in its rotation. The majority of the 2012 income for the S-M was from grain sorghum, whereas all of the income for the M/W-F was from millet. The 2012 season was more favorable for grain sorghum production than millet production and the grain sorghum market price was very good, but the millet price excellent. If the production of millet had been proportionally closer to the grain sorghum production level, then the M/W-F would have easily had the highest annual rotation income. In 2007, 2009, 2010, and 2012, the W-Sun-F rotation produced the least variable net income because the sunflower crop either outright failed or had poor stands.

In past years, winter wheat performed better than the spring crops in both yield and income. This year the wheat crop was lost to hail and the sunflower crop was not harvest because of poor stand (the fourth failed sunflower crop in five cropping years). Without wheat and sunflower crop incomes this year, rotations containing grain sorghum and millet had higher incomes. This suggests that rotations that include adapted crops will spread income risk and may increase crop rotation revenue over multiple years.

Table .-Dryland Crop Rotation Study, Crop Production, 2012.

	Crop Production						
	--------------------------2012 Crop--------------------------					2012 Total	Annual
Rotation	Wheat	Grain Sorghum	Millet	Sunflower	Fallow	Rotation Production	Rotation Production
	------------------------------------lb/a---------------------------------						
S-M		1187	376			1563	782
W-S-F	0	1562			0	1562	521
M/W-F	0		712		0	712	356
W-Sun-F	0			0	0	0	0
Average	0	1375	544	0	0	959	415
LSD 0.20		180.9	107.6				

The wheat crop was not harvested because of hail damage.
The sunflower crop was not harvested because of poor stand.

Table .-Dryland Crop Rotation Study, Variable Net Income, 2012.

						2012	Annual
	-------------------------2012 Crop-------------------------					Total	Rotation
Rotation	Wheat	Grain Sorghum	Millet	Sunflower	Fallow	Crop Net Income	Variable Net Income
	--$/a--						
S-M		121.16	75.60			196.76	98.38
W-S-F	-20.66	169.74			-29.64	119.44	39.81
M/W-F	-20.66		156.24		-29.64	105.94	52.97
W-Sun-F	-20.66			-48.34	-29.64	-98.64	-32.88
Average	-20.66	145.45	115.92	-48.34	-29.64	80.87	39.57

Variable Net Income is gross income minus seed cost and weed control cost.
The wheat and sunflower crops were not harvested: the wheat crop was hailed out and the sunflower crop had a poor stand.

Table .-Dryland Crop Rotation Study, Walsh, 2012.

Crop Rotation	Seeding Density	Seed Cost	Weed Control Cost	Yield	Crop Price	Gross Income	Variable Net Income
		-----------------	-------------$/a	-------------	-------------	-------------	-----------------
<u>Wheat</u>	50 lb	10.00	10.66	0 bu	8.00/bu	0.00	-20.66
M/W-F				0.0	8.00	0.00	-20.66
W-Sun-F				0.0	8.00	0.00	-20.66
W-S-F				0.0	8.00	0.00	-20.66
<u>Millet</u>	18 lb	5.31	9.14	9.7 bu	13.44/bu	130.37	115.92
S-M				6.7	13.44	90.05	75.60
M/W-F				12.7	13.44	170.69	156.24
<u>Grain Sorghum</u>	30,000 seeds	4.50	28.04	24.6 bu	7.25/bu	177.99	145.45
S-M				21.2	7.25	153.70	121.16
W-S-F				27.9	7.25	202.28	169.74
<u>Sunflower</u>	16,500 seeds	24.75	23.59	0 lb	0.37/lb	0.00	-48.34
W-Sun-F				0	0.37	0.00	-48.34
Fallow	---	---	29.64	---	---	-29.64	-29.64
Average			20.21			55.74	32.55

Planted: Grain Sorghum Mycogen 627 at 30,000 on June 8; Millet, Huntsman at 18 lb/a on June 25; and Sunflower Mycogen 8H449CL at 16,500 seeds/a on June 22; Wheat, Hatcher at 50 lb/a on October 5, 2011.
Harvested: Millet, October 10; Grain Sorghum, November 6;
Wheat and Sunflower crops were not harvested.
Weed control cost is herbicide cost and $5.50/a application cost for each application.

Table .-Dryland Crop Rotation Study, Annual Rotation Income, 2006 to 2012.

Rotation	Annual Rotation Variable Net Income 2006	2007	2009	2010	2012	2006-2012 Total Crop Net Income	Average Annual Rotation Variable Net Income
	$/a						
S-M	12.70	118.18	141.76	262.97	98.38	535.61	107.12
W-S-F	36.67	120.47	105.16	198.75	39.81	461.05	92.21
M/W-F	30.79	121.22	143.26	135.55	52.97	430.82	86.16
W-Sun-F	8.01	103.07	27.69	99.95	-32.88	238.72	47.74
Average	22.04	115.74	104.47	174.31	39.57	416.55	83.31

No crops were harvested in 2008 and 2011 because of drought.
The 2012 wheat crop was lost to hail.
Variable Net Income is gross income minus seed cost and weed control cost.
Annual Rotation Variable Net Income is Total Crop Variable Net Income divided by years to complete one rotational cycle.

Dryland Millet and Wheat Rotation Study

Kevin Larson and Brett Pettinger

This was the fifth year of harvest for our dryland millet and wheat rotation study. We established these rotations to identify which millet and wheat and fallow rotation sequences produce the highest net income. Each rotation represents different fallow length. We began this new 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).

Materials and Methods

This was our fifth crop harvest for the following rotations: Wheat-Fallow (W-F), Wheat-Wheat (W-W), Millet-Millet (M-M), Wheat-Millet-Fallow (W-M-F), Millet/Wheat-Fallow (M/W-F), and Wheat/Millet-Fallow (W/M-F). We planted wheat, Hatcher, at 50 lb/a on October 5, 2011 and proso millet, Huntsman, at 18 lb/a on June 25, 2012. We applied 50 lb N/a to the study site. Before planting we sprayed two applications of glyphosate at 28 oz/a, dicamba 4.0 oz/a, and LoVol 0.5 lb/a. For in-season weed control, we chose short-residual herbicides that should not interfere with crop rotations: wheat, Express 0.33 oz/a, LoVol 0.38 lb/a, and Penetrant II 8 oz/a; millet (except W/M-F and M/W-F) dicamba 4 oz/a and 2,4-D amine 10 oz/a; and fallow, glyphosate 30 oz/a, dicamba 4 oz/a and LoVol 0.5 lb/a two times. Since the millet in the W/M-F and M/W-F rotations was not planted, no in-crop herbicides were used, only fallow chemicals were used on the millet plots. We harvested the millet with a self-propelled combine equipped with a digital scale on October 10. The wheat crop was not harvested because of hail damage. Grain yields for the millet were adjusted to 12% moisture content. We recorded cost of production and yields in order to determine rotation revenues. There were no crops harvested in 2008 because of drought. Only wheat was harvested in 2011: the millet was not planted because of drought. This year only the millet was harvested because the wheat crop was hailed out.

Results and Discussion

Only two rotations, M-M and W-M-F, had any crop production. Millet was the only crop harvested because the wheat crop was completely lost to hail. The M-M rotation produced slightly higher yield and higher annual rotation variable net income than the W-M-F rotation (M-M, 4.5 bu/a and $47.39/a; W-M-F, 3.8 bu/a and -$1.65/a).

For the short period of time that we have conducted this study, we already have had crop failures and missed plantings, therefore rotational affects are, at best, difficult to generalize and quantify. This year, we had only millet production because the wheat was completely hailed out, and we failed to plant millet in the M/W-F and W/M-F rotations. After five years, and acknowledging crop failures and missed planting, the M-M rotation produced the highest average annual rotation variable net income of $105.72/a. The five other rotations provided around $47/a to $64/a in average annual rotation variable net income after five harvest years. In 2011, we had wheat production, but no millet production; therefore, we were able to plant and harvest only the wheat for in all phases of the rotations containing wheat. In 2010, there was sufficient precipitation to plant and harvest all wheat and millet crops in all rotations. The W-W rotation had the highest annual rotation variable net income in 2010. In 2009, adequate spring and summer moisture produced good yields for most crops with the wheat and millet producing similar yields. No crops were harvested in 2008 because of drought. Winter wheat performed better than millet in both yield and income in 2007. In 2007, it was too dry for the millet planted immediately after wheat harvest (millet in the W/M-F) to establish a stand. We missed planting wheat in the M/W-F rotation in 2008. In 2009, we did not plant millet in the W/M-F rotation because of delayed volunteer wheat control.

Table .-Dryland Millet and Wheat Rotation Study, Walsh, 2012.

Crop Rotation	Seeding Density	Seed Cost	Weed Control Cost	Yield	Crop Price	Gross Income	Variable Net Income
	lb/a	$/a	$/a	bu/a	$/a	$/a	$/a
Wheat							
W-F	50	6.67	12.37	0	8.00	0.00	-19.04
W-W	50	6.67	12.37	0	8.00	0.00	-19.04
W-M-F	50	6.67	12.37	0	8.00	0.00	-19.04
M/W-F	50	6.67	21.00	0	8.00	0.00	-27.67
W/M-F	50	6.67	12.37	0	8.00	0.00	-19.04
Wheat Average	**50**	**6.67**	**14.10**	**0.0**	**8.00**	**0.00**	**-20.77**
Millet							
M-M	18	5.31	7.78	4.5	13.44	60.48	47.39
W-M-F	18	5.31	7.78	3.8	13.44	51.07	37.98
M/W-F	0	0.00	0.00	0	13.44	0.00	0.00
W/M-F	0	0.00	0.00	0	13.44	0.00	0.00
Millet Average	**18**	**5.31**	**7.78**	**2.1**	**13.44**	**27.89**	**21.34**
Fallow	---	---	23.90	---	---	0.00	-23.90
Average			11.29			0.00	-7.77

Planted: Millet, June 25; Wheat, Hatcher at 50 lb/a on October 5, 2011.
Harvested: Millet on October 10; Wheat was not harvested due to hail damage.
Wheat herbicides: Express 0.33 oz/a, 2,4-D, 0.38 lb/a; Wheat hericide cost: $6.87/a.
Millet herbicides: dicamba 4 oz/a, 2,4-D amine 10 oz/a: Millet herbicide cost: $2.78/a
Fallow herbicides: glyphosate 30 oz/a, 2,4-D 0.5 lb/a, dicamba 4 oz/a;
Fallow herbicide cost: $6.45/a per application (two applications, $5.5/a per application)
Wheat in M/W-F additional herbicide: glyphosate 30 oz/a cost $3.13/a.
Millet in W/M-F and M/W-F herbicides: none, not planted.
Weed control cost is herbicide cost and $5.50/a application cost for each application.

Table .Dryland Millet-Wheat Rotation, Variable Net Income, 2012.

Rotation	-----------2012 Crop---------- Wheat	Millet	Fallow	2012 Total Rotation Production	Annual Rotation Production
	-------------------------lb/a----------------------------				
W-F	0			0	0
W-W	0			0	0
W-M-F	0	214		214	71
M/W-F	0	0		0	0
W/M-F	0	0		0	0
M-M		250		250	250
Average	0	116		77	54

Annual Rotation Production is Total Rotation Production divided by the number of years to complete one rotation cycle.
The wheat crop was lost to hail.

Table .Dryland Millet-Wheat Rotation, Variable Net Income, 2012.

Rotation	-----------2012 Crop---------- Wheat	Millet	Fallow	2012 Total Crop Net Income	Annual Rotation Variable Net Income
	-------------------------$/a----------------------------				
W-F	-19.04		-23.90	-42.94	-21.47
W-W	-19.04			-19.04	-19.04
W-M-F	-19.04	37.982	-23.90	-4.96	-1.65
M/W-F	-27.67	0	-23.90	-51.57	-25.79
W/M-F	-19.04	0	-23.90	-42.94	-21.47
M-M		47.39		47.39	47.39
Average	-20.77	21.34	-23.90	-19.01	-7.00

Variable Net Income is gross income minus seed cost and weed control cost.
The wheat crop was lost to hail.

Table .Millet-Wheat Rotation, Annual Rotation Income, 2007 to 2012.

Rotation	Annual Rotation Variable Net Income 2007	2009	2010	2011	2012	2007-2012 Total Crop Net Income	Average Annual Rotation Variable Net Income
	$/a						
W-F	108.22	52.13	112.08	63.66	-21.47	314.61	62.92
W-W	193.14	105.30	170.76	78.46	-19.04	528.62	105.72
W-M-F	95.53	72.66	116.42	37.05	-1.65	320.00	64.00
M/W-F	141.03	32.87	123.45	-34.96	-25.79	236.61	47.32
W/M-F	95.36	38.57	118.77	59.48	-21.47	290.71	58.14
M-M	102.97	73.83	93.66	-23.30	47.39	294.55	58.91
Average	122.71	62.56	122.52	30.07	-7.00	330.85	66.17

No crops were harvested in 2008 because of drought.
No millet was harvested in 2011 because of drought.
No wheat was harvested in 2012 because of hail damage.
Variable Net Income is gross income minus seed cost and weed control cost.
Annual Rotation Variable Net Income is Total Crop Variable Net Income divided by years to complete one rotational cycle.

The Effects of Spring and Winter Cover Crops on Dryland Crop Production

Kevin Larson and Brett Pettinger

One of the Natural Resource Conservation Service (NRCS) current foci is on cover crops and their affects on soil health. Much of this recent work with cover crops is from much higher precipitation and much lower evaporation locations, such as the Upper Midwest (Conservation Tillage & Technology Conference, 2011), than we have in Southeastern Colorado. 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 common dryland crop rotations in our semi-arid climate where water conservation is the key to successful dryland crop production.

Materials and Methods

Our treatments for this cover crop study were: four cover crops, three N rates, and two crop rotations. For the first spring season of this cover crop study, we planted four cover crops: oats at 60 lb/a, rapeseed at 5 lb/a, hairy vetch at 30 lb/a, and Spring N Mix at 58 lb/a (lentil, 10 lb/a; common vetch, 6 lb/a; spring forage pea, 15 lb/a; oats, 20 lb/a; rapeseed, 2 lb/a; flax, 5 lb/a) on April 6, 2012. All cover crop seed was from Green Cover Seed in Bladen, Nebraska. Our three N rates were 0, 25, and 50 lb/a stream applied as 32-0-0. No N was applied to the cover crop plots. We are testing these cover crops and N rates in two common crop rotations: Wheat-Fallow (W-F) and Wheat-Sorghum-Fallow (W-S-F). After establishing the rotations, all phases of each rotation will be present each year. We were only able to test grain sorghum in the W-S-F rotation since we had only launched the rotations this spring. We sprayed a tank mix of glyphosate, 2,4-D and dicamba to terminate the cover crops and to control weeds in the N plots on May 17, 2012. We planted Mycogen 627 at 30,000 seeds/a on June 8, 2012 and seedrow applied 5 gal 10-34-0/a at planting. For in-season broadleaf weed control in the grain sorghum crop, we applied a tank mix of Huskie 16 oz/a, atrazine 0.5 lb/a, and AMS 1 lb/a. We inserted gypsum blocks at 6 in., 18 in., and 30 in. depths to measure soil water use by the cover crops and the subsequent grain sorghum crop. We harvested the grain sorghum on November 6, 2012 with a self-propelled combine equipped with a digital scale. Grain sorghum grain yields were adjusted to 14.0% seed moisture content.

Results and Discussion

The precipitation for the growing season from May to October was nearly average, in fact, only 1.08 in. less than our 30-year average. The 2012 precipitation form May to October was 12.87 in. and our 30-year average for this same period is 13.95 in. For 2012, May and July were drier than average, and June and September were wetter than average. Sorghum grain yields were poor, they did not reflect this average precipitation season.

Cover crops were terminated after six weeks of growth, three weeks prior to planting the grain sorghum. Because this is our first season with these newly established crop rotations, we were only able to test grain sorghum in the W-S-F rotation. In five weeks of growth, the average dry matter production of the cover crops was 444 lb/a. The forage yield of the oats was 699 lb/a, which was significantly higher than any of the other cover crops. Hairy vetch produced just 60 lb/a of forage, which was significantly less than the other cover crops. Nitrogen in the forage of the non N fixing cover crops was 26.1 lb/a for rapeseed and 26.5 lb/a for oats. The leguminous hairy vetch produced the least amount of forage N with just 3.0 lb/a. The Spring N Mix was a mixture of legumes and non N fixing plants. The N in the Spring N Mix was similar to the non N fixing crops with 23.6 lb/a. Since the amount of N in the N fixing crops was less than the non N fixing crops, the N in the forages is considered uptake from the soil and not fixed from the atmosphere.

When terminated after six weeks of growth, the cover crops used: 0.04 in. for hairy vetch, 1.26 in. for Spring N Mix, 1.35 in. for rapeseed, and 2.78 in. for oats of soil water to a depth of three feet. Oats and hairy vetch produced the same grain sorghum yield of 6.2 bu/a, but oats had the highest water use and hairy vetch had the lowest water use.

The treatment with the highest grain sorghum yield of 11.5 bu/a was N at 50 lb/a. The grain sorghum yield of the 50 lb N/a treatment was significantly higher than any of the cover crop treatments. Rapeseed cover produced just 3.1 bu/a, which was significantly less grain sorghum yield than any of the other treatments.

The 0 N check produced the highest variable net income with $63.80/a because it had comparatively higher yield than most of the other treatments and no treatment cost. The variable net income from the cover crops ranged from -$24.05/a for hairy vetch to $20.95/a for oats. All of the N rate treatments produced at least $15.10/a more than the highest variable net income of the cover crops. Since this first spring cover crop planting produced less yield than conventionally planted grain sorghum, there was no production or income advantage to planting cover crops for this first season.

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Table .-Cover Crop Study, Grain Sorghum after Spring Cover Crop, Walsh, 2012.

Treatment	Grain Sorghum Yield	Test Weight	Cover Dry Matter	Cover N	Treatment Cost	Variable Net Income
	bu/a	lb/bu	lb/a	lb/a	$/a	$/a
Spring N Mix	5.8	53	513	23.6	41.65	0.40
Hairy Vetch	6.2	53	60	3.0	69.00	-24.05
Rapeseed	3.1	53	503	26.1	16.75	5.73
Oats	6.2	53	699	26.5	24.00	20.95
0 N	8.8	54			0.00	63.80
25 N	7.8	55			20.50	36.05
50 N	11.5	56			35.50	47.88
Average	7.1	54	444	19.8	29.63	21.54
LSD 0.20	5.15		92.9			

Cover crops planted: April 6, 2012; Terminated: May 17, 2012.
Grain sorghum planted: June 8; Harvested: November 6, 2012.
Cover crop seeding rate: Spring Mix, 58 lb/a; hairy vetch, 30 lb/a; rapeseed, 5 lb/a; oats, 60 lb/a.
Spring N Mix: lentil, 10 lb/a; common vetch, 6 lb/a; spring forage pea, 15 lb/a; oats, 20 lb/a; rapeseed, 2 lb/a; flax, 5 lb/a.
Cover seed cost: Spring Mix, $29.65/a; hairy vetch, $57/a; rapeseed, $4.75/a; oats, $12/a.
N fertilizer cost: 28-0-0, $0.60/lb.
Treatment application cost: cover crop planting, $12/a; N application, $5.50/a.
Grain sorghum price: $7.25/a.

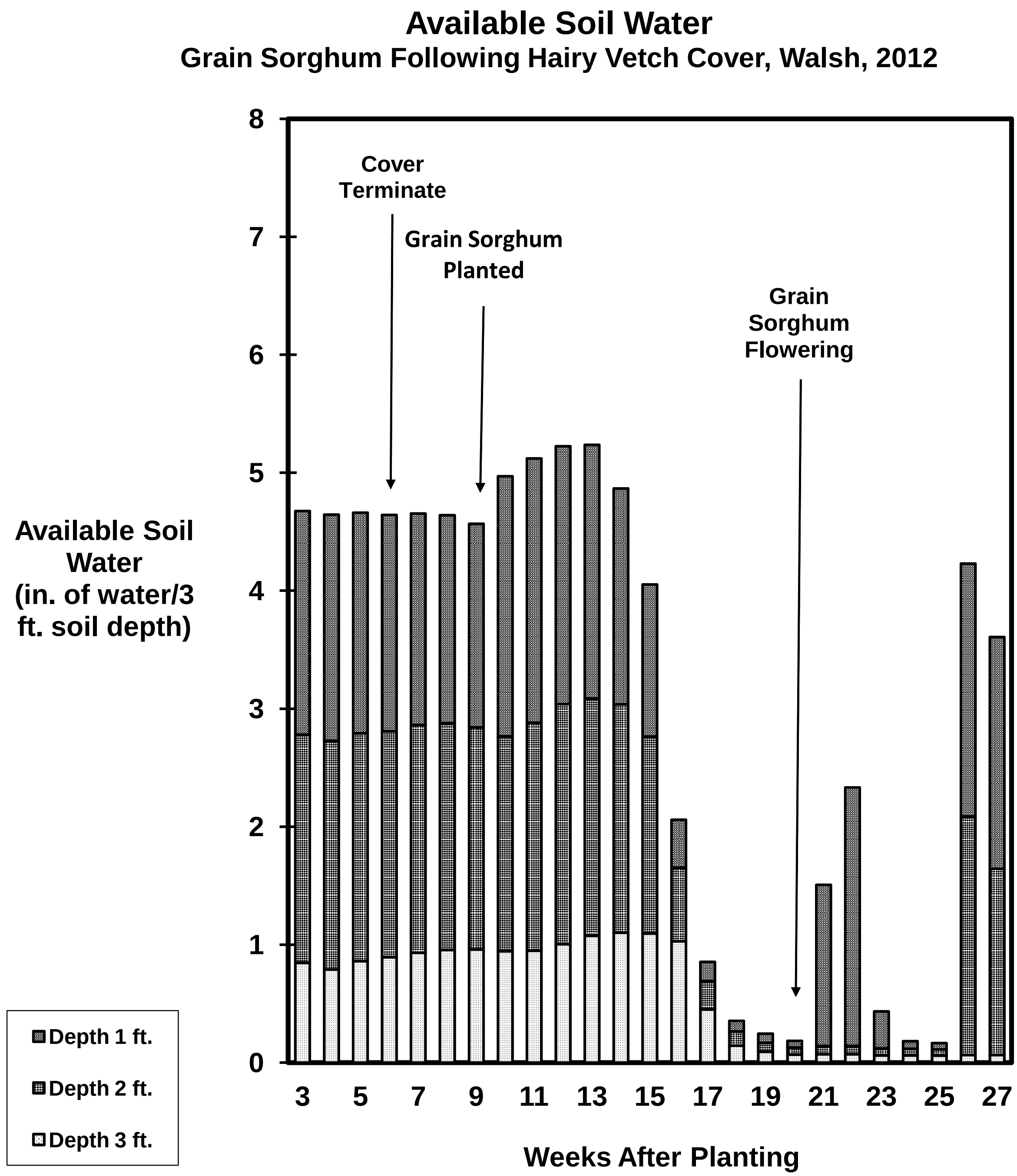

Fig. . Available soil water in grain sorghum following Hairy Vetch cover at Walsh. Gypsum block measurements taken to 3 ft. with 1 ft. increments. Total rainfall at Walsh from sorghum planting to first freeze was 7.74 in. Any increase in available soil water between weeks is from rain.

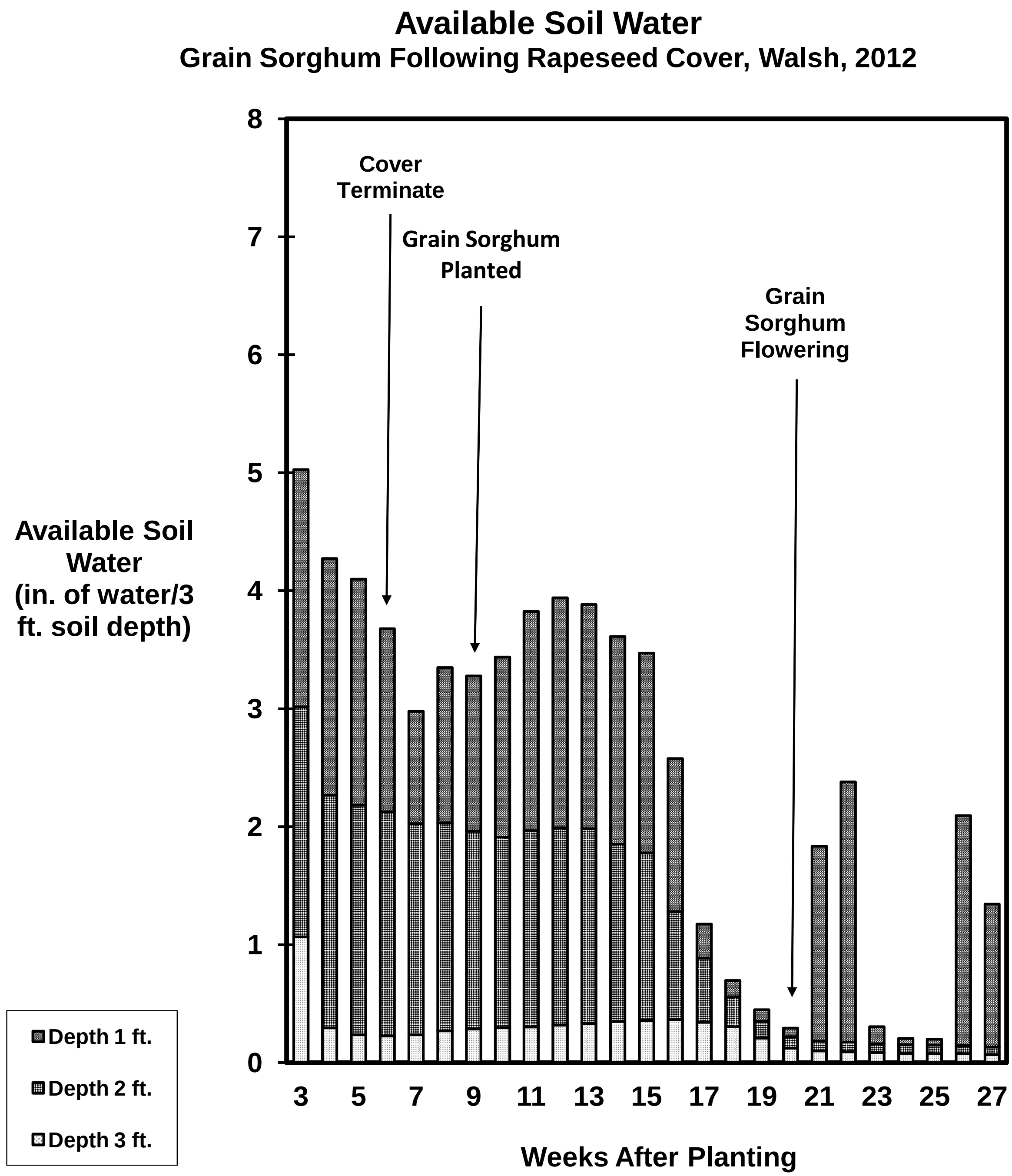

Fig. . Available soil water in grain sorghum following rapeseed cover at Walsh. Gypsum block measurements taken to 3 ft. with 1 ft. increments. Total rainfall at Walsh from sorghum planting to first freeze was 7.74 in. Any increase in available soil water between weeks is from rain.

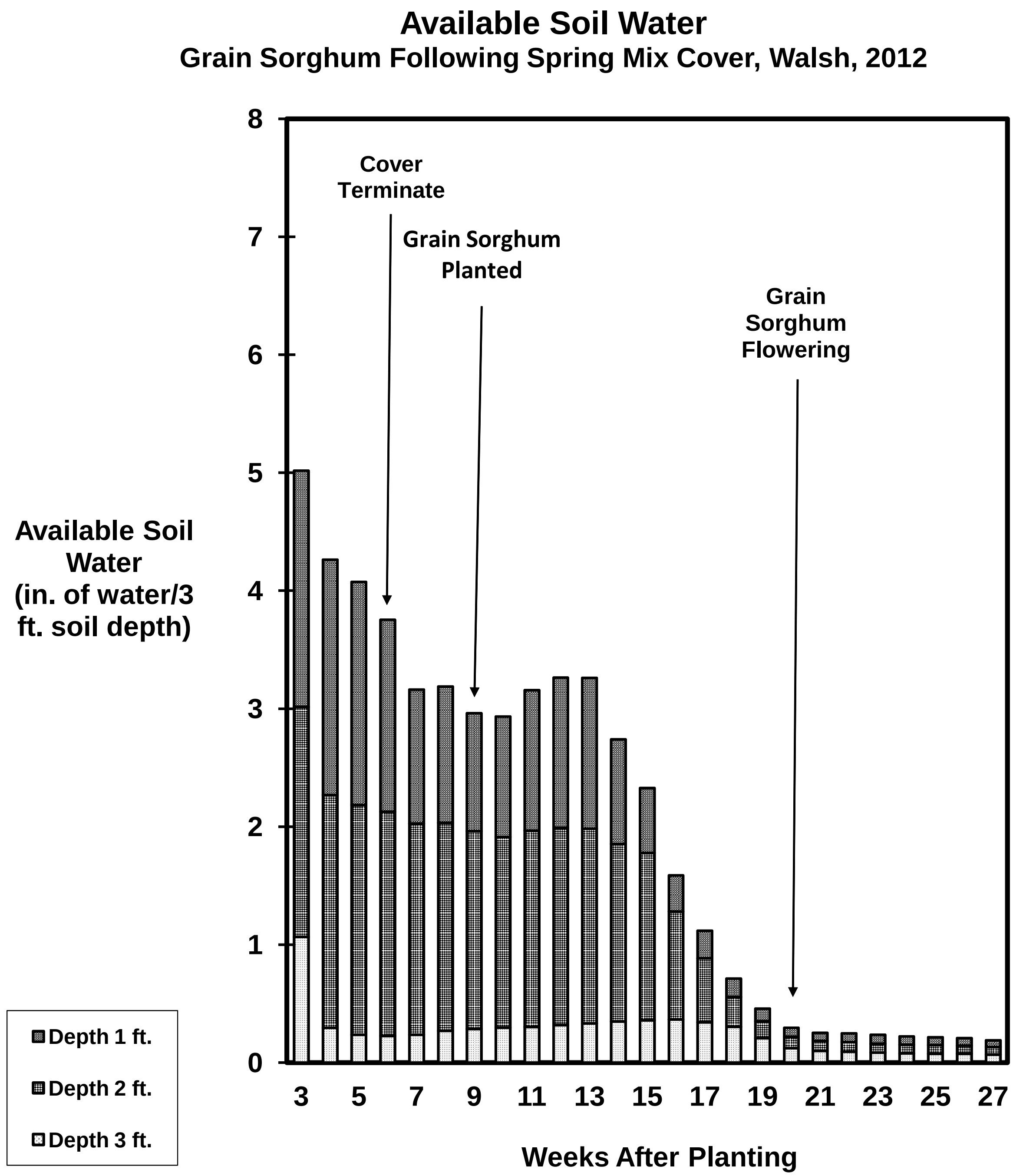

Fig. . Available soil water in grain sorghum following Spring Mix Cover at Walsh. Gypsum block measurements taken to 3 ft. with 1 ft. increments. Total rainfall at Walsh from sorghum planting to first freeze was 7.74 in. Any increase in available soil water between weeks is from rain.

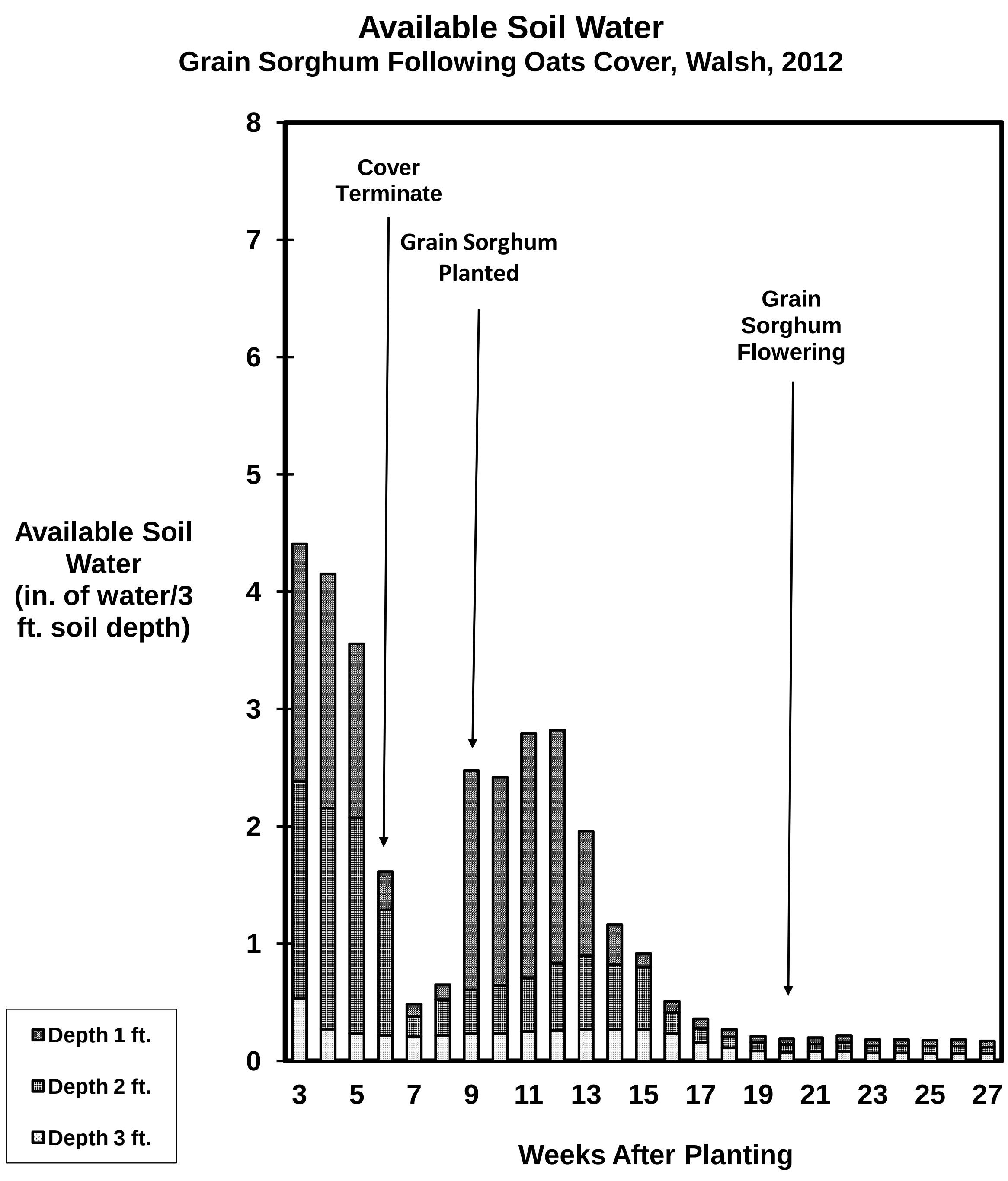

Fig. . Available soil water in grain sorghum following oats cover at Walsh. Gypsum block measurements taken to 3 ft. with 1 ft. increments. Total rainfall at Walsh from sorghum planting to first freeze was 7.74 in. Any increase in available soil water between weeks is from rain.

Long Term Evaluation of CRP Conversion Back into Crop Production

Kevin Larson and Brett Pettinger

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. Colorado has 1.87 million acres in CRP, and of that total, 571,000 acres will expire in October, 2012 (USDA, FSA, 2011). Because of high commodity prices and government funding uncertainty for CRP extensions, many CRP acres may be converted back into crop production. CRP has provided soil erosion protection by growing perennial grass cover. We developed this study to see which CRP grass conversion method, chemical (no-till) or tillage, provides the highest variable net return over multiple years for two common crop rotations.

Materials and Methods

We began our long term CRP conversion study on March 29, 2012 using chemical or tillage. For chemical CRP conversion, we applied glyphosate at 128 oz/a and ammonium sulfate (AMS) at 2 lb/a on four application dates: March 29, April 25, May 18 and June 21, 2012. For tillage CRP conversion, we disked with an offset disk on four dates: March 29, April 23, May 18 and June 21, 2012. We are testing our long term CRP conversion in two common crop rotations: Wheat-Fallow (W-F) and Wheat-Sorghum-Fallow (W-S-F). After establishing the rotations, all phases of each rotation will be present each year. For the cropping first season, we were only able to test grain sorghum in the Wheat-Sorghum-Fallow (W-S-F) since we are still establishing the rotations. For in-season broadleaf weed control in the grain sorghum crop, we applied a tank mix of Huskie 16 oz/a, atrazine 0.5 lb/a, and AMS 1 lb/a. For N fertilization, we streamed 32-0-0 at 75 lb N/a on 18 in. spacing. We planted Sorghum Partners KS310 at 39,000 seeds/a on June 21, 2012 and seedrow applied 5 gal 10-34-0/a at planting. We harvested the grain sorghum on November 5, 2012 with a self-propelled combine equipped with a digital scale.

Results and Discussion

On August 3, 1990, Ken Lair, Soil Conservation Service, planted these 11 perennial grass strips: Hycrest, crested wheat grass; Bozorsky, Russian wildrye; Oahe, intermediate wheatgrass; Luna, pubescent wheatgrass; 9053823, smooth brome; Paiute, orchard grass; Granada, yellow bluestem; WWSpar, old world bluestem; Caucasian, bluestem; Ironmaster, bluestem; Morpa, weeping lovegrass. Each of our CRP conversion treatments transects all 11 perennial grass strips.

For this CRP conversion study, we want to determine the effect of keeping the grass cover on subsequent crop yields over multiple years. This first year we are still establishing our rotations. Grain sorghum in W-S-F was the only crop phase of the rotations that we were able to test after our initial burn down or tillage control of the perennial grasses. Neither the chemical nor tillage conversion methods completely controlled all the perennial grasses. Some perennial grasses were still present at planting. Because the perennial grasses were only partially controlled, grain sorghum yields and test weights were poor. Chemical conversion produced higher average yield and test weight than the tillage treatment, 5.6 bu/a and 51 lb/bu for chemical, 3.5 bu/a and 44 lb/bu for tillage. Both CRP conversion methods lost $35/a in variable net income. The cost of the chemical conversion treatment was $15/a higher than the tillage treatment, but the chemical treatment produce enough additional yield to offset its higher cost; therefore, both treatment lost the same amount of income.

Reference Cited

USDA, FSA. December 30, 2011. Conservation Reserve Program - Monthly CRP Acreage Report, Summary of Active and Expiring CRP Acres by State. Accessed: January 12, 2012. ftp://ftp.fsa.usda.gov/crpstorpt/RMEPEGG/MEPEGGR1.HTM

Table .Long Term CRP Conversion Using Tillage or Chemical, First Season, Wheat-Sorghum-Fallow, Grain Sorghum Crop, Walsh, 2012.

CRP Conversion	Rotation	Test Weight	Grain Sorghum Yield	Gross Income	Conversion Cost	Variable Net Income
		lb/bu	bu/a	$/a	$/a	$/a
Chemical	W-S-F	51	5.6	40.60	75.40	-34.80
Tillage	W-S-F	44	3.5	25.38	60.00	-34.63
Average		48	4.6	32.988	67.70	-34.71
LSD 0.20			1.54			

Chemical: glyphosate 128 oz/a and AMS 2 lb/a applied four times.
Chemical cost: $13.35/a and $5.50/a for each application.
Chemical application dates: March 29, April 25, May 18 and June 21, 2012.
Tillage: disked four times.
Tillage cost: $15/a per disking.
Tillage application dates: March 29, April 23, May 18 and June 21, 2012.
N fertilizer applied at 75 lb/a as 32-0-0.
Grain sorghum, Sorghum Partners KS310, planted at 39,000 seeds/a and seedrow applied 5 gal 10-34-0/a at planting.
Grain sorghum planted on June 21; harvested on November 5, 2012.
Grain sorghum price: $7.25/bu.
Variable Net Income is Gross Income minus Conversion Cost.

Irrigated Mid and High Oleic Sunflower Hybrid Performance Trial at Walsh, 2012

COOPERATORS: Plainsman Agri-Search Foundation; K. Larson, B. Pettinger, D. Harn, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2700 heat units in a silty clay loam soil.

RESULTS: Of the 6 hybrids tested, Mycogen 8H449CL had the highest oil yield of 722 lb/a. For this limited irrigation trial, we applied 10.7 in./a of water.

PLOT: Four rows with 30 in. row spacing, at least 600 ft. long. SEEDING DENSITY: 26,000 seeds/a. PLANTED: June 22. HARVESTED: November 11.

IRRIGATION: Subsurface Drip Irrigated: total water applied 10.7 a-in./a.

PEST CONTROL: Preemergence Herbicides: Glyphosate 28 oz/a, 2,4-D 0.5 lb/a, Spartan 2.0 oz/a. Post Emergence Herbicides: Select 10 oz/a, COC 16 oz/a.

Summary: Growing Season Precipitation and Temperature \1
Walsh, Baca County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in	--------no. of days--------			
June	0.17	0.00	277	8	7	8
July	1.61	0.00	942	27	7	39
August	2.91	3.44	800	21	6	70
September	2.36	5.67	517	8	0	100
October	0.86	1.56	167	0	0	118
Total	7.91	10.67	3703	64	20	118

\1 Growing season from June 22 (planting) to October 18 (freeze, 29F).
\2 Total in-season water from irrigation and precipitation was 26.81 in/a.
\3 GDD: Growing Degree Days for sorghum.
\4 DAP: Days After Planting.

CULTIVATION: Once. INSECTICIDES: Nufos and Methyl Parathion (Sunflower Head Moth control).
FIELD HISTORY: Previous Crop: Grain Sorghum. FIELD PREPARATION: No-till.

COMMENTS: Planted in good soil moisture. Weed control was good. The growing season precipitation was average, but variable (June was wet and July was dry). Head moth control was poor: many heads were infected with Rhizopus Head Rot. Seed yields were fair and oil content was average.

SOIL: Silty clay loam for 0-8” and silty clay loam 8”-24” depths from soil analysis.

Summary: Soil Analysis from Drip Site.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------------ppm----------------				
0-8”	7.9	0.6	2.0	41	1.0	980	0.7	3.7
8”-24”				30				
Comment	Alka	Vlo	Hi	VHi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization for Drip Site.

Fertilizer	N	P_2O_5	Zn	Fe
	--------------------lb/a------------------			
Recommended	0	40	0	0
Applied	150	20	0	0

Yield Goal: 2000 lb/a.
Actual Yield: 1678 lb/a.

Drip Irrigated Sunflower, Mid and High Oleic Variety Trial, PRC, Walsh, 2012.

Firm	Hybrid	Oil Yield	Seed Yield	Oil	Test Wt.	Plant Density	Plant Ht.	50% Flower	Mid or High Oleic
		lb/a	lb/a	%	lb/bu	plants/a (X1000)	in	date	
MYCOGEN	8H449CL	722	1699	42.5	33	16.0	45	8/16	high
TRIUMPH	s673	707	1733	40.8	31	20.0	34	8/19	mid
TRIUMPH	651CL	703	1752	40.1	30	18.8	52	8/17	mid
TRIUMPH	s668	678	1691	40.1	30	17.6	35	8/19	mid
TRIUMPH	662	674	1747	38.6	31	21.2	47	8/15	mid
TRIUMPH	849CLD	576	1444	39.9	31	22.0	45	8/17	high
Average		677	1678	40.3	31	19.3	43	8/17	
LSD 0.20			230.2						

Planted: June 22; Harvested: November 11, 2012.
Seed Yield adjusted to 10% seed moisture content.
Total water applied was 10.7 in./a of drip irrigation.