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Agricultural Experiment Station

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

Plainsman Research Center 2006 Research Reports

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In Memory of
Edward Langin
1924 – 2006

This research report booklet is dedicated to Edward Langin, Plainsman's Founding Father.

Ed Langin's legacy is the Plainsman Agri-Search Foundation, the quintessential research and growers' association model. Ed was the visionary behind Plainsman. He envisioned a research center where growers and researchers are partners. Grower involvement ensures that their agronomic concerns are studied, and researchers know that their research is utilized. The qualities he forged in Plainsman continue to be the keys to Plainsman's success. His dynamic leadership will surely be missed. We thank Ed for establishing the Plainsman Agri-Search Foundation, through this legacy he will always be remembered.

Plainsman Research Center, 2006 Research Reports

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2006 Climatological Summary
Plainsman Research Center

Month	Temperature Max. F	Min. F	Max. Mean F	Min. Mean F	Mean F	Precip. In.	Greatest Day of Precip. In.	Snow-Fall In.	Greatest Snow Depth In.	Evapor-ation In.
Jan.	80	14	55.1	23.7	39.4	0.30	0.13	3.75	2.00	
Feb.	74	-5	51.4	17.0	34.2	0.00	0.00	0.00	0.00	
Mar.	80	8	58.1	28.2	43.2	0.77	0.46	5.50	4.00	
Apr.	94	21	74.7	40.2	57.5	0.88	0.53	0.00	0.00	4.18
May	101	35	80.5	48.9	64.7	1.19	0.34	0.00	0.00	11.96
Jun.	104	50	92.5	59.5	76.0	1.37	0.58	0.00	0.00	15.77
Jul.	102	57	92.7	63.6	78.2	4.03	1.01	0.00	0.00	10.14
Aug.	101	47	87.2	62.3	74.8	4.04	1.04	0.00	0.00	6.89
Sept.	93	35	76.6	47.8	62.2	0.96	0.38	0.00	0.00	7.05
Oct.	90	19	68.4	38.8	53.6	2.31	1.13	0.00	0.00	3.23
Nov.	84	11	59.7	28.7	44.2	0.24	0.24	2.00	2.00	
Dec.	66	7	42.4	20.6	31.5	4.00	1.61	34.25	16.00	
Total Annual			**69.94**	**39.94**	**54.94**	**20.09**		**45.50**		**59.22**

*** NOTE: Evaporation read mid April 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.
Very high evaporation for month of June - 15.77

	2006	2005
Highest Temperature:	104 degrees on June 21	106 degrees on July 21
Lowest Temperature:	-5 degrees on Feb. 18	-8 degrees on Dec. 8
Last freeze in spring:	27 degrees on Apr. 26	32 degrees on May 1
First freeze in fall:	28 degrees on Oct. 19	30 degrees on Oct. 7
2005 frost free season:	176 frost free days	160 frost free days
Avg. for 23 years:	Avg for 23 years 20.14 inches	Avg for 22 years 20.15 inches

Maximum Wind:

Jan.	43 mph on 13th	July.	38 mph on 31st
Feb.	46 mph on 6th	Aug.	34 mph on 1st
Mar.	57 mph on 31st	Sept.	52 mph on 22nd
Apr.	51 mph on 8th	Oct.	46 mph on 27th
May	41 mph on 21st	Nov.	51 mph on 15th
Jun.	58 mph on 22nd	Dec.	40 mph on 22nd

2006 Colorado Winter Wheat Variety Performance Trial Results

Jerry Johnson and Scott Haley (July 2006)

Performance Trial Results Help Colorado Wheat Producers Make Better Variety Decisions

Colorado State University provides unbiased and reliable information to Colorado wheat producers to help them make better wheat variety decisions. Crop variety testing is only the tip of the iceberg of CSU and Colorado wheat industry investment in wheat improvement which includes excellent research faculty and staff, a focused breeding program, graduate and undergraduate students, and dedicated agricultural extension specialists. Wheat improvement in Colorado is made possible by the support and cooperation of the entire Colorado wheat industry.

Wheat variety performance trials represent the final stages of a wheat breeding program where experimental lines are tested under a broader range of conditions than is possible during earlier generations. On-going and strong support for a public breeding program at CSU is critical because the variety development is a long process, especially under the highly variable climatic conditions in Colorado. Variation in annual precipitation, as well as variable fall, winter, and spring temperature regimes, hail and spring freeze events, interact with disease and insect pests and variety maturity to affect wheat yields.

The following table, obtained from the National Agriculture Statistics Service (NASS), underscores the interacting effects of weather on Colorado wheat production and illustrates the severity of environmental conditions in 2006 compared to the previous ten years.

Table 1. Colorado winter wheat acreage, yield, price, and value of production – 1996 to 2006.

Year	Harvested acres (thousands)	Yield (bu/a)	Price ($/bu)	Value of production (thousands)
1996	2,200	32	$4.27	$300,608
1997	2,700	32	$3.17	$273,888
1998	2,550	39	$2.49	$247,631
1999	2,400	43	$2.23	$230,136
2000	2,350	29	$2.70	$184,005
2001	2,000	33	$2.72	$179,520
2002	1,650	22	$3.63	$131,769
2003	2,200	35	$3.32	$255,640
2004	1,700	27	$3.25	$149,175
2005	2,200	24	$3.35	$176,880
2006 exp.	2,000	21	?	?

Relevant sections from the Colorado Agricultural Statistics Service Crop Progress Reports between April and July demonstrate the development of stress conditions during critical crop growth stages which resulted in a good crop at the beginning of April but, by late June and July, had evolved into one of the lowest yielding crops since 1968:

- March 12, 2006 - Winter wheat is rated in mostly fair to good condition with 6 percent of the crop being pastured.
- April 9, 2006 - Even with the recent snow and rain showers, statewide, Colorado recorded below normal levels of precipitation for the week. Evidence of wheat mite infestation is still being reported in areas around the state. Winter wheat is now rated in mostly good to fair condition with the crop being reported at 15 percent at or beyond the jointed stage.
- May 12, 2006 - Winter wheat production in Colorado is forecast at 54.0 million bushels. This is 2 percent above last year's production. Acreage for harvest, estimated at 2.0 million acres, is 200,000 acres less than a year ago. Average yield is forecast at 27.0 bushels per acre, up 3.0 bushels per acre from last year's crop. Conditions were favorable for fall seeding, but a dry winter followed by a dry spring reduced yield potential in most of the growing areas.
- June 9 2006 - Winter wheat production in Colorado is forecast at 46.0 million bushels, down 15 percent from the May 1 forecast and 13 percent below the 52.8 million bushels produced last year. Average yield is forecast at 23.0 bushels per acre, 1.0 bushel per acre below last year's average. Limited moisture received in May contributed to lower yield expectations as did record high temperatures. Currently, 59 percent of the crop is rated in poor to very poor condition.
- July 12 2006 - Winter wheat production in Colorado is forecast at 42.0 million bushels. This is down 9 percent from the June 1 forecast and is 10.8 million bushels below last year's production. The state's average yield is forecast at 21.0 bushels per acre, 3.0 bushels per acre below the previous year and 2.0 bushels per acre below the June forecast. If realized, the forecasted yield will be the lowest since 1968. Record hot temperatures in June combined with below average rainfall led to lower expected yields.

As these reports illustrate, drought stress, high temperature stress often with dry winds, spring freeze injury, and the interaction among these, were the major factors influencing 2006 wheat variety trial performance. The significant precipitation (2-3+ inches in most areas) received in early October, however, was extremely beneficial as this was the only appreciable precipitation received after planting in many areas. Wheat diseases, insects, and weed infestations were generally negligible in 2006, except for localized infestations of Russian wheat aphid, brown wheat mite, and wheat streak mosaic virus, the latter being widespread across the High Plains. Early reports in April of the lack of leaf and stripe rust in the southern Great Plains held true for Colorado as virtually no leaf or stripe rust pustules were observed on susceptible entries in the trials. A new strain of High Plains disease may have been detected in Kansas, though no confirmation of its presence in Colorado was made.

With regard to the lack of precipitation, the following table illustrates the severity and timing of the drought stress along with the average yields at Colorado's dryland variety trial locations. As the table demonstrates, the 63% average yield over locations in 2006 is approximated by 70% average precipitation from October 2005 through June 2006.

Table 2. Precipitation during critical crop growth stages during 2005 and 2006, trial location yield averages (1997-2005), and percent of average yields resulting from drought stress.

							Yield (bu/a)		Yield
Location*	March	April	May	June	Avg (Mar-Jun)	Oct-May	2006	97-05	% Avg
Walsh	75%	62%	43%	59%	60%	60%	18	38	48%
Lamar	113%	17%	79%	127%	84%	91%	23	33	69%
Arapahoe	107%	22%	23%	20%	43%	88%	14	30	48%
Burlington	50%	1%	19%	101%	43%	60%	16	29	56%
Genoa	47%	31%	29%	183%	73%	46%	28	38	72%
Akron	58%	65%	45%	6%	44%	85%	25	47	54%
Yuma**	56%	81%	43%	53%	58%	87%	.	.	.
Julesburg	35%	11%	28%	97%	43%	57%	8	42	18%
Orchard	122%	14%	32%	21%	47%	86%	40	32	125%
Bennett	59%	19%	11%	3%	23%	60%	34	43	80%
Sheridan Lake	.	.	.	.	.	.	37	33	112%
Average	74%	27%	34%	69%	51%	70%	23	37	63%

*Precipitation at Sheridan Lake/Brandon not available. Weather stations located at Cheyenne Wells for Arapahoe, Burlington South Station for Burlington, Holyoke for Julesburg, Briggsdale for Orchard, and Brighton for Bennett. No weather station located near the Sheridan Lake trial.

**Yuma is a new trial location starting in 2004 thus yield history unavailable.

***Yields at locations for years when trial results were not reported were estimated at 10 bu/a for computing 1997-2005 average yields.

Interactions of low precipitation, high temperatures, stand establishment, and altitude affected variety performance to a significant extent in 2006. General comments regarding the trials include the following:

- Low starting spring soil moisture content, drought from March through June in many locations and high temperatures in May and June, led to overall low trial average yields in 2006 compared to long term average trial yields.
- Late planting and thin stand establishment delayed maturity and led to reasonably high 2006 trial yields in some locations.
- Soil moisture levels were generally very low in early March which exacerbated the effects of subsequent months of low moisture.
- Even though some locations received above average March and June precipitation, total precipitation received at any trial is small by comparison to April, May, and June total precipitation.
- Much of June precipitation was not effective for increasing yield as it was received after wheat maturity.
- Otherwise, 2006 was characterized by strong windy conditions exacerbating drought and heat water losses and relatively few and weak hail events.
- Blowing soil caused wind erosion in wheat fields during fall 2005 and spring 2006 in some parts of Colorado.

There were 54 entries in the dryland performance trials (UVPT) and 40 entries in the irrigated performance trials (IVPT). All trials include a combination of public and private varieties and experimental lines from Colorado and surrounding states. Trials were planted in a randomized complete block design with four replicates (increased from three in previous years) in the dryland trials and three replicates in the irrigated trials. Yields are corrected to 13% moisture. All eleven dryland and three irrigated uniform variety performance trials were harvested. Three-year and the 2006 yield summary results are presented below.

Note that individual 2006 Variety Trial Results for both dryland and irrigated trials including test weight, grain moisture, height, and lodging information will be available on the following websites:
www.csucrops.com the CSU Crops Testing website for all Colorado crop performance results
http://wheat.colostate.edu/vpt.html the CSU Wheat Breeding Program web site (downloadable wheat variety database)
http://www.coloradowheat.org Colorado Wheat Administrative Committee, CAWG, and CWRF website

Colorado Dryland Winter Wheat Variety Performance Trial Summary For 2006.

	2006 Trial Locations														
Variety[1]	Akron	Arapahoe	Bennett	Burlington	Genoa	Julesburg	Lamar	Orchard	Sheridan Lake	Walsh	Yuma	**2006 Yield**	Grain Moisture	Test Weight	Plant Height
	----------Yield (bu/ac)----------												%	lb/bu	in
CO00016*	30.7	15.0	34.7	13.1	30.5	4.8	28.8	42.3	36.5	24.7	44.7	27.8	9.7	56.9	19.7
NuDakota	39.7	16.3	35.3	19.8	28.9	8.5	24.6	40.3	29.6	21.0	41.9	27.8	9.9	56.4	20.0
Infinity CL	33.8	12.7	33.5	16.9	34.3	10.7	25.4	43.4	32.6	20.7	38.0	27.5	10.3	57.5	22.6
Goodstreak	27.3	17.0	35.8	18.7	27.5	10.5	21.5	46.5	43.9	14.0	38.3	27.4	10.3	58.6	23.3
Endurance	29.9	16.6	34.5	22.6	27.5	7.4	20.6	42.6	40.6	19.0	36.8	27.1	10.7	58.6	20.5
Harry	21.5	16.6	34.2	16.6	29.0	6.7	23.8	44.3	48.3	16.2	39.3	27.0	9.4	55.9	20.7
Keota	29.6	11.7	38.9	20.3	26.7	4.8	21.0	43.7	37.4	21.0	41.4	26.9	10.5	58.7	22.0
Hatcher	17.1	13.4	43.3	21.7	28.7	2.2	23.0	43.7	38.7	21.2	39.5	26.6	10.4	58.6	20.4
Alliance	26.1	15.8	34.5	19.5	32.2	2.9	22.4	38.0	43.5	15.9	38.2	26.3	10.3	57.8	21.7
Avalanche	28.5	13.7	35.8	17.4	27.7	7.5	26.7	37.6	35.2	19.5	39.0	26.2	10.7	58.9	21.0
Yuma	23.2	16.6	34.9	19.0	27.5	6.4	23.1	42.6	36.2	20.8	38.0	26.2	9.8	57.4	20.3
Ankor	20.8	14.7	37.6	19.8	27.6	3.8	23.9	42.0	39.3	19.2	39.6	26.2	10.4	57.6	20.7
Trego	18.3	16.1	33.8	15.2	30.2	8.3	24.8	44.2	38.1	18.8	40.1	26.2	10.7	59.5	19.9
Jagger	34.9	10.0	31.1	22.0	27.2	13.6	23.4	36.3	31.7	18.3	38.5	26.1	10.0	57.5	22.2
Bond CL	19.3	15.4	36.8	14.0	24.8	10.9	28.3	41.9	32.9	17.7	43.8	26.0	10.1	56.7	22.2
Akron	20.3	16.1	35.4	19.0	26.8	4.1	23.6	41.4	39.4	22.0	35.6	25.8	10.3	58.0	20.6
KS03HW6-6	20.3	13.8	34.1	13.3	30.1	7.5	24.9	42.4	50.3	9.0	35.3	25.5	10.4	58.1	20.0
Above	26.9	13.5	35.6	21.0	30.5	5.3	26.2	36.2	38.8	19.3	26.9	25.5	10.2	57.7	20.6
Danby	15.8	13.1	40.4	16.4	30.6	3.8	21.0	38.6	36.0	28.5	33.1	25.2	11.0	60.0	21.0
Prairie Red	27.3	10.4	30.3	19.6	28.9	6.0	25.5	36.7	30.7	20.6	35.0	24.6	10.0	57.9	20.4
Jagalene	28.4	14.2	32.2	19.0	28.2	4.3	20.9	34.1	33.0	20.1	35.6	24.5	10.5	59.3	20.9
NuHills	25.4	12.3	33.4	13.5	25.9	11.9	26.3	33.9	37.2	20.1	28.1	24.4	10.2	58.1	19.8
NuGrain	23.6	13.9	28.6	14.9	26.1	8.7	23.3	40.5	35.2	16.7	36.3	24.3	11.0	59.6	20.0
TAM 111	17.6	11.7	35.9	18.8	28.4	4.2	22.8	43.0	34.3	15.6	34.8	24.3	10.9	58.7	22.2
Guymon	24.0	14.0	28.7	14.0	23.2	8.7	23.6	40.2	39.5	16.5	31.6	24.0	10.0	59.5	19.4
NuFrontier	27.7	15.3	31.3	12.5	25.0	13.8	17.1	28.3	37.7	17.0	37.8	24.0	9.4	58.6	19.8
Prowers 99	20.4	12.6	31.4	13.8	24.8	6.7	19.1	39.5	38.3	15.3	38.2	23.6	10.3	58.9	22.6
Postrock	24.3	13.0	32.0	20.3	20.5	5.4	23.5	36.0	29.2	18.3	34.9	23.4	10.5	58.0	21.0
RonL	14.6	13.2	32.1	10.1	26.5	8.6	24.3	37.1	35.5	20.4	30.3	23.0	11.0	59.7	18.5
Average	**24.7**	**14.1**	**34.4**	**17.3**	**27.8**	**7.2**	**23.6**	**39.9**	**37.2**	**18.9**	**36.9**	**25.6**	**10.3**	**58.2**	**20.8**
$LSD_{(0.30)}$	4.8	2.1	2.3	2.6	3.5	3.7	2.4	3.9	3.9	2.2	5.0				

[1]Varieties in table ranked by the average yield over 11 locations in 2006.
*CO00016 is being advanced toward variety release in fall 2006.

Specific comments about individual dryland variety trial locations:

- Walsh – low starting soil moisture and low precipitation in May led to low trial yields. Some plots were lost to drought stress resulting from prior bindweed patches.
- Lamar – very early maturity and low April moisture lead to low yields.
- Arapahoe – looked good at the end of March but very low April-June precipitation led to very low yields.
- Burlington – poor and uneven emergence due to crusting and low April-May precipitation led to very low trial yields.
- Genoa – late emergence, average stands, and high altitude led to better yields in 2006, albeit only 72% of long term average yields.
- Akron – timely planting, excellent stands and fall growth, looked terrific until May when very high tillering and drought stress led to much lower than expected yields.
- Julesburg – late planting following October moisture, stand establishment was good, but consistently low precipitation from March through May led to very low yields.
- Orchard – uniformly thin stand establishment and near average October to May precipitation led to higher than average yields.

Colorado Dryland Winter Wheat 3-Yr and 2-Yr Variety Performance Trial Summary.

	Averages						
Variety[1]	3-Yr	2-Yr	2006	2005	2004	3-Yr	2-Yr
	----------Yield (bu/ac)----------					--Twt (lb/bu)--	
CO00016*	36.7	33.1	27.8	38.9	52.1	56.9	56.9
Bond CL	35.3	32.2	26.0	39.0	48.4	56.3	56.5
Hatcher	34.3	31.0	26.6	35.8	48.3	57.8	58.0
Avalanche	33.5	29.4	26.2	33.0	50.6	58.6	58.7
Jagalene	33.5	28.6	24.5	33.1	54.1	58.1	58.1
Above	33.4	29.1	25.5	33.1	51.4	57.7	58.0
Harry	33.3	29.1	27.0	31.4	51.2	54.9	55.1
Goodstreak	32.9	28.6	27.4	30.0	51.0	58.3	58.4
Jagger	32.7	29.3	26.1	32.7	47.3	56.8	56.9
Alliance	32.4	29.1	26.3	32.2	46.4	57.4	57.8
Prairie Red	32.4	28.7	24.6	33.1	48.0	57.6	57.7
Yuma	32.2	28.4	26.2	30.8	48.4	56.8	56.9
NuHills	31.9	28.1	24.4	32.2	48.1	56.5	56.3
Ankor	31.8	27.9	26.2	29.7	48.3	57.3	57.3
NuFrontier	31.5	27.8	24.0	32.0	47.3	57.8	57.9
TAM 111	31.3	26.7	24.3	29.4	50.2	57.9	58.0
Akron	30.4	26.5	25.8	27.2	46.7	57.5	57.6
Trego	30.3	26.2	26.2	26.2	47.7	59.0	58.9
Prowers 99	30.1	27.3	23.6	31.3	42.2	58.1	58.2
Varieties that have only been in the trial for two years.							
Keota		30.2	26.9	33.7			57.3
Infinity CL		29.2	27.5	31.1			57.0
Endurance		28.8	27.1	30.7			58.3
NuGrain		28.2	24.3	32.5			58.8
Danby		27.9	25.2	30.9			58.8
Average	**32.6**	**28.8**	**25.8**	**32.1**	**48.8**	**57.4**	**57.6**

[1]Varieties in table ranked based on 3-Yr average yields.
*CO00016 is being advanced toward variety release in fall 2006.

Discussion of Dryland Wheat Variety Trial Results

The aforementioned effects of drought, high temperatures, and windy conditions greatly affected 2006 trial yields and led to a compression of average variety performance which meant that, when 2006 yields are averaged with yields from 2005 and 2004, there was little change in the rank of varieties over the three years 2004-2006 as compared to rank of varieties from 2003-2005 trials. Consequently, for prediction purposes and variety selection for fall 2006 plantings, the 3-Yr average performance is the most reliable. CO00016 is being advanced toward variety release in fall 2006 and proved to be high yielding in the past three years as well as this year. The impressive average performance of NuDakota in the 2006 trials will need to be confirmed by trial results in future years before it should be considered by Colorado producers. Variety trial results should be used to avoid varieties that are lower-yielding unless they have some characteristic that makes them otherwise desireable. Avalanche has pulled away from Trego in terms of recent average yield under Colorado conditions. Producers who choose to plant Prowers 99 should expect to suffer yield loss, though Goodstreak may be a good option for those interested in a standard height (tall) wheat. Ankor, the RWA-resistant version of Akron, is proving to yield approximately 2 bu/ac better than Akron over the past three years even though its resistance has been rendered ineffective by the prevalence of new RWA biotypes. Alliance, Prairie Red, Yuma, NuHills, TAM 111, NuFrontier, and Akron can be replaced by higher yielding varieties in Colorado.

Colorado Irrigated Winter Wheat Variety Performance Trial Summary For 2006.

	Haxtun				Fort Collins					Rocky Ford					2006 ave
		Grain	Test	Plant		Grain	Test	Plant			Grain	Test	Plant		Test
Variety[1]	Yield	Moist	Wt	Ht	Yield	Moist	Wt	Ht	Head[2]	Yield	Moist	Wt	Ht	Head	Wt
	bu/ac	%	lb/bu	in	bu/ac	%	lb/bu	in	date	bu/ac	%	lb/bu	in	date	lb/bu
Bond CL	133.0	10.5	57.2	36	44.8	10.6	54.4	21	141	60.6	10.5	56.6	37	134	56.1
TAM 111	119.9	11.9	59.5	37	66.5	11.9	61.1	26	144	68.1	9.0	57.3	37	136	59.3
Keota	119.4	11.4	58.6	39	59.8	11.2	59.6	27	143	70.4	9.4	57.5	37	134	58.5
Danby	118.8	11.9	60.5	36	55.3	10.9	56.6	26	142	56.5	8.7	58.1	33	134	58.4
Platte	116.1	11.4	60.1	32	55.0	8.2	59.3	23	144	71.0	8.7	56.7	34	137	58.7
Ankor	115.4	11.1	57.6	33	50.7	12.4	58.6	23	143	58.1	8.6	56.1	35	134	57.5
NI03427	111.8	12.0	59.8	34	66.2	11.3	60.6	23	142	60.5	9.7	58.3	32	135	59.6
Hatcher	111.4	11.0	58.3	32	47.3	11.4	59.8	21	143	54.2	9.7	56.9	33	134	58.4
Yuma	110.4	10.9	58.5	35	45.2	10.0	58.2	20	144	60.6	9.8	56.7	33	136	57.8
Prairie Red	109.9	10.7	58.7	36	44.6	8.3	60.0	28	141	59.2	10.4	56.7	32	128	58.5
NuFrontier	107.9	11.1	59.1	38	47.7	12.2	60.0	27	142	54.4	9.2	58.0	35	136	59.0
NuDakota	106.7	10.9	57.9	34	39.5	11.0	53.7	22	141	62.0	8.7	54.3	34	136	55.3
NuGrain	105.4	11.1	59.8	32	46.1	11.1	60.8	24	142	64.9	8.8	57.5	34	135	59.4
Guymon	104.8	11.2	59.8	34	49.0	10.2	59.4	23	142	60.6	10.0	56.9	32	136	58.7
Antelope	103.6	10.9	57.9	35	43.1	10.5	58.2	23	141	58.3	9.5	56.4	31	133	57.5
NuHills	101.9	11.1	59.2	35	47.4	4.7	53.6	19	140	66.6	10.3	57.7	33	133	56.8
NI02425	101.8	10.4	58.3	34	43.4	2.4	51.4	21	141	44.3	10.8	55.7	31	132	55.1
Jagalene	99.1	11.4	58.9	35	53.1	11.0	60.5	23	142	62.1	9.1	57.8	36	132	59.1
NW98S097	98.5	10.9	59.2	35	43.9	8.8	59.3	22	146	47.6	10.4	57.2	31	137	58.6
Wesley	92.1	10.5	57.8	33	41.1	4.4	55.1	21	142	47.6	9.8	55.7	32	136	56.2
Postrock	86.5	11.0	59.1	33	50.9	9.5	60.6	22	140	60.9	9.5	56.9	35	134	58.9
Average	**108.3**	**11.1**	**58.8**	**35**	**49.5**	**9.6**	**58.1**	**23**	**142**	**59.5**	**9.5**	**56.9**	**34**	**134**	**58.0**
$LSD_{(0.30)}$	5.2				5.5					6.6					

[1]Varieties in table ranked by the average yield at Haxtun.
[2]Julian date from January 1.

Specific comments about individual irrigated variety trial locations:

- Haxtun (Irrigated) – Early planting after pinto bean crop, good stand establishment, good fall and spring tillering, and excellent fertilizer and water management produced a superlative trial for comparing variety performance near maximum yield capability.
- Fort Collins (Irrigated) – timely planting, excellent fall stands and growth, very little spring precipitation and problems with sprinkler irrigation system resulted in drought stress and shortened plant height.
- Rocky Ford (Irrigated) – In mid-June this trial looked like it would average 100-110 bu/ac as plant stands were good, tillering was excellent, RWA was controlled by spraying and there were no diseases. Some plots were starting to lodge. However, high winds and heavy rainfall led to severe lodging subsequently causing estimated losses of 30-40 bu/ac.

Colorado Irrigated Winter Wheat 3-Yr and 2-Yr Variety Performance Trial Summary.

	Haxtun[1]			Fort Collins[2]			Rocky Ford[3]		
Variety[4]	2006	2-Yr ave	Variety[4]	2006	2-Yr ave	Variety[4]	2006	2-Yr ave	3-Yr ave
	Yield (bu/ac)			Yield (bu/ac)			Yield (bu/ac)		
Bond CL	133.0	131.8	NuGrain	46.1	69.9	NuHills	66.6	82.9	89.3
Yuma	110.4	121.9	Bond CL	44.8	69.8	TAM 111	68.1	82.8	-----
TAM 111	119.9	119.9	TAM 111	66.5	67.7	Jagalene	62.1	77.3	78.7
Ankor	115.4	118.0	Jagalene	53.1	64.2	NuGrain	64.9	76.9	-----
Hatcher	111.4	114.9	Ankor	50.7	64.0	NuFrontier	54.4	76.7	81.9
Antelope	103.6	112.6	Hatcher	47.3	63.8	Bond CL	60.6	76.3	82.5
Platte	116.1	112.0	NuFrontier	47.7	61.8	Hatcher	54.2	75.7	78.7
NuFrontier	107.9	109.8	Platte	55.0	60.2	Platte	71.0	74.4	75.3
Prairie Red	109.9	109.5	Yuma	45.2	59.7	Yuma	60.6	71.3	79.5
Jagalene	99.1	109.5	NuHills	47.4	57.1	Antelope	58.3	71.1	73.9
NuGrain	105.4	105.4	Antelope	43.1	56.6	Prairie Red	59.2	70.1	82.1
Wesley	92.1	102.9	Prairie Red	44.6	45.7	Ankor	58.1	69.8	79.0
NuHills	101.9	102.8	Wesley	41.1	42.7	Wesley	47.6	68.1	73.2
Average	**109.7**	**113.2**	**Average**	**48.6**	**60.3**	**Average**	**60.4**	**74.9**	**79.5**
$LSD_{(0.30)}$	5.2		$LSD_{(0.30)}$	5.5		$LSD_{(0.30)}$	6.6		

[1]The irrigated trial was not conducted at Haxtun in 2005 so results from 2004 and 2006 were used for the 2-Yr averages.
[2]The Fort Collins 2004 trial results were not reported so data are only available for the 2005 and 2006 results.
[3]At Rocky Ford, 3-Yr averages could not be computed for TAM 111 and NuGrain because they were not entered in the 2004 trial.
[4]Varieties are ranked at each location according to 2-Yr average yields.

Discussion of Irrigated Wheat Variety Trial Results

For several reasons, the presentation of the irrigated variety trial results is different this year than in previous years when we averaged variety performance across years and locations. Three locations per year is a very small sample and ranking varieties according to differences among variety mean yields can easily misrepresent good performance of some varieties at specific locations where the trial has been repeated for multiple years. More importantly, each of the irrigated variety trial locations represents a very different agro-climatic environment that might account for different variety performance.

Yields at the Fort Collins trials in 2005 and 2006 are lower than what we would like to see in order to evaluate the maximum yield potential of irrigated wheat varieties on the Front Range. While we strive to manage the Fort Collins for high yields, the lack of natural precipitation, abnormally high temperatures, and mechanical difficulties with the linear move irrigation system resulted in low yields. Similarly, excessive early lodging at Rocky Ford due to severe storms reduced all variety yields approximately 30-40 bu/ac below their potential yield in the Arkansas Valley. The 2004 and 2006 trials at Haxtun were indicative of the maximum irrigated yield potential in northeastern Colorado. Bond CL stands out for its superlative yield potential in these two trials followed by TAM 111, Platte, Ankor, Hatcher, and Yuma that all averaged over 110 bu/ac.

Irrigated variety selection should also take into consideration stripe rust resistance and lodging. For variety ratings for these characteristics, see the Making Better Decisions Winter Wheat Variety Selection in Colorado for Fall 2006 tables below."

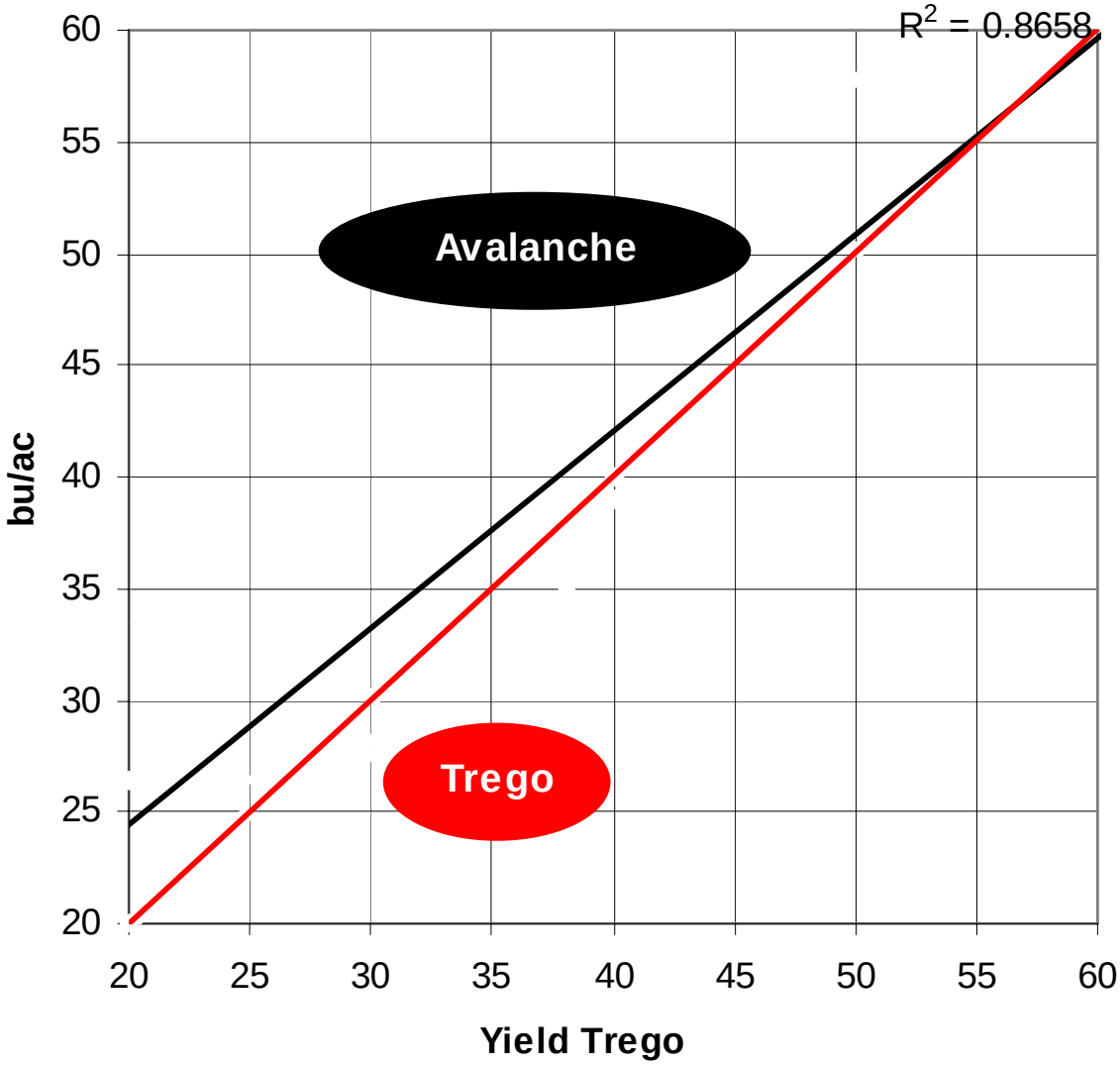
Collaborative On-Farm Tests (COFT) complement performance trial results to help Colorado wheat producers make better variety decision

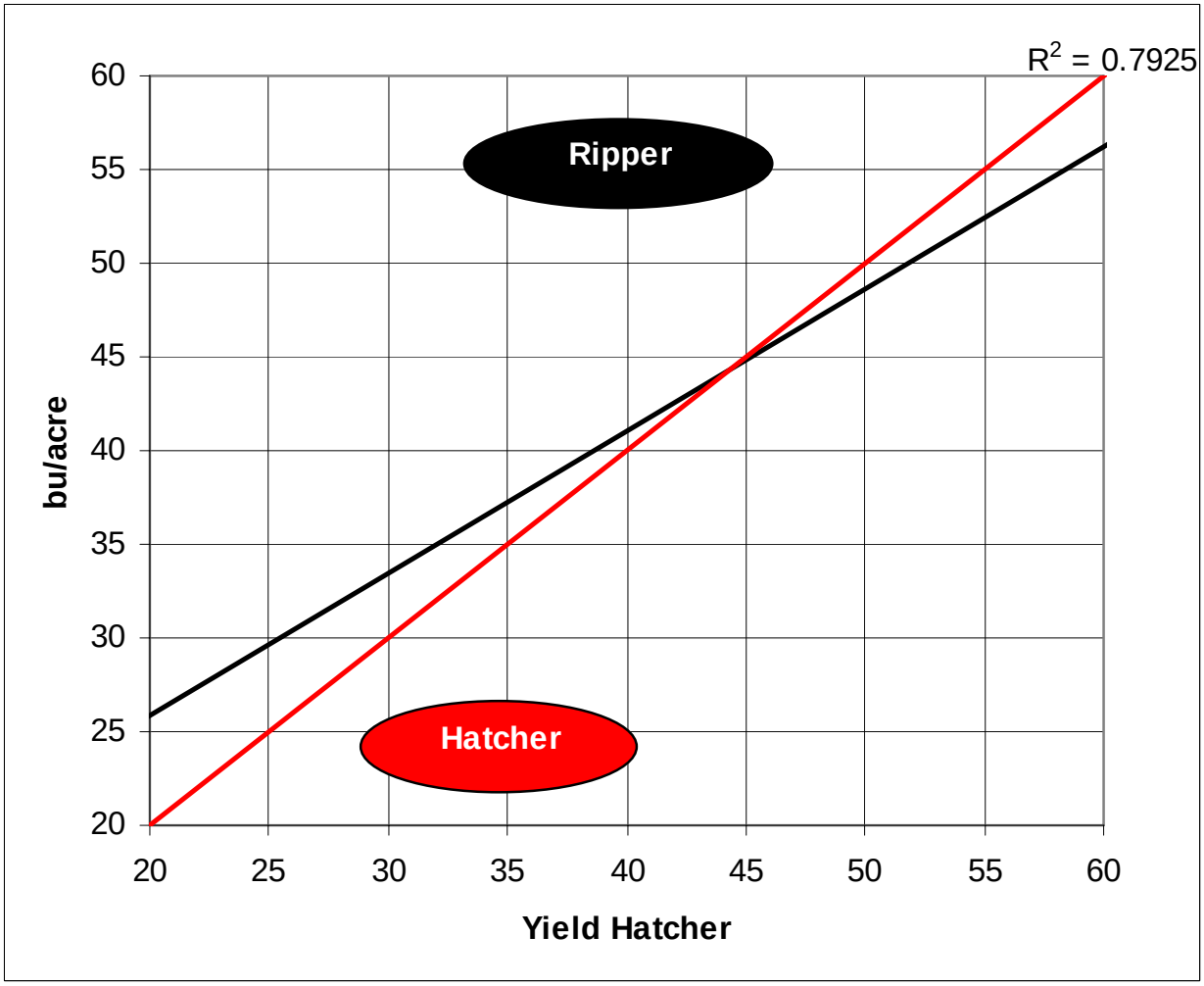
Over half of Colorado's 2006 wheat acreage was planted to winter wheat varieties that have been tested in the COFT program which is in its eighth year of testing. With on-farm testing, wheat producers get to evaluate new varieties on their own farms before seed of the new varieties is available on the market to all farmers. On-farm testing directly involves agents and producers in the variety development process, thereby speeding adoption of superior, new varieties.

Colorado State University Cooperative Extension specialists have a large responsibility for the success of this program - recruiting volunteer growers, delivering seed, planning test layout and operations, helping with planting, keeping records, coordinating visits, communicating with growers and campus coordinators, coordination of weighing plots and measuring yields. COFT would not be possible without the collaboration of so many dedicated wheat producers throughout eastern Colorado.

Eastern Colorado Cooperative Extension Wheat Educators and On-Farm Test Coordinators

Name	Title	Office Location
Bruce Bosley	Platte River agronomist	Sterling
Scott Brase	SE Area agronomist	Lamar
Alan Helm	Golden Plains specialist	Holyoke
Ron Meyer	Golden Plains agronomist	Burlington


R^2 = 0.8658
Avalanche
Trego
bu/ac
Yield Trego
60
55
50
45
40
35
30
25
20
20
25
30
35
40
45
50
55
60


R2 = 0.7925
Ripper
Hatcher
bu/acre
Yield Hatcher
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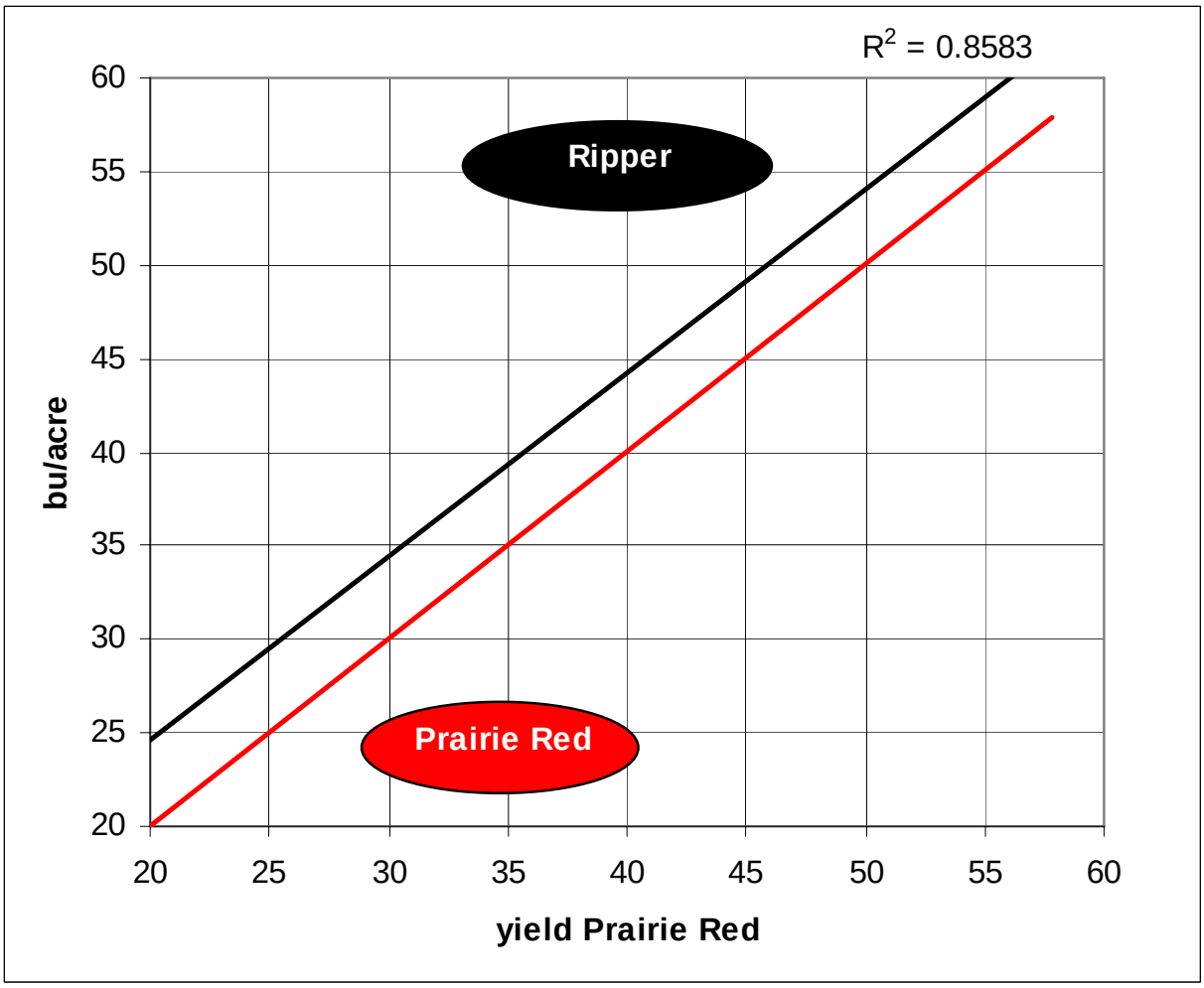
55
50
45
40
35
30
25
20
20
25
30
35
40
45
50
55
60


R^2 = 0.8583
Ripper
Prairie Red
bu/acre
yield Prairie Red
60
55
50
45
40
35
30
25
20
20
25
30
35
40
45
50
55
60


60
55
50
45
40
35
30
25
20
bu/acre
20
25
30
35
40
45
50
55
60
yield Ankor
Ripper
Ankor
R2 = 0.7774

Dryland Wheat Strips for Forage and Grain Yield at Walsh, 2006

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

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

MATERIALS AND METHODS: Fourteen wheat varieties were planted on October 7, 2005 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 0.1 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 10) and at boot (May 3). We measure the forage for fresh weight, oven-dried the samples, and recorded dry weight at 15% moisture content. Except for herbicides, no other pesticides were applied because insects (e.g., RWA) and diseases (e.g., Stripe Rust) were not a problem. We harvested the plots on June 26 with a self-propelled combine and weighed them in a digital weigh cart. Grain yields were adjusted to 12% seed moisture content.

RESULTS: Dry weather had the greatest impact on grain yields: the average yield was only 16 Bu/A. Trego produced the highest dry forage yields at both jointing and boot. The forage yield of Trego was significantly higher than TAM 107, the highest grain producing variety. The two-year grain yield average for our study placed TAM 111 as the highest yielding variety, 116% of TAM 107 yield, because of its outstanding yield obtain last year. T 81 is the only variety that had a higher three-year grain yield average than TAM 107.

DISCUSSION: The best overall dual-purpose wheat variety was Trego, a Hard White Wheat (HWW) variety. It had the highest forage yield at jointing and boot and the third highest grain yield. Trego was the sole HWW tested in the study. This shows that HWW can be very competitive with Hard Red Wheat in our environment.

TAM 107 produced 20 Bu/A, the highest grain yield of the 14 varieties tested. The low grain yields obtained in this study are directly related to the dry weather. The growing season moisture was well below average. From September 2005 through June 2006, there was 6.57 inches of moisture, only 58% of normal. At the wheat field day, I asked the growers which variety is going to have the highest grain yield. The variety that got the most votes was TAM 107. And they were right. TAM 107 has been around for 20 years and they knew that it performed well under adverse conditions, such as we were experiencing last season.

Table .Dryland Wheat Strips, Forage and Grain Yield at Walsh, 2006.

Variety	Jointing		Boot		Plant	Test	Grain
	Fresh Wt.	Dry Wt.	Fresh Wt.	Dry Wt.	Height	Weight	Yield
	----------Lb/A----------				In	Lb/Bu	Bu/A
TAM 107	2607	736	7445	2503	17	58	20
Jagalene	3941	1228	8277	2829	18	59	18
Trego	5075	1478	11370	3816	17	60	17
TAM 110	3842	1075	7476	2517	18	58	17
Ankor	3437	1027	8461	2763	18	58	17
Yumar	2998	820	7522	2462	19	58	16
TAM 111	3626	989	11693	3655	20	59	16
Bond CL	4334	1282	9598	3139	19	57	16
Above	3797	1126	8617	2827	18	57	16
Jagger	3653	1213	7252	2550	17	58	15
T81	2366	736	7378	2471	16	60	14
Prowers 99	4192	1183	10800	3417	21	58	14
Hatcher	3015	930	7424	2481	16	58	14
2137	2241	639	7770	2465	19	57	13
Average	3509	1033	8649	2850	18	58	16
LSD 0.05	1112.9	354.8	3259.5	1131.3			5.7

Planted: October 7, 2005; 50 Lb seed/A; 5 gal/A 10-34-0.
Jointing sample taken April 10, 2006.
Boot sample taken May 3, 2006.
Grain Harvested: June 26, 2006.
Wet Weight is reported at field moisture.
Dry Weight is corrected to 15% moisture content.
Grain Yield is corrected to 12% seed moisture content.

Table .--Summary: Dryland Wheat Strips Variety Performance Tests at Walsh, 2004-2006.

		Grain Yield					Yield as % of TAM 107 Average				
Firm	Variety	2004	2005	2006	2-Year Avg	3-Year Avg	2004	2005	2006	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
Agseco	TAM 111	--	50	16	33	--	--	152	80	116	--
Agseco	TAM 110	19	38	17	28	25	100	115	85	100	100
AgriPro	Jagalene	11	43	18	31	24	58	130	90	110	93
Colorado State	Hatcher	--	48	14	31	--	--	145	70	108	--
Colorado State	Prowers 99	8	42	14	28	21	42	127	70	99	80
Colorado State	Prairie Red	18	35	--	27	--	95	106	--	100	--
Colorado State	Above	20	36	16	26	24	105	109	80	95	98
Colorado State	Avalanche	17	35	--	26	--	89	106	--	98	--
Colorado State	Ankor	14	35	17	26	22	74	106	85	96	88
Kansas State	Jagger	14	47	15	31	25	74	142	75	109	97
Kansas State	2137	10	28	13	21	17	53	85	65	75	67
Kansas State	Trego	16	29	17	23	21	84	88	85	86	86
Texas A & M	TAM 107	19	33	20	27	24	100	100	100	100	100
Trio	T 81	17	47	14	31	26	89	142	70	106	101
Average		15	39	16	28	23					

Grain Yields were adjusted to 12.0 % seed moisture content.

Winter Wheat Planting Date and Seeding Rate Study for Southeastern Colorado

Kevin Larson, Dennis Thompson, and Deborah Harn

Currently there is a winter wheat planting date controversy about the deadline for winter wheat planting and government program compliance. The wheat planting date compliance cutoff for Southeastern Colorado was recently extended from October 5 to October 15. This date appears to be arbitrarily selected and not based on scientific research. Our neighboring states of Kansas and Oklahoma have much later winter wheat planting date compliance deadlines. The deadline for the Panhandle of Oklahoma is November 15, a full month later than Colorado, and the deadline for Southwestern Kansas is October 20. Our winter wheat planting date and seeding rate study will ascertain the optimum planting date and seeding rate window for winter wheat production.

Materials and Methods

For our planting date and seeding rate study, we used the winter wheat variety Hatcher. We planted five planting dates: PD1, September 16; PD2, September 30; PD3, October 14; PD4, October 28; and PD5, November 11. We tested four seeding rates: 30, 60, 90, and 120 lb/A (0.40, 0.80, 1.20, and 1.60 million seeds/A). The experimental design for our study was a split-plot design (planting date as main plots, and seeding rates as subplots) with four replications. We applied N fertilizer at 50 Lb/A to the site with a sweep plow with an anhydrous attachment. For weed control, we applied Express, 0.33 Oz/A and 2,4-D, 0.38 Lb/A in early spring. We bedded the field in order to furrow irrigate the site for stand establishment. We measured Russian Wheat Aphid (RWA) infestation by sampling 25 tillers per treatment. The percentage of tillers infested with RWA was the sum of tillers with aphids and tillers damaged from RWA. Forage samples (2.0 ft by 2.5 ft) were harvested at jointing: PD1, March 27; PD2, April 4; PD3, April 17; PD4, April 26; and PD5, May 3. Forage samples were harvested at boot: PD1 and PD2, April 27; PD3 and PD4, May 10; and PD5, May 15. We weighed the forage samples, dried them in an oven at 100 C until no more weight loss occurred, and reweighed them. Forage yields were adjusted to 15% moisture. We harvested grain from the 10 ft. by 44 ft. plots on June 21 with a self-propelled combine equipped with a digital scale. Grain yields were adjusted to 12% seed moisture content.

Results

Forage yields for all five planting dates had significant linear responses to increasing seeding rates for both jointing and boot. Less average forage was produced with each subsequent planting date at jointing: PD1, 2825 Lb/A; PD2, 1375 Lb/A; PD3, 740 Lb/A; PD4, 610 Lb/A; and PD5, 375 Lb/A; and also at boot: PD1, 4825 Lb/A; PD2, 3440 Lb/A; PD3, 1850 Lb/A; PD4, 1300 Lb/A; and PD5, 1210 Lb/A. The earliest planting date, September 15, produced the highest forage yields at jointing and at boot. PD1 at the lowest seeding rate produced more forage than PD3 at the highest planting date at jointing with 1835 Lb/A for PD1 and 960 Lb/A for PD3, and at boot with 3280 Lb/A for PD1 and 2330 Lb/A for PD3.

PD2 had the highest grain yield of 37 Bu/A at a seeding rate optimum around 75 Lb Seed/A. The grain yield response of PD1 to increasing seeding rate was relatively flat: there was only a slight yield increase with decreasing seeding rates. The last three

planting dates had strong linear grain yield increases with increasing seeding rate. The largest grain yield responses to increasing seeding rate were less than 9 Bu/A.

Russian Wheat Aphid infestation was light last season. RWA infestation tended to increase with later planting dates, lower seeding rates, and later sampling dates. The worst RWA infestation, 6% infested tillers, occurred with the latest planting dates (PD4, October 28 and PD5, November 11), at the lowest seeding rates (30 Lb/A and 60 Lb/A), and at the last sampling date (June 2). No RWA's were found on the highest seeding rate (120 Lb/A).

Discussion

The first two planting dates, September 16 and September 30 produced substantially higher grain yields than the last three planting dates, October 14, October 28 and November 11. The large grain yield disparity between September 30 planting date and October 14 planting date suggests that the current wheat planting date deadline of October 15 was too late for good grain yields. This is the first time that the mid-October planting date did not produce sufficient grain yield to be considered a viable planting date. The seeding rate optimum for the first two planting dates was flat for September 16 and about 75 Lb/A for September 30. However, to achieve high grain yields when planting late, growers should consider seeding at higher rates.

The RWA results are typical of the RWA results from most of our previous wheat planting date studies. It is common for us to find high RWA infestation with later planting dates and lower seeding rates. It appears that less developed wheat is more susceptible to RWA or that RWA is more attracted to less developed wheat. The 2005 results were in contrast to our typical findings. In 2005, the highest RWA infestation occurred with the first planting date and the second highest RWA infestation was with the last planting date. We still have no explanation for the 2005 RWA results where the highest RWA levels were on both the first and last planting dates.

Forage grazing can be extended from early April to late April by manipulating planting date and seeding rate, but early planting with high seeding rate produced up to four times more than late planting. The forage production drop with late planting dates is too large to compensate for the three weeks extension in grazing. Forage production from each planting date increase with higher seeding rates. To produce high wheat forage yields, we recommend planting early with high seeding rates (90 to 120 Lb/A).

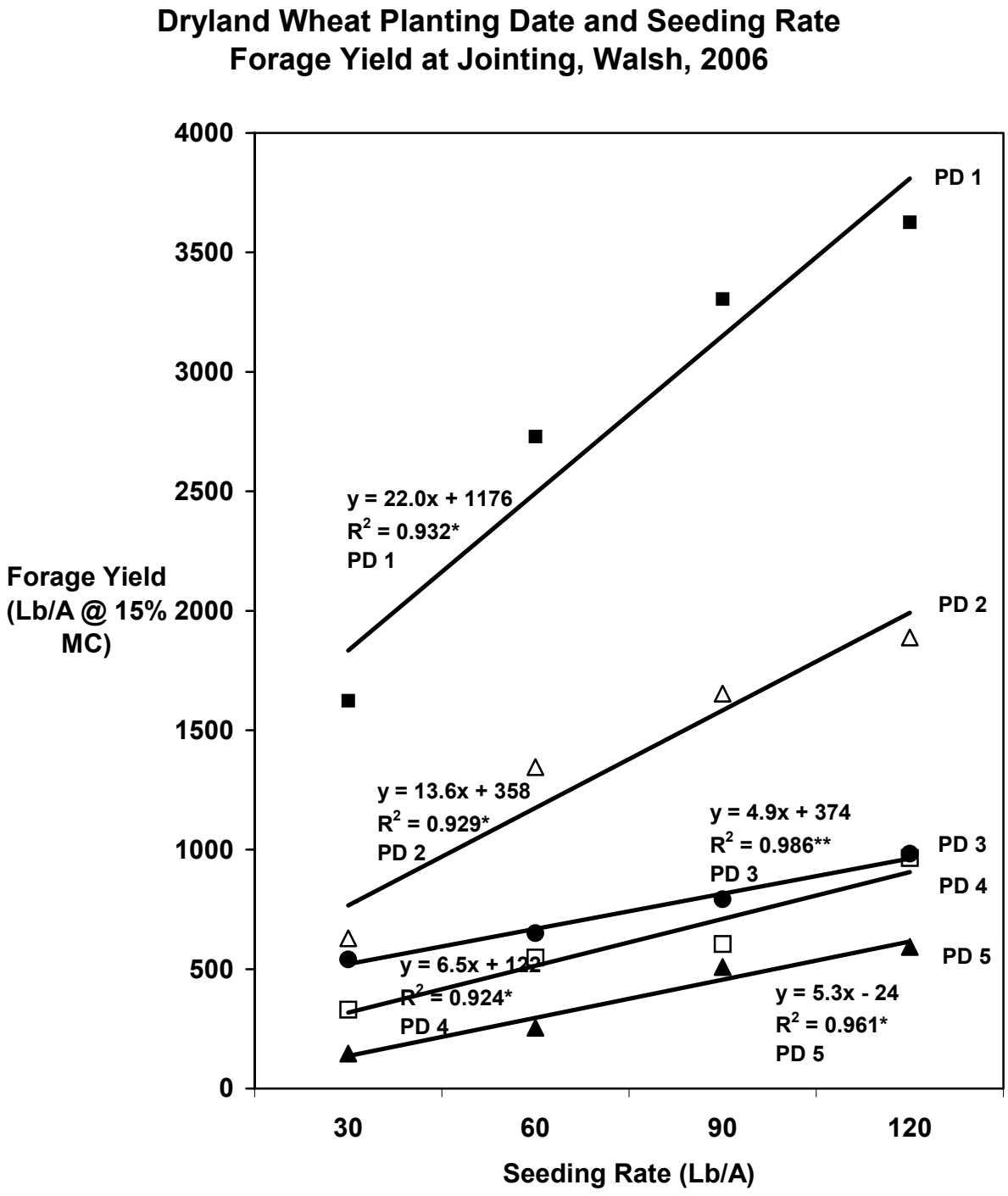


Fig. Forage yields at jointing from planting dates and seeding rates for dryland wheat at Walsh. Planting dates were PD 1, September 16; PD 2, September 30; PD 3, October 14; PD 4, October 28; and PD 5, November 11, 2005. Seeding rates were 30, 60, 90, and 120 Lb/A, corresponding to 400,000, 800,000, 1,200,000, and 1,600,000 seeds/A. Jointing dates: PD 1, March 27; PD 2, April 4; PD 3, April 17; PD 4, April 27; and PD 5, May 3. The wheat variety was Hatcher.

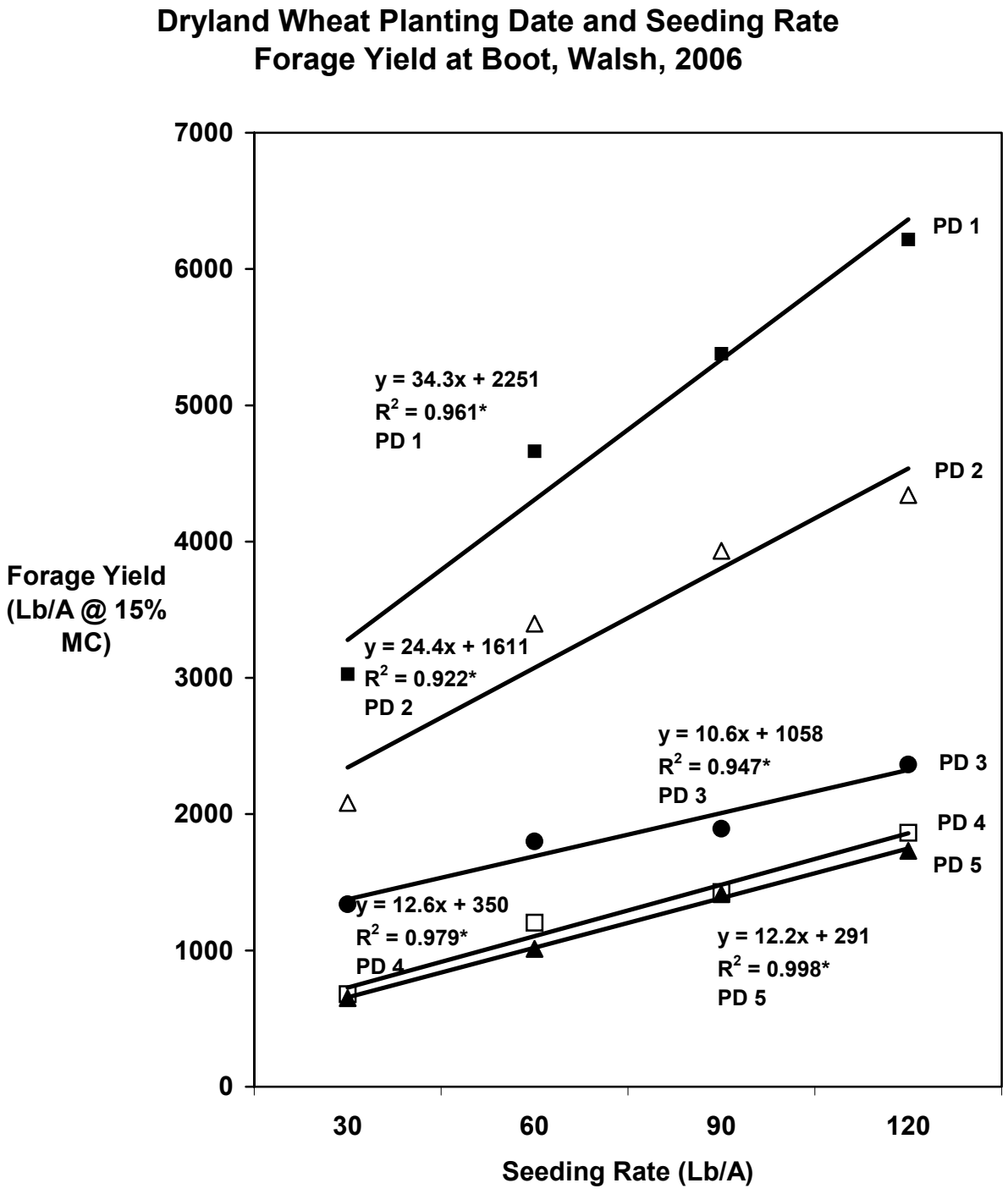


Fig. Forage yields at boot from planting dates and seeding rates for dryland wheat at Walsh. Planting dates were PD 1, September 16; PD 2, September 30; PD 3, October 14; PD 4, October 28; and PD 5, November 11, 2005. Seeding rates were 30, 60, 90, and 120 Lb/A, corresponding to 400,000, 800,000, 1,200,000, and 1,600,000 seeds/A. Boot dates: PD 1, April 27; PD 2, May 3; PD 3, May 8; PD 4, May 12; and PD 5, May 15. The wheat variety was Hatcher.

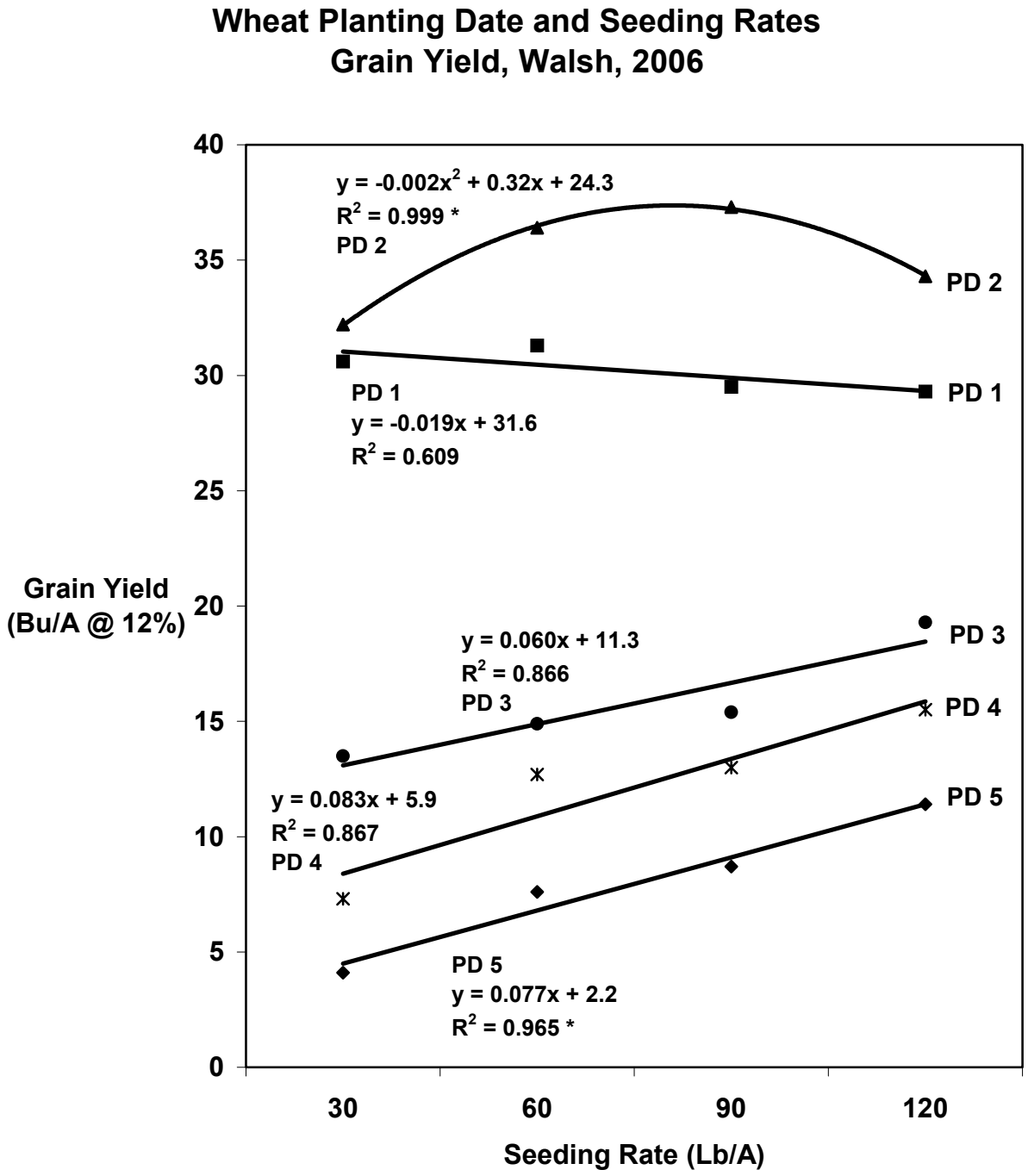


Fig. Grain yield from planting dates and seeding rates for dryland wheat at Walsh. Planting dates were PD 1, September 16; PD 2, September 30; PD 3, October 14; PD 4, October 28; and PD 5, November 11, 2005. Seeding rates were 30, 60, 90, and 120 Lb/A, corresponding to 400,000, 800,000, 1,200,000, and 1,600,000 seeds/A. The wheat variety was Hatcher.

Table .Dryland Wheat Planting Date and Seeding Rate, Russian Wheat Aphid Infestations, Walsh, 2006.

	Planting Date					Seeding Rate			
Sample Date	PD 1 Sept. 16	PD 2 Sept. 30	PD 3 Oct. 14	PD 4 Oct. 28	PD 5 Nov. 11	SR 30 30 Lb/A	SR 60 60 Lb/A	SR 90 90 Lb/A	SR 120 120 Lb/A
	----------% Tillers Infested with RWA----------								
April 15	0	0	0	0	0	0	0	0	0
May 1	1	0	2	2	3	1	2	3	0
June 2	0	1	5	5	5	6	6	3	0
RWA Average	0	0	2	2	3	2	3	2	0

RWA infestation recorded from 25 tillers sampled per treatment.

Residual P on Dryland Wheat, Long Term Study at Manter, 2006

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: The highest producing P treatment was 69 Lb P_2O_5/A with 9 Bu/A. Regression analysis shows the optimum P rate at about 70 Lb P_2O_5/A; however, there was only 1 Bu/A difference between the lowest yielding rate, 0 P_2O_5/A, and the highest yielding rate. After three wheat crops, two P rates produced positive total net returns, 23 Lb P_2O_5/A with $7.66 and 46 Lb P_2O_5/A with $13.83, using wheat prices of $3.50/Bu for 2002, $3.20/Bu for 2004, and $4.75/Bu for 2006 and 10-34-0 cost of $210/Ton.

DISCUSSION: This is the third wheat crop after we applied the one-time P fertilizer rates. For the first wheat crop following P rates, 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 added was $3.33/A with the 69 P_2O_5/A treatment. Although net returns from P rates above 46 P_2O_5/A are increasing, the high cost of P fertilizer continues to keep these P rates from producing positive net returns. There was no yield difference between the 0 P check and the 23 P_2O_5/A rate. This may signal that the residual P from the one time application of 23 P_2O_5/A is gone and no longer available to increase crop yields. The one time application of 23 P_2O_5/A increased yields for two wheat crops. It was believed that the low P rate would be available for only one season, and there would be no residual P effect because our high pH soils would bind it. If yields continue to response to residual P from these P rates, a heavy one-time application of P may be more profitable than smaller annual P applications.

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 at 35 Lb Seed/A in the 60 ft. by 680 ft. plots around late-September to early-October for 2001, 2003, and 2005. We harvested the plots on June 18 for 2002, June 25 for 2004, and June 19 for 2006 with a self-propelled combine and weighed them in a digital grain cart. Seed yields were adjusted to 12% seed moisture.

In 2001, 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 Silty Clay for both depths. 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 mmhos/cm	OM %	N	P	K	Zn	Fe	Mn	Cu
				ppm						
0-8”	7.8	0.8	1.3	11	2.1	390	0.6	5.1	15	2.5
8-24”				17						

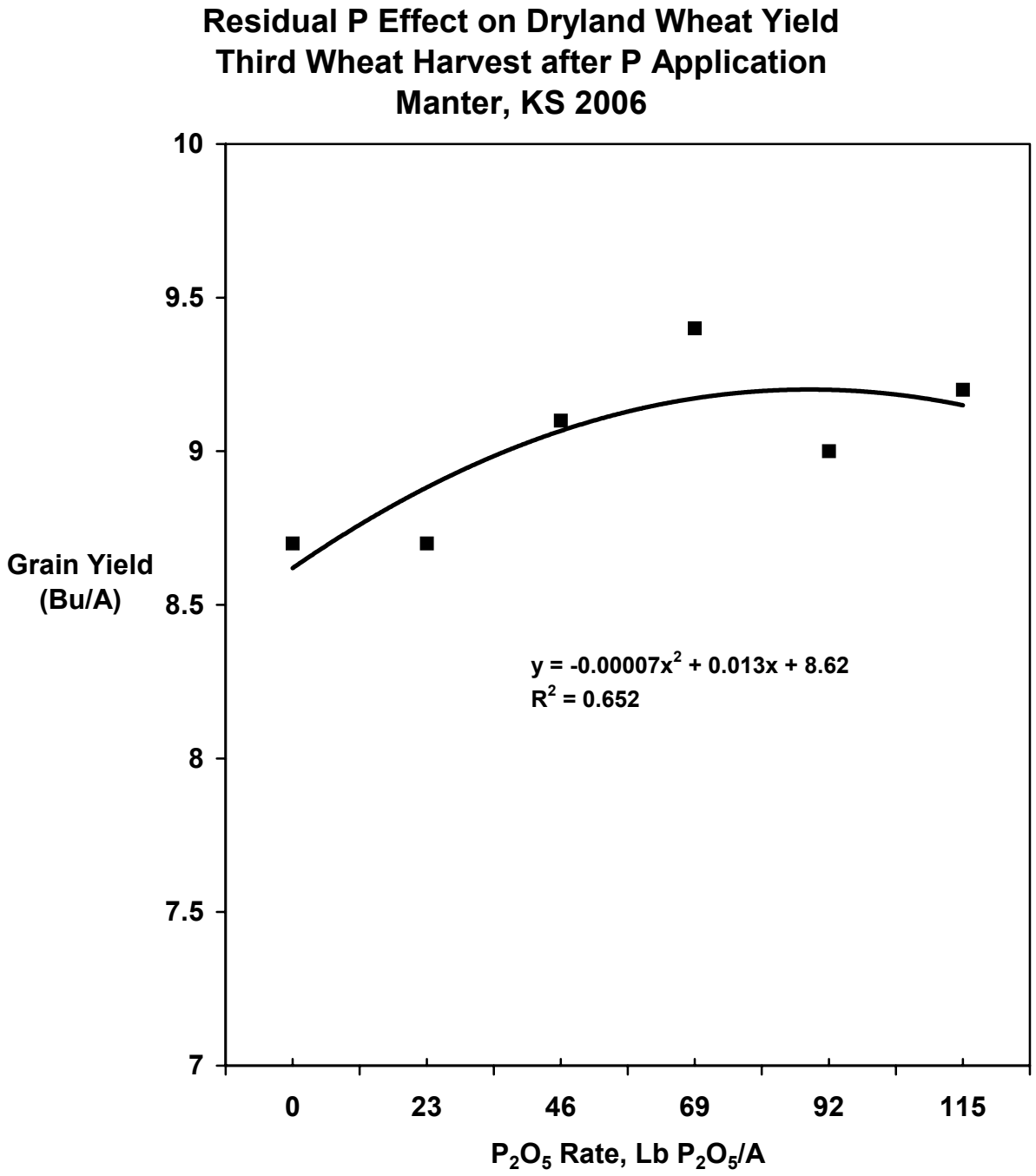


Fig. . Yield of long term P on dryland wheat, third wheat crop after P application, at Manter. P treatment are 0,23, 46, 69, 92, and 115 Lb P_2O_5/A applied with a chisel with shanks 18 in. apart to a 6 in. depth on July 13, 2001. Grain yields were adjusted to 12% seed moisture content.

Residual P on Dryland Wheat, Manter KS
Net Return from One Time P Application, 2002 to 2006

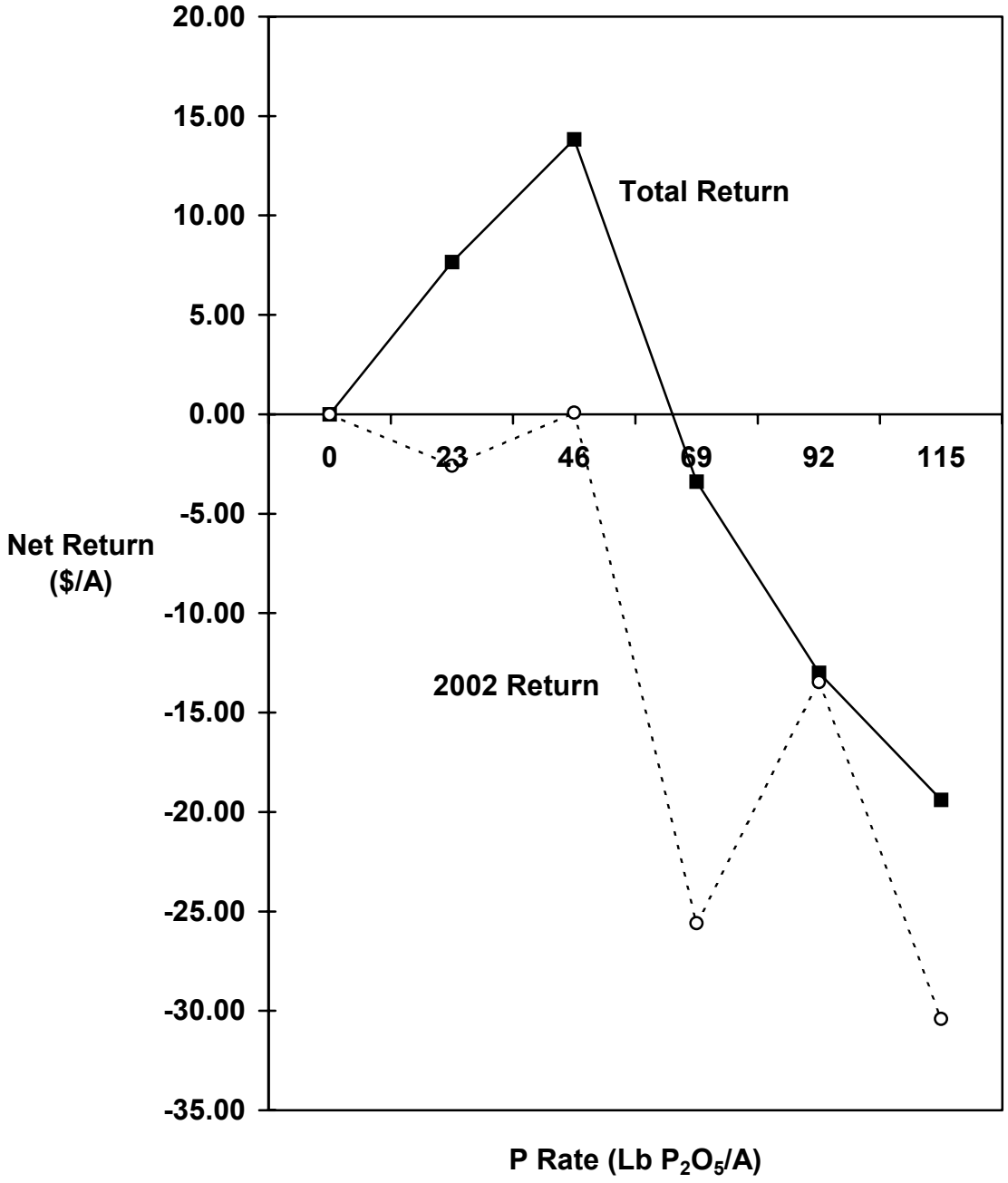


Fig. . Net return of long term P on dryland wheat, third wheat crop after P application, at Manter. P treatment are 0,23, 46, 69, 92, and 115 Lb P_2O_5/A applied with a chisel with shanks 18 in. apart to a 6 in. depth on July 13, 2001. Total return is sum from 2002 and 2006 wheat crops.

Early Maturing Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids, when planted late in the season (June 28), under dryland conditions with 2400 sorghum heat units in Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,600 Seed/A. PLANTED: June 28. HARVESTED: November 7.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 75 F.

PEST CONTROL: Preemergence Herbicides: Glyphosate 24 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides Banvel 4 Oz/A, Atrazine 1.0 Lb/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
June	0.00	77	3	0	3
July	4.09	874	23	3	34
August	4.04	765	13	3	65
September	0.96	431	1	0	95
October	1.18	208	3	0	114
Total	10.27	2355	43	6	114

\1 Growing season from June 28 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

FIELD HISTORY: Last Crop: Sunflower. FIELD PREPARATION: Disc.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. No greenbug infestation. Only one hybrid had minor lodging. Late freeze date. Yields were fair.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.4	0.5	1.9	18	6.8	535	2.6	5.9
8"-24"				19				
Comment	Alka	VLo	Hi	Hi	Lo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	150	20	0.3	0

Yield Goal: 100 Bu/A.
Actual Yield: 64 Bu/A.

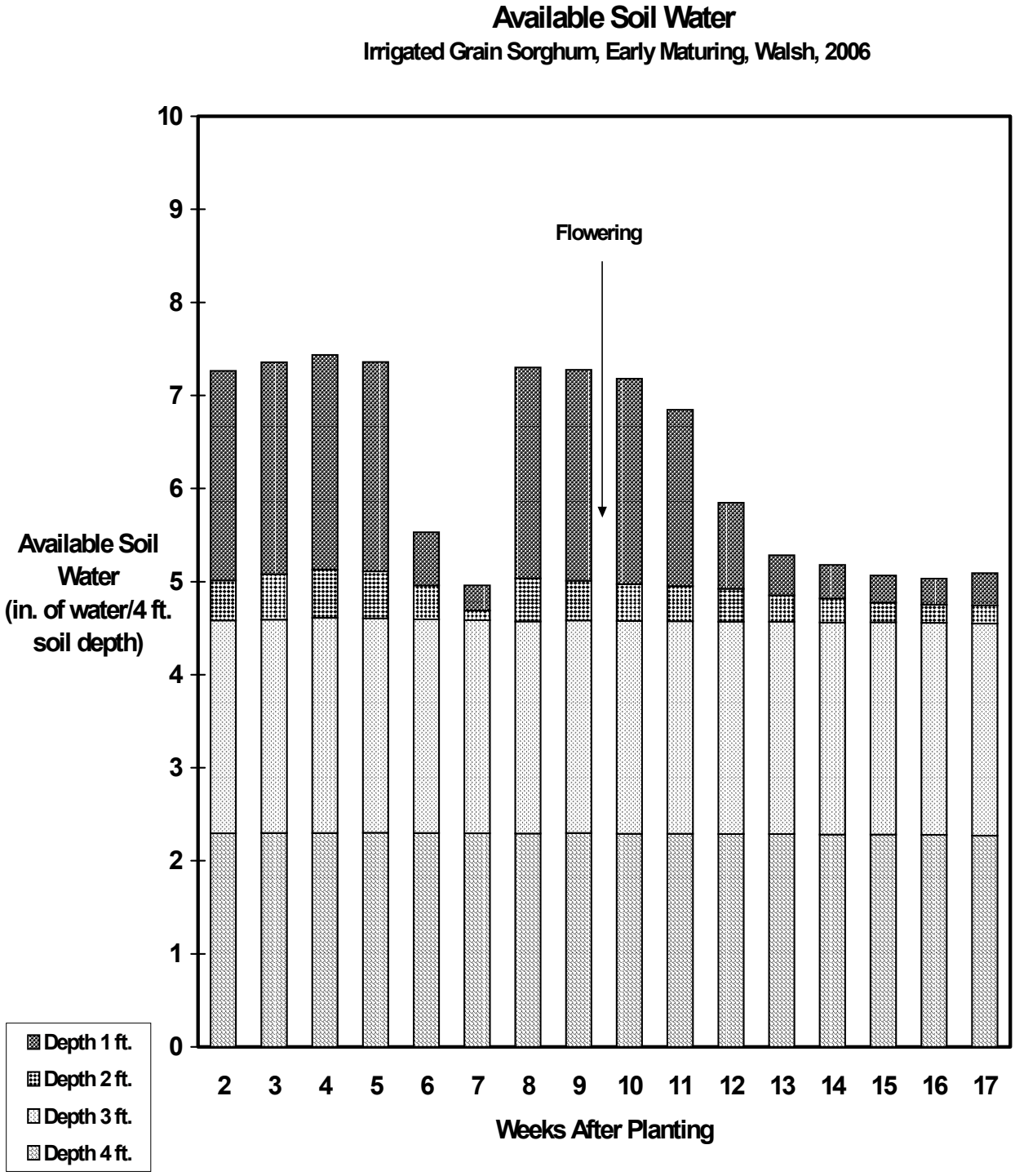


Fig. 1. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 10.27 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 2.--Irrigated Grain Sorghum Early Maturing Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
DEKALB	DK-28E	6	54	1503	101	E	45	59.2	0	56	87	136
ASGROW	Reward	5	56	1543	103	E	43	55.0	0	55	79	123
DEKALB	DKS 29-28	6	60	1636	110	E	43	68.9	0	53	76	118
TRIUMPH	TR 418	6	55	1525	102	E	44	54.2	0	56	69	108
NC+	NC+ 5B89	5	63	1677	112	ME/E	50	55.8	7	51	54	84
(Check)	399 X 2737	5	73	1836	SD	ML	48	55.4	0	46	22	34
Average		6	60	1620	110	E	46	58.1	1	53	64	
LSD 0.20											8.7	

\1 Planted: June 28; Harvested: November 7, 2006.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze (28 F, October 19).

Seed Maturation: PM, pre-milk; EM, early milk; MM, mid-milk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; DAP, mature.

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 3.--Summary: Grain Sorghum Early Maturing Hybrid Performance Tests, 2004-2006.

Brand	Hybrid	Grain Yield 2004	Grain Yield 2005	Grain Yield 2006	Grain Yield 2-Year Avg	Grain Yield 3-Year Avg	Yield as % of Test Average 2004	Yield as % of Test Average 2005	Yield as % of Test Average 2006	Yield as % of Test Average 2-Year Avg	Yield as % of Test Average 3-Year Avg
		Bu/A					%				
ASGROW	Reward	100	70	79	75	83	116	112	123	118	117
DEKALB	DK-28E	93	74	87	81	85	108	119	136	128	121
DEKALB	DKS 29-28	97	69	76	73	81	113	110	118	114	114
TRIUMPH	TR 418	91	--	69	80	--	106	--	108	107	--
(Check)	399 X 2737	37	47	22	35	35	43	75	34	55	51
Average		86	62	62	62	70					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated at Walsh for 2004 and 2006, dryland for 2005.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2400 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,600 Seed/A. PLANTED: June 26. HARVESTED: November 8.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 66 F.

PEST CONTROL: Preemergence Herbicides: Glyphosate, 24 Oz/A; 2,4-D, 0.5 Lb/A. Post Emergence Herbicides: Banvel 4.0 Oz/A, Atrazine 1.0 Lb/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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--------		
June	0.00	110	3	0	5
July	4.09	874	23	3	36
August	4.04	765	13	3	67
September	0.96	431	1	0	97
October	1.18	208	3	0	116
Total	10.27	2388	43	6	116

\1 Growing season from June 26 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in marginal soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. No greenbug infestation. None of the hybrids lodged. Late freeze date. Yields and test weights were poor due to the dry conditions.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.5	0.5	1.8	22	5.3	439	1.0	5.8
8"-24"				29				
Comment	Alka	Vlo		Hi	Hi	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	50	20	0.3	0

Yield Goal: 45 Bu/A.
Actual Yield: 6 Bu/A.

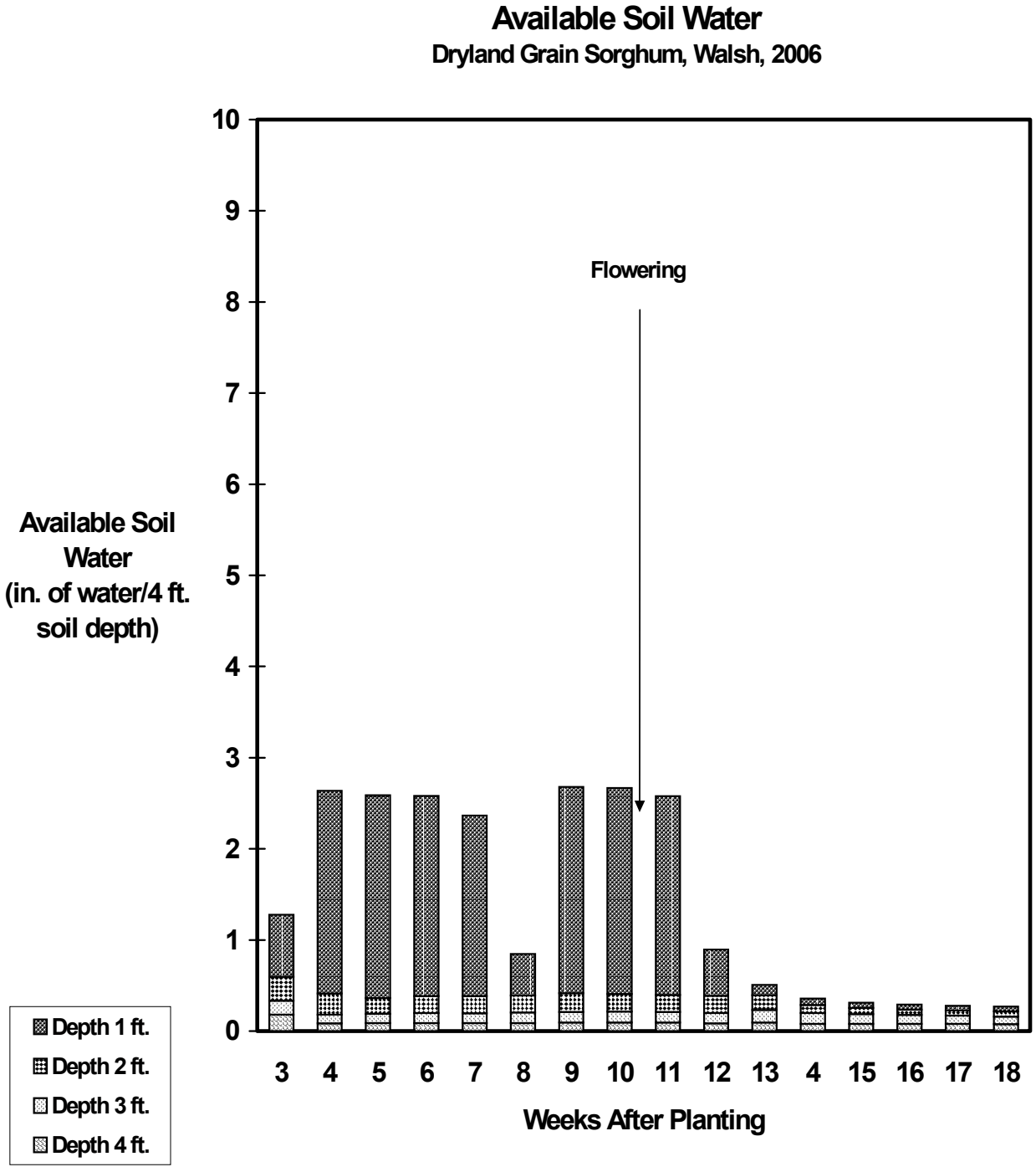


Fig. 2. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 10.27 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Plants Lodged	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
NC+	NC+ 5C35	8	62	1697	112	E	46	20.9	0	52	17	290
ASGROW	Pulsar	6	69	1809	HD	ME	44	22.1	0	50	10	163
NC+	NC+ 5B89	7	67	1788	HD	ME/E	47	24.0	0	49	7	117
DEKALB	DK-44	7	76	1915	SD	ME	46	19.0	0	48	6	93
ASGROW	Seneca	6	76	1915	SD	ME	43	25.2	0	49	5	87
NC+	NC+ Y363	7	75	1900	SD	ME	45	29.0	0	49	5	82
DEKALB	DKS 37-07	6	76	1915	SD	ME	49	25.9	0	48	5	78
DEKALB	DKS 35-70	8	73	1869	SD	ME	46	23.2	0	49	4	60
NC+	NC+ 6B50	6	75	1900	SD	ME	47	27.9	0	49	3	55
(Check)	399 X 2737	7	81	2009	LM	ML	42	20.9	0	44	2	40
Average		7	73	1872	SD	ME	46	23.8	0	49	6	
LSD 0.20											5.8	

\1 Planted: June 26; Harvested: November 8, 2006.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: EM, early milk; MM, mid milk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 2004-2006.

Brand	Hybrid	Grain Yield 2004	2005	2006	2-Year Avg	3-Year Avg	Yield as % of Test Average 2004	2005	2006	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Seneca	66	56	5	31	42	107	97	87	92	97
ASGROW	Pulsar	64	60	10	35	45	105	104	163	134	124
DEKALB	DK-44	52	61	6	34	40	85	105	93	99	94
DEKALB	DKS 37-07	28	68	5	48	34	78	117	78	98	91
(Check)	399 X 2737	43	44	2	23	30	70	76	40	58	62
Average		61	58	5	32	41					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2700 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: June 14. HARVESTED: November 7.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 65 F.

IRRIGATION: Drip irrigated for 15 weeks with 12.6 A-in./A.

PEST CONTROL: Preemergence Herbicides: Glyphosate 24 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides: Banvel 4 0z/A, Atrazine 1.0 Lb/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
June	1.10	439	10	4	16
July	4.09	874	23	3	47
August	4.04	765	13	3	78
September	0.96	431	1	0	108
October	1.18	208	3	0	127
Total	11.37	2717	50	10	127

\1 Growing season from June 14 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

FIELD HISTORY: Last Crop: Sunflower. FIELD PREPARATION: Disc.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. Late freeze date. No greenbug infestation. None of the hybrids lodged. Grain yields were fair.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.4	0.5	1.9	18	6.8	535	2.6	5.9
8"-24"				19				
Comment	Alka	VLo	Hi	Hi	Lo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	150	20	0.3	0

Yield Goal: 125 Bu/A.
Actual Yield: 83 Bu/A.

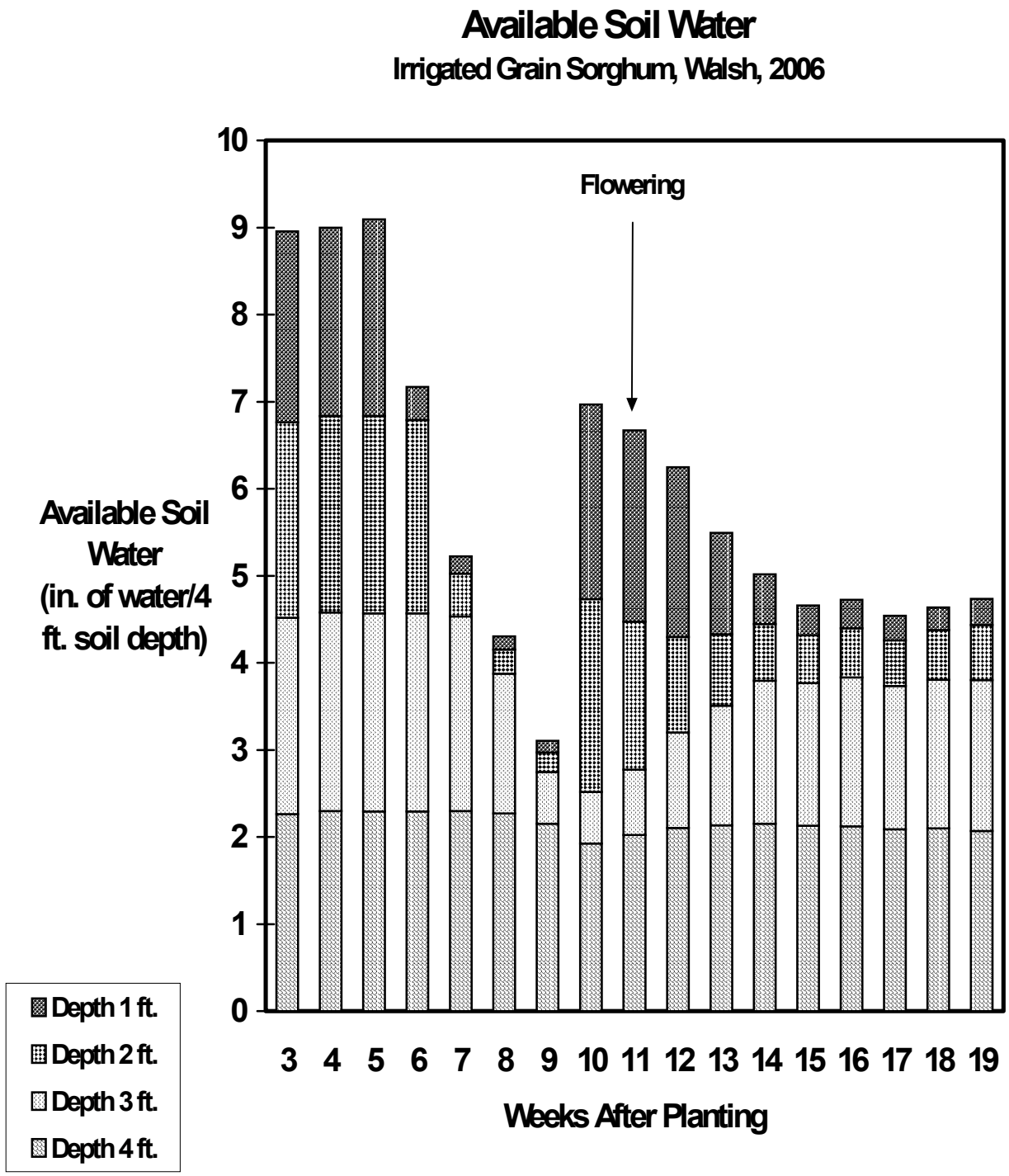


Fig. 3. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.37 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 6.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
NC+	NC+ 6B50	7	64	1797	115	ME	49	63.1	0	56	101	122
RICHARDSON SEEDS	RS 225	7	64	1797	115	ME/M	50	51.1	0	57	91	110
NC+	NC+ 7C22	7	63	1772	114	ME	48	54.2	0	57	88	106
ASGROW	A567	8	68	1884	121	M/ML	53	50.3	0	55	90	108
DEKALB	DKS 54-00	7	70	1927	HD	ML	52	68.5	0	51	84	102
DEKALB	DKS 53-11	9	70	1927	HD	ML	54	53.4	0	52	76	91
(Check)	399 X 2737	7	70	1927	HD	ML	47	47.6	0	51	73	87
ASGROW	A571	7	82	2138	SD	ML	53	54.6	0	48	64	77
Average		7	69	1896	HD	ML	51	55.4	0	53	83	
LSD 0.20											6.7	

\1 Planted June 14; Harvested: November 7. 2006.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DAP).

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 7.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Walsh, 2004-2006.

Brand	Hybrid	Grain Yield 2004	Grain Yield 2005	Grain Yield 2006	Grain Yield 2-Year Avg	Grain Yield 3-Year Avg	Yield as % of Test Average 2004	Yield as % of Test Average 2005	Yield as % of Test Average 2006	Yield as % of Test Average 2-Year Avg	Yield as % of Test Average 3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	A 567	117	117	90	104	108	105	103	108	106	105
ASGROW	A 571	107	117	64	91	96	96	103	77	90	92
DEKALB	DKS 54-00	107	128	84	106	106	96	112	102	107	103
DEKALB	DKS 53-11	119	113	76	95	103	107	100	91	96	99
(Check)	399 X 2737	109	102	73	88	95	98	90	87	89	92
Average		111	115	83	99	103					

Grain Yields were corrected to 14.0 % seed moisture content.

Limited Sprinkler Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under limited sprinkler irrigated conditions with 3100 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, at least 1000' long. SEEDING DENSITY: 58,000 Seed/A. PLANTED: May 30. HARVESTED: November 3.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 65 F.

IRRIGATION: Sprinkler irrigated with 12.0 A-in./A, applied with eight rotations.

PEST CONTROL: Preemergence Herbicides: Glyphosate 24 Oz/A, 2,4-D 0.5 Lb/A, Atrazine 1.0 Lb/A. Post Emergence Herbicides: Banvel 8 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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	0.01	38	0	0	2
June	1.37	780	21	4	32
July	4.09	874	23	3	63
August	4.04	765	13	3	94
September	0.96	431	1	0	124
October	1.18	208	3	0	143
Total	11.65	3096	61	10	143

\1 Growing season from May30 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

FIELD HISTORY: Last Crop: Grain sorghum. FIELD PREPARATION: Sweep plow and strip-till.

COMMENTS: Planted in marginal soil moisture. Weed control was fair. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. Late freeze date. No greenbug infestation. Lodging was severe throughout the field. Grain yields were poor because the stands were low for half the field.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.6	0.4	1.3	9	1.5	215	0.4	5.0
8"-24"				25				
Comment	Alka	VLo	Mod	Hi	Lo	VHi	VLo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	125	40	0	0

Yield Goal: 125 Bu/A.
Actual Yield: 52 Bu/A.

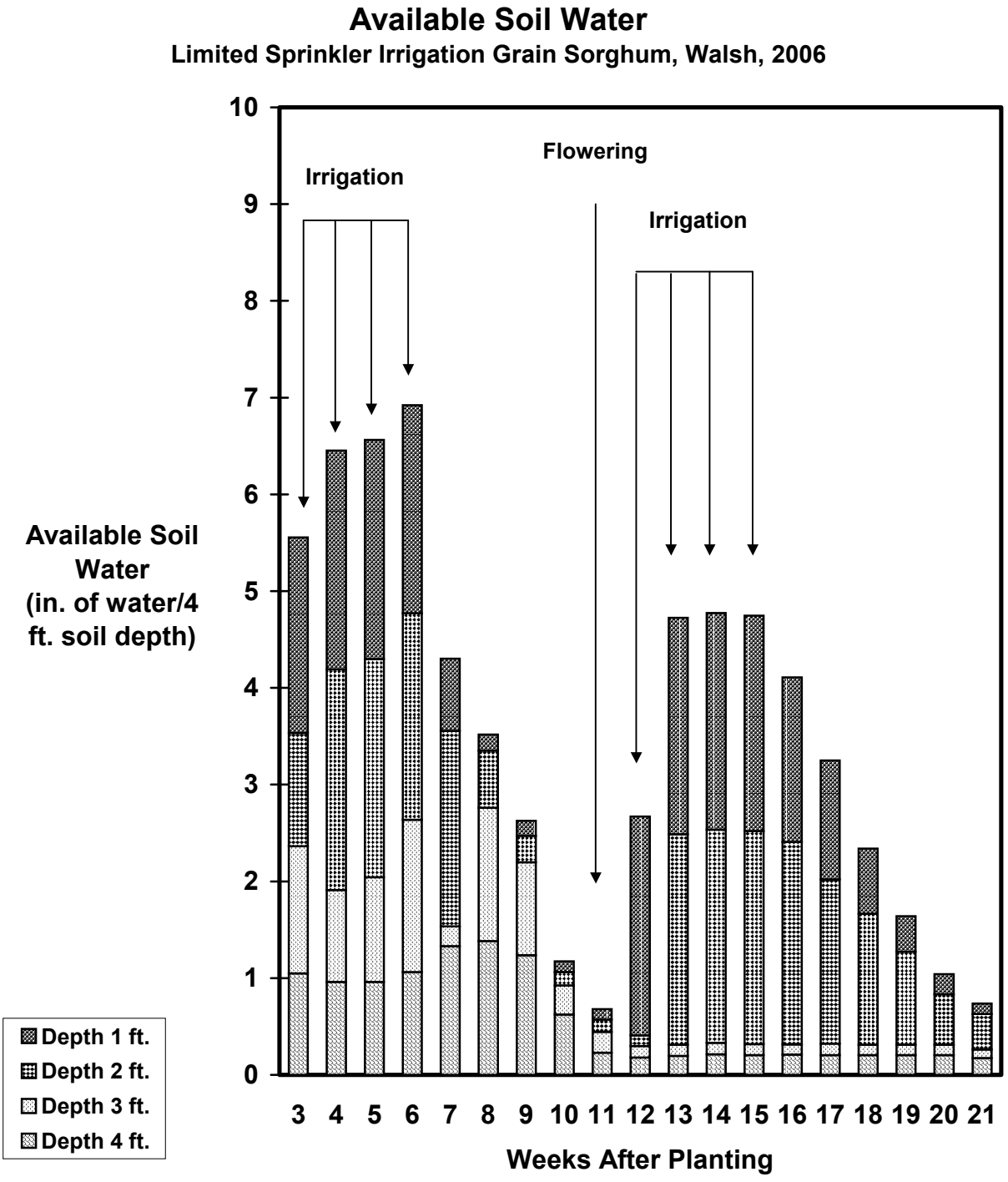


Fig. 4. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 11.65 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Limited Irrigation Sprinkler Grain Sorghum Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Plants Lodged	Test Wt.	Grain Yield	Yield % of Test Average
						In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
PIONEER	87G57	68	1834	114	E	45	67.3	0	57	52	100
TRIUMPH	TR 442	74	2024	119	ME	49	67.7	0	56	60	114
TRIUMPH	TR 438	72	1958	117	ME	47	63.7	0	59	57	110
TRIUMPH	TRX02783	73	1994	118	ME	49	70.1	0	57	57	110
MYCOGEN	627	74	2024	121	ME	47	74.5	0	54	54	104
FONTANELLE	GE4532	76	2087	122	ME	48	62.9	0	57	54	103
TRIUMPH	TR 459	75	2054	121	ME	46	70.9	0	54	47	89
MYCOGEN	M3838	76	2087	124	ME	44	85.7	0	55	44	85
PIONEER	85G01	77	2103	125	M	45	81.3	0	54	49	94
MYCOGEN	697	78	2125	128	M	46	61.7	0	53	48	92
Average		74	2029	121	ME	47	70.6	0	56	52	
LSD 0.20										7.6	

\1 Planted: May 30; Harvested: November 3, 2006.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze.

Seed Maturation: EM, early milk; MM, mid milk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; mature (DA

GDD: Growing Degree Days for sorghum.

Maturity Group: E, early; ME, medium early; M, medium; ML, medium late; L, late.

Table 9.--Summary: Limited Irrigation Grain Sorghum Hybrid Performance Tests at Walsh, 2004-2006.

Brand	Hybrid	Grain Yield 2004	2005	2006	2-Year Avg	3-Year Avg	Yield as % of Test Average 2004	2005	2006	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
FONTANELLE	GE4532	--	62	54	58	--	--	105	103	104	--
MYCOGEN	M3838	--	52	44	48	--	--	87	85	86	--
TRIUMPH	TR 442	--	73	60	67	--	--	124	114	119	--
Average		--	59	52	56	--					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2500 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 69,700 Seed/A. PLANTED: June 20. HARVESTED: October 13.

EMERGENCE DATE: 12 days after planting. SOIL TEMP: 72 F.

PEST CONTROL: Preemergence Herbicides: Glyphsate 24 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Banvel 4 Oz/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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--------		
June	0.62	268	6	2	10
July	4.09	874	23	3	41
August	4.04	765	13	3	72
September	0.96	431	1	0	102
October	1.08	162	3	0	115
Total	10.79	2500	46	8	115

\1 Growing season from June 20 (planting) to October 13 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in marginal soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. No greenbug infestation. Lodging was mild. Forage yields were poor because of the dry conditions.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.5	0.5	1.8	22	5.3	439	1.0	5.8
8"-24"				29				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	50	20	0	0

Yield Goal: 10 Ton/A.
Actual Yield: 5.5 Ton/A @ 70% MC.

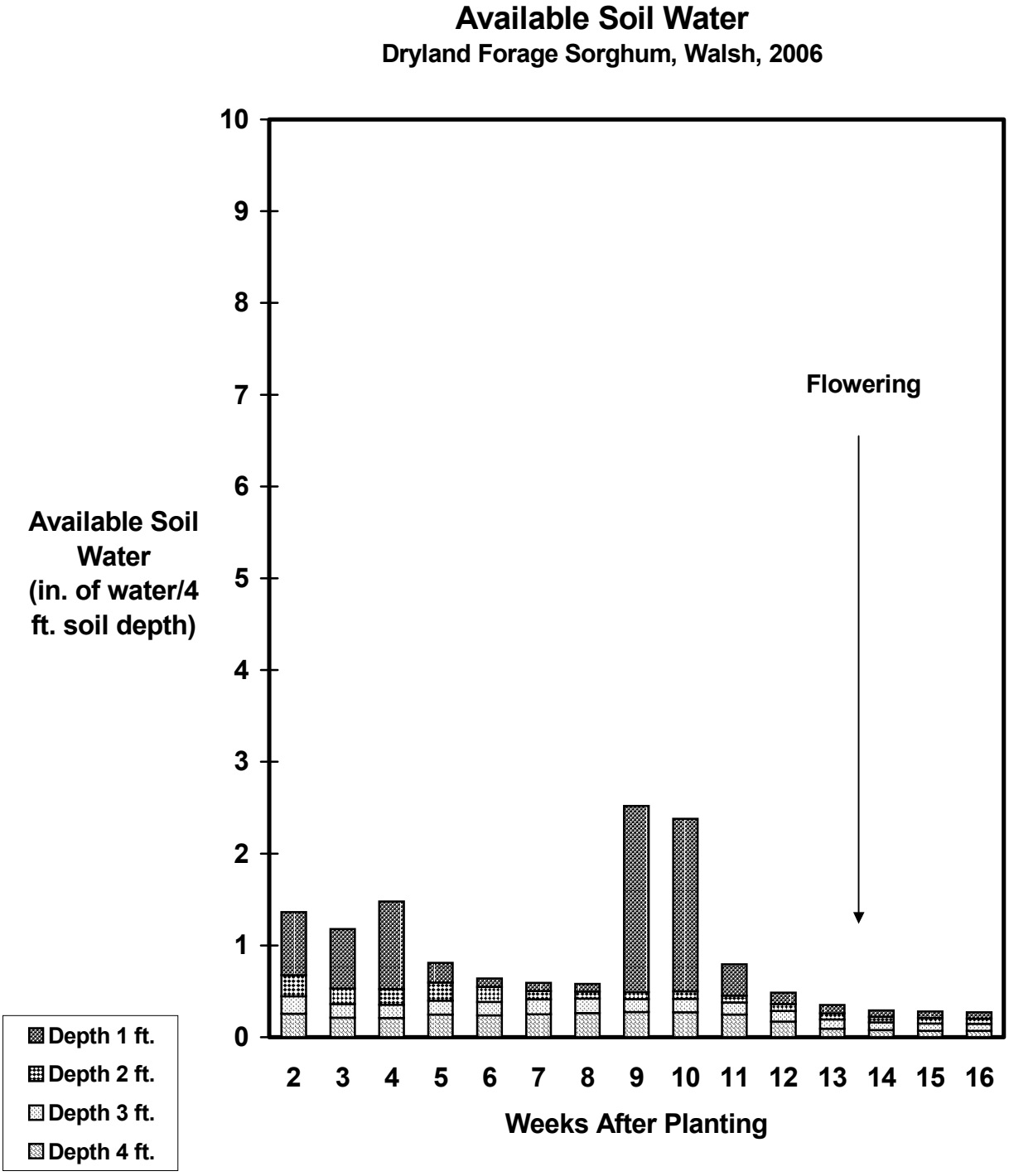


Fig. 5. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 10.79 in. Any increase in available soil water between weeks is from rain.

Table 10.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	Forage Type \2	Days to Emerge	Days to 50% Bloom	Harvest Density	Plant Ht.	Stage \3 at Harvest	Stem Sugar	Plants Lodged	Forage Yield	Yield % of Test Average
					Plants/A (1000 X)	In.		%	%	Tons/A	%
SORGHUM PARTNERS	HIKANE II	FS	8	94	41.0	56	PM	18	15	6.5	118
(Check)	NB 305F	FS	9	96	25.6	62	PM	19	12	4.7	85
SORGHUM PARTNERS	NK300	FS	7	110	41.4	30	FL	18	0	4.4	80
SORGHUM PARTNERS	Sordan 79	SS	7	87	36.0	69	EM	13	2	7.3	133
GARST	8247 YG1	Corn	6	81	24.0	80	LM	14	3	4.5	82
Sorghum Average		FS	7	94	33.6	59	PM	16	6	5.5	
LSD 0.20										0.90	

\1 Planted: June 20; Harvested: October 13.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\3 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

Forage Yield adjusted to 70% moisture content based on oven-dried sample.

Table 11.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 2003-2006.

		Forage Yield					Yield as % of Test Average				
Brand	Hybrid	2003	2004	2006	2-Year Avg	3-Year Avg	2003	2004	2006	2-Year Avg	3-Year Avg
		----------Tons/A----------					----------%----------				
AERC	AERC SSH 35	4.9	3.1	--	4.0	--	102	32	--	67	--
BUFFALO BRAND	Canex	5.5	8.5	--	7.0	--	115	88	--	102	--
BUFFALO BRAND	Canex BMR 208	4.8	8.7	--	6.8	--	99	90	--	95	--
BUFFALO BRAND	Canex BMR 310	5.5	6.3	--	5.9	--	115	65	--	90	--
BUFFALO BRAND	Canex BMR 248	5.1	9.2	--	7.2	--	107	95	--	101	--
BUFFALO BRAND	Grazex BMR 727	3.9	10.1	--	7.0	--	80	104	--	92	--
SORGHUM PARTNERS	NK 300	4.2	12.1	4.4	8.3	6.9	87	125	80	103	97
SORGHUM PARTNERS	SS 405	6.0	8.9	--	7.5	--	124	92	--	108	--
SORGHUM PARTNERS	1990	3.3	12.4	--	7.9	--	48	128	--	88	--
SORGHUM PARTNERS	Sordan 79	3.9	9.6	7.3	8.5	6.9	81	99	133	116	104
SORGHUM PARTNERS	Sordan Headless	4.3	13.4	--	8.9	--	89	138	--	114	--
SORGHUM PARTNERS	Trudan 8	4.2	11.7	--	8.0	--	87	120	--	104	--
(Check)	NB 305F	5.0	9.5	4.7	7.1	6.4	104	98	85	92	96
(Check)	Corn	3.1	8.5	4.5	6.5	5.4	64	87	82	85	78
Average		4.8	9.7	5.5	7.6	6.7					

Forage Yields were corrected to 70% moisture content based on oven-dried sample.

There was no dryland forage sorghum trial in 2005.

Table 12.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2006.

Brand	Hybrid	Forage Type \1	Days to Boot	Boot Plant Ht	CP	ADF	NDF	NDFD	TDN	RFV	Net Energy Main.	Net Energy Gain	Net Energy Lact.
				In	----------%----------						-----MCal/lb-----		
SORGHUM PARTNERS	NK300	FS	95	29	10.7	34.6	54.3	68	63.2	106	0.64	0.38	0.65
SORGHUM PARTNERS	HIKANE II	FS	81	63	10.4	31.6	55.1	63	66.5	108	0.69	0.42	0.69
(Check)	NB 305F	FS	85	67	13.7	32.7	53.9	71	65.3	109	0.67	0.41	0.67
SORGHUM PARTNERS	Sordan 79	SS	77	68	12.9	35.1	55.2	68	62.6	104	0.63	0.37	0.64
GARST	8247 YG1	Corn	75	69	12.2	29.9	50.0	71	68.5	122	0.72	0.45	0.71
Sorghum Average		FS	83	59	12.0	32.8	53.7	68	65.2	110	0.67	0.41	0.67

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; NDFD, Digestibility of NDF; RFQ, Relative Forage Value; Net Energy: Maintenance, Gain, Lactation..

Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2500 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 113,250 Seed/A. PLANTED: June 20. HARVESTED: October 12.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 66 F.

IRRIGATION: Three furrow irrigations: June 29, August 18, and September 1, total applied 17 A-in./A.

PEST CONTROL: Preemergence Herbicides: Glyphosate 24 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Banvel 4 Oz/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
June	0.62	268	6	2	10
July	4.09	874	23	3	41
August	4.04	765	13	3	72
September	0.96	431	1	0	102
October	1.08	159	3	0	114
Total	10.79	2497	41	8	114

\1 Growing season from June 20 (planting) to October 12 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

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

COMMENTS: Planted in marginal soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. No greenbug infestation. Six hybrids had 30% or more lodging. Forage yields were good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.5	0.5	1.8	22	5.3	439	1.0	5.8
8"-24"				29				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	0	20	0	0
Applied	150	20	0	0

Yield Goal: 18 Ton/A.
Actual Yield: 15.5 Ton/A @ 70% MC.

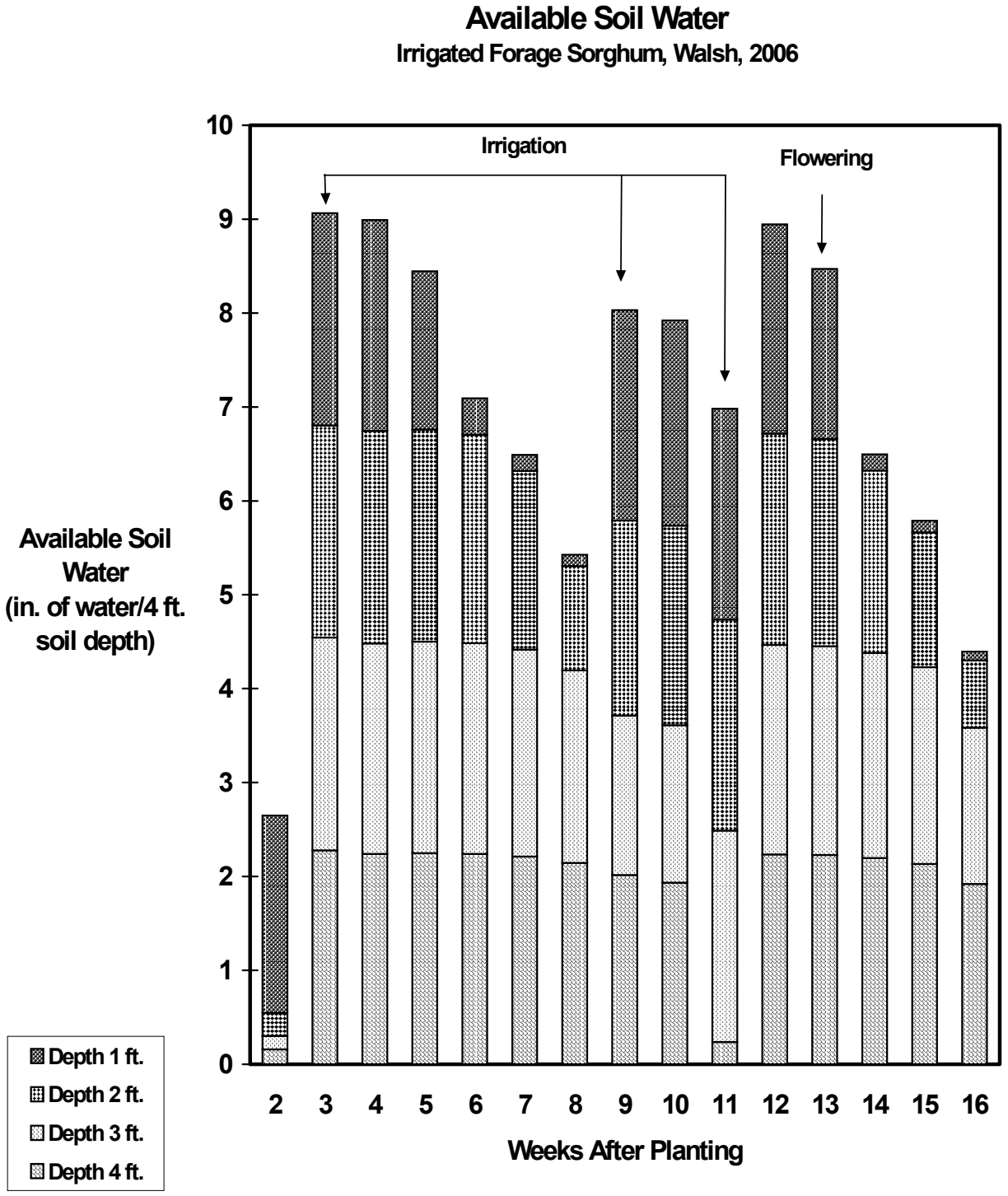


Fig. 6. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 10.79 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 13.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2006. \1

Brand	Hybrid	Forage Type \2	Days to Emerg	Days to 50% Bloom	Harvest Density	Plant Ht.	Stage \3 at Harvest	Stem Sugar	Plant Lodg	Forage Yield	Yield % of Test Avg.
					Plants/A (1000 X)	In.		%	%	Tons/A	%
DEKALB	FS-5	FS	7	90	62.7	97	EM	14	15	20.1	130
SORGHUM PARTNERS	NK300	FS	6	95	74.7	71	PM	17	15	19.3	125
RICHARDSON SEEDS	Silo 700D	FS	6	98	73.2	71	PM	16	8	17.4	112
DEKALB	FS-25E	FS	7	108	53.1	92	FL	12	45	13.9	89
DEKALB	DKS 59-09	FS	7	87	53.4	73	MM	14	30	13.6	88
RICHARDSON SEEDS	Dairy Master BMR	FS	7	93	53.1	87	PM	16	60	13.5	87
SORGHUM PARTNERS	HIKANE II	FS	7	86	70.9	86	EM	16	70	12.8	82
(Check)	NB 305F	FS	8	92	51.9	88	PM	17	35	10.2	66
SORGHUM PARTNERS	Sordan 79	SS	6	78	51.1	113	LM	10	18	18.8	121
RICHARDSON SEEDS	Sweeter 'N Honey II	SS	6	101	68.5	106	PM	14	1	16.6	107
RICHARDSON SEEDS	Sweeter 'N Honey BMR	SS	6	87	47.6	94	MM	12	55	13.5	87
GARST	8247 YG1	Corn	5	70	34.9	99	ED	11	0	16.5	107
Sorghum Average		FS	7	90	57.9	90	EM	14	29	15.5	
LSD 0.20										2.87	

\1 Planted: June 20; Harvested: October 12.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

\3 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

Forage Yield adjusted to 70% moisture content based on oven-dried sample.

Table 14.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 2004-2006.

		Forage Yield					Yield as % of Test Average				
Brand	Hybrid	2004	2005	2006	2-Year Avg	3-Year Avg	2004	2005	2006	2-Year Avg	3-Year Avg
		----------Tons/A----------					----------%----------				
DEKALB	FS-5	21.0	21.5	20.1	20.8	20.9	137	123	130	127	130
DEKALB	FS-25E	13.3	22.0	13.9	18.0	16.4	87	125	89	107	100
DEKALB	DKS 59-09	20.7	17.8	13.6	15.7	17.4	136	102	88	95	109
RICHARDSON SEEDS	Dairy Master BMR	--	17.9	13.5	15.7	--	--	102	87	95	--
RICHARDSON SEEDS	Sweeter 'N Honey II	--	18.3	16.6	17.5	--	--	104	107	106	--
RICHARDSON SEEDS	Sweeter 'N Honey BMR	--	16.0	13.5	14.8	--	--	91	87	89	--
SORGHUM PARTNERS	NK 300	16.2	--	19.3	17.8	--	106	--	125	116	--
(Check)	NB 305F	17.2	15.9	10.2	21.8	14.4	112	91	66	79	90
(Check)	Corn	18.7	21.9	16.5	19.2	19.0	122	125	107	116	118
Average		15.3	17.5	15.5	16.5	16.1					

Forage Yields were corrected to 70% moisture content based on oven-dried sample.

Table 15.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2006.

Brand	Hybrid	Forage Type \1	Days to Boot	Boot Plant Ht	CP	ADF	NDF	NDFD	TDN	RFV	Net Energy Main.	Net Energy Gain	Net Energy Lact.
				In	----------%----------						-----MCal/lb-----		
SORGHUM PARTNERS	HIKANE II	FS	75	72	17.4	31.1	51.2	67	67.0	117	0.70	0.43	0.69
DEKALB	FS-25E	FS	97	84	12.9	32.7	56.3	66	65.2	105	0.67	0.41	0.67
DEKALB	DKS 59-09	FS	77	59	14.5	35.2	54.8	71	62.4	104	0.63	0.37	0.64
SORGHUM PARTNERS	NK300	FS	85	59	14.9	35.0	55.1	66	62.7	104	0.64	0.37	0.64
RICHARDSON SEEDS	Silo 700D	FS	88	59	13.5	35.3	55.5	63	62.3	103	0.63	0.37	0.64
(Check)	NB 305F	FS	81	77	14.5	35.7	56.5	65	61.8	101	0.62	0.36	0.63
DEKALB	FS-5	FS	79	75	14.1	35.7	57.0	62	61.9	100	0.62	0.36	0.63
RICHARDSON SEEDS	Dairy Master BMR	FS	80	80	12.1	36.5	58.2	65	61.0	97	0.61	0.35	0.62
RICHARDSON SEEDS	Sweeter 'N Honey BMR	SS	77	73	16.9	31.8	52.9	71	66.2	113	0.69	0.42	0.68
RICHARDSON SEEDS	Sweeter 'N Honey II	SS	92	97	13.6	33.1	53.4	62	64.8	110	0.67	0.40	0.67
SORGHUM PARTNERS	Sordan 79	SS	67	82	14.0	35.5	57.3	63	62.0	99	0.63	0.36	0.64
GARST	8247 YG1	Corn	65	78	14.2	32.2	54.7	65	65.9	109	0.68	0.41	0.68
Sorghum Average		FS	80	75	14.4	34.2	55.2	66	63.6	105	0.65	0.38	0.65

\1 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass.

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; NDFD, Digestibility of NDF; RFQ, Relative Forage Value; Net Energy: Maintenance, Gain, Lactation..

Skip-Row Planting and Seeding Rate Comparison for Dryland Grain Sorghum and Corn Production

Kevin Larson and Dennis Thompson

Skip-row planting is an old idea that is being revitalized for dryland row crop production in the drier areas of the High Plains. The two main advantages of skip-row planting compared to solid planting are reported to be late-season water availability from water stored in the skip-row (Klein et al., 2005) and less down the row input costs (Jost and Brown, 2001). Another approach for increasing late-season water availability is planting density manipulation. Adjusting the seeding rate to the moisture conditions may be as effective as skip-row planting for increasing late-season water availability. In this study, we compared skip-row planting to seeding rate to see which approach is most effective for increasing grain yield under dry conditions.

Materials and Methods

All sites were planted no-till into wheat stubble. Our three skip-row treatments were: 1) all rows planted (sorghum, 34,000 Seeds/A; corn, 16,000 Seeds/A), 2) skip row/plant row (sorghum, 17,000 Seeds/A; corn, 8,000 Seeds/A), and 3) skip row/plant two rows (sorghum, 21,300 Seeds/A; corn, 10,000 Seeds/A). We planted the skip-row studies with an eight-row vacuum planter. Adjacent to the skip-row studies we planted corn and grain sorghum seeding rate studies with a four-row cone planter. The corn seeding rates were: 6, 8, 10, 12, 14, 16, 18, and 20 Seeds/A x 1000. The grain sorghum seeding rates were: 10, 15, 20, 25, 30, 35, 40, and 45 Seeds/A x 1000. We planted the corn hybrid, Mycogen 2E762, on May 23 and the grain sorghum hybrid, Mycogen IG600, on June 28. We applied N at 50 Lb/A and we seedrow applied P at 20 Lb P2O5/A to the grain sorghum and corn studies. For preplant weed control, we sprayed Glystar Plus at 24 Oz/A, 2,4-D at 0.5 Lb/A, and Atrazine 1.0 Lb/A to both the corn and grain sorghum sites, and for post emergence control we applied Roundup Ultra at 24 Oz/A to the corn site and no post emergence control was used on the grain sorghum site. We harvested the grain sorghum on November 8 and the corn on October 24 with a self-propelled combine equipped with a digital scale. Grain yields were adjusted to 14% seed moisture for grain sorghum and 15.5% seed moisture for corn.

Results and Discussion

The grain yields of the corn and sorghum skip-row and seeding rate studies were very low: no treatment made over 5 Bu/A. It is difficult to generalize about treatment affects when yields are so low. Despite that warning about inferences from these studies, there appears to be a pattern for higher yield for low seeding rate (all rows planted) compared to skip-row with the same low seeding rate for both corn and grain sorghum. This yield difference was not entirely because of treatment differences between skip-row and seeding rate, the planter used contributed some of the yield difference because of the uniformity of seed placement. The vacuum planter, used for the skip-row study, provided uniform placement of seeds; whereas, the cone planter, used for the seeding rate study, had varying seed spacing. The non-uniform seed spacing from the cone planter was especially evident at low seeding densities. The

effect of seed spacing uniformity on grain yield is apparent when comparing all rows planted at the same seeding rate for both the vacuum and cone planters. Ideally, since these are the same treatment using only different planters, they should have very similar yields. This is not the case. The cone planter with its non-uniform seed spacing produced higher yield than the vacuum planter with uniform seed spacing. The higher yields with non-uniform spacing suggest that clustering or clumping of seeds may be beneficial under dryland conditions. Recent studies reported that clumping of seeds under dry, low yielding conditions produced higher yield than uniform seed spacing (Steward, 2006).

Skip-row planting is not a new idea. For many years, cotton growers in Texas have used skip-row to take advantage of government programs. The skip-row area was considered set-aside acres and only the cotton in the planted rows was counted as production acres. This has caused a potential insurance problem with skip-row plantings for other row crops because only 20 inches on each side of the planted row is considered planted area (Little, 2002). Only the crop area that is considered planted is insurable; therefore, insurance coverage is dependent on growers' skip-row planting patterns. With an alternate skip row pattern on 40 in. rows, only 50% of the field is considered planted and insurable. Recent ruling may change the insurability of skip-row plantings; therefore, before planting row crops in a skip-row pattern, we recommend that growers consult with their FSA office for further details on this issue.

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Table. -Dryland Corn Skip-Row and Seeding Rate Study, Walsh 2006.

Skip Row Treatment	No. of Rows Harvested	Skip Row Seeding Density	Skip Row Yield	Seeding Rate Density	Seeding Rate Yield
		Seeds/A (1000 X)	Bu/A	Seeds/A (1000 X)	Bu/A
Plant all rows	8	16.0	1.3	16.0	3.4
Skip row, plant two rows	5	10.0	1.6	10.0	4.7
Skip row, plant row	4	8.0	2.2	8.0	4.4
Average		11.3	1.7	11.3	4.2

Planted: May 23 with Mycogen 2E762; Harvested: October 24.

Table. -Dryland Grain Sorghum Skip Row & Seeding Rate Study, Walsh 2006.

Skip Row Treatment	No. of Rows Harvested	Skip Row Seeding Density	Skip Row Yield	Seeding Rate Density	Seeding Rate Yield
		Seeds/A (1000 X)	Bu/A	Seeds/A (1000 X)	Bu/A
Plant all rows	8	34.0	0.18	34.0	1.19
Skip row, plant two rows	5	21.3	0.19	21.3	1.47
Skip row, plant row	4	17.0	0.21	17.0	1.50
Average		24.1	0.19	24.1	1.39

Planted: June 28 with Mycogen IG600; Harvested: November 8.

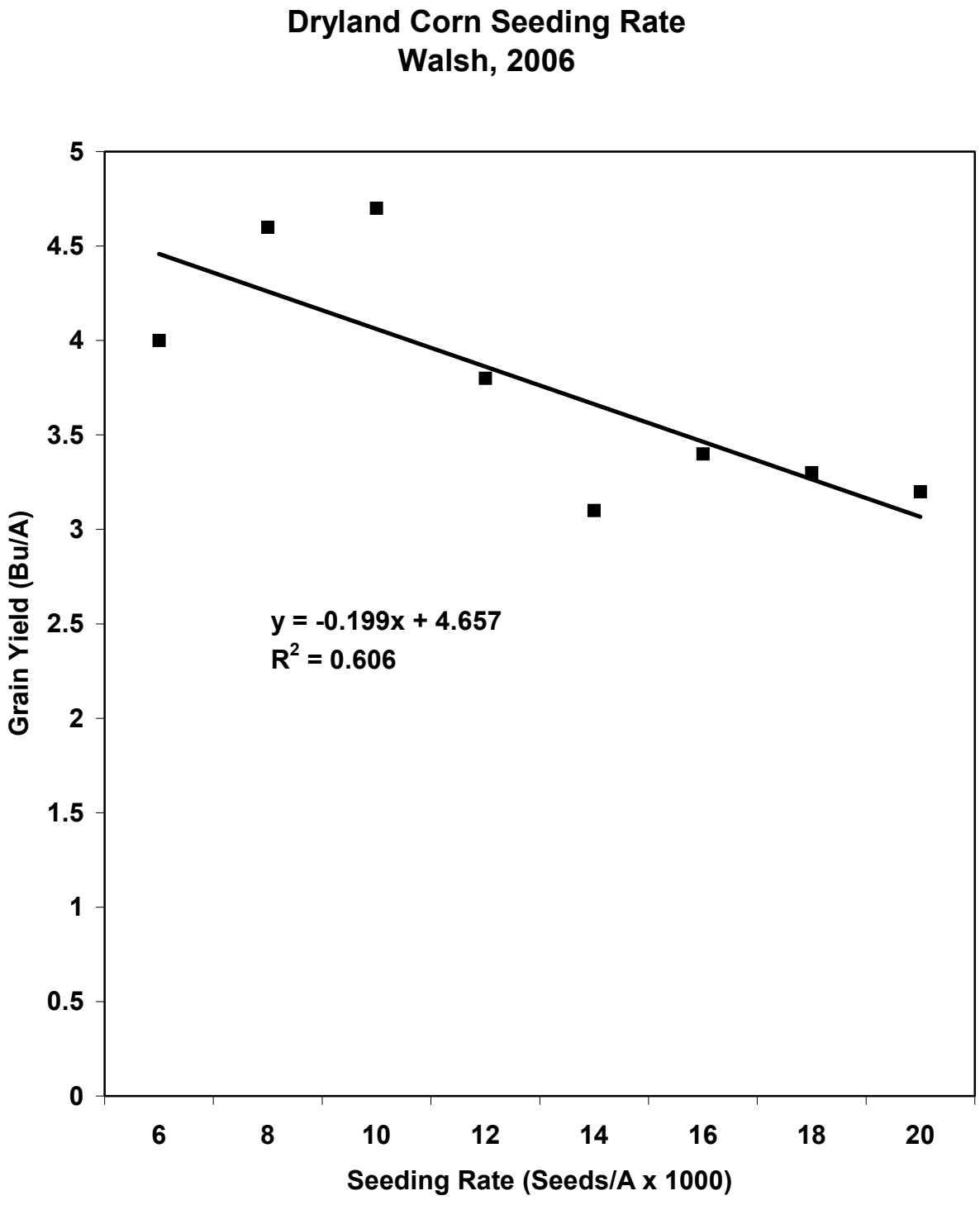

Fig. .Dryland corn seeding rate at Walsh. The eight seeding rates were 6, 8, 10, 12, 14, 16, 18, and 20 Seeds/A X 1000. The corn hybrid was Mycogen 2E762 planted on May 23.

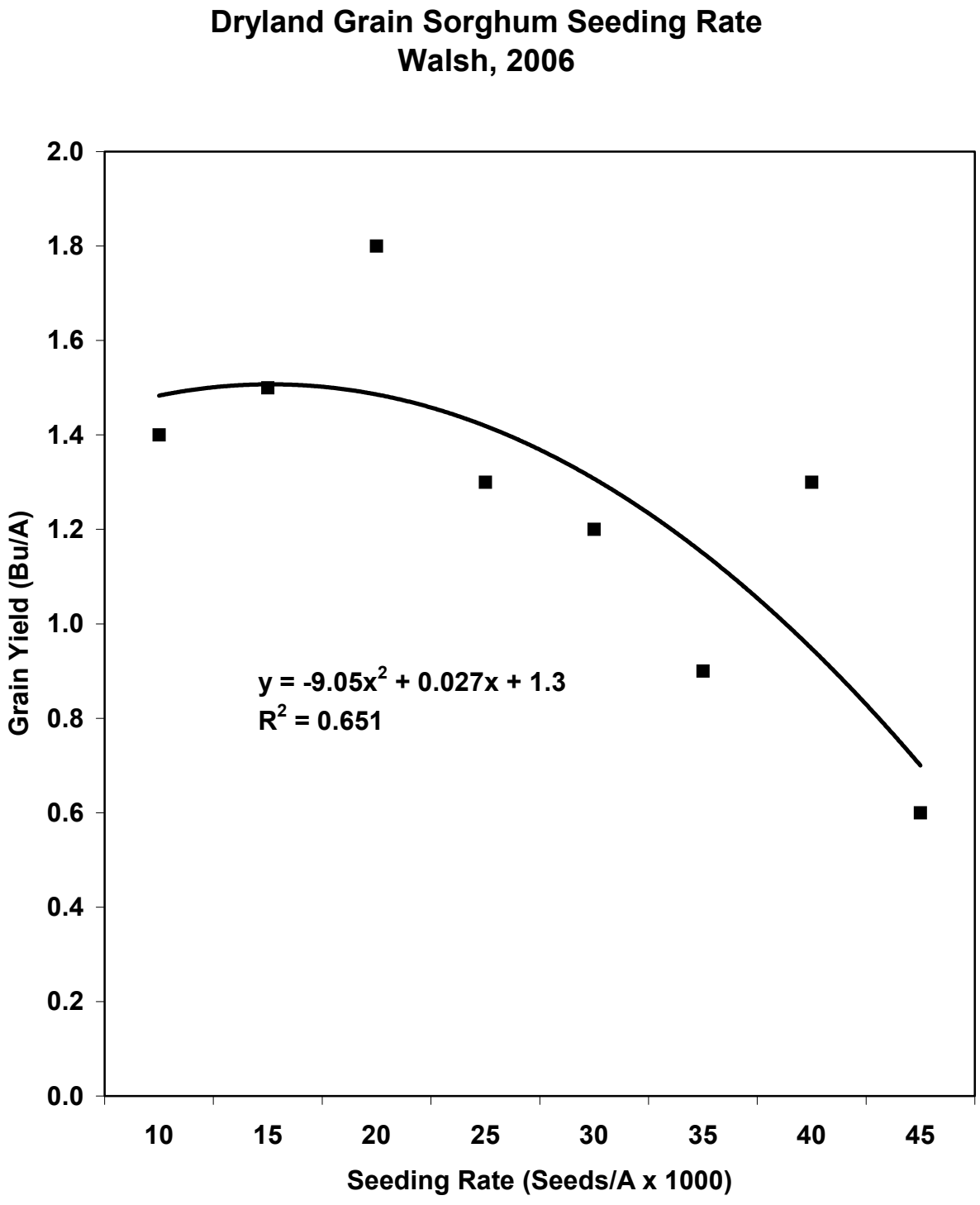

Fig. .Dryland grain sorghum seeding rate at Walsh. The eight seeding rates were 10, 15, 20, 25, 30, 35, 40, and 45 Seeds/A X 1000. The grain sorghum hybrid was Mycogen IG600 planted on June 28.

Limited Sprinkler Irrigation Corn Study at Walsh, 2006

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

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

RESULTS: Of the 14 hybrids tested, NK Brand 68-B8 was the highest yielding hybrid with 133 Bu/A. For this limited irrigation trial we applied 18 in./A of water, 8 in./A more than our normal limited irrigation corn study, because we were about 8 in. short on stored moisture.

PLOT: Four rows with 30" row spacing, at least 600' long. SEEDING DENSITY: 29,000 Seeds/A. PLANTED: May 1. HARVESTED: October 30.

IRRIGATION: Twelve sprinkler rotations applied 18.0 acre-in/A of total water.

PEST CONTROL: Pre Herbicides: Balance 2.0 Oz/A, Atrazine 1.0 Lb/A, Glystar Plus 24 Oz/A, LoVol 0.5 Lb/A; Post Herbicides: Banvel 8 Oz/A.
CULTIVATION & INSECTICIDE: None.
FIELD HISTORY: Last Crop: Sunflower.
FIELD PREP: Sweep plow and strip-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	1.19	523	9	1	31
June	1.37	780	21	4	61
July	4.09	874	23	3	92
August	4.04	765	13	3	123
September	0.96	431	1	0	153
October	1.18	208	3	0	172
Total	12.83	3581	70	11	172

\1 Growing season from May 1 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in fair soil moisture. Weed control was fair. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. The nonresistant corn borer hybrid had relatively high amounts of stock holes and lodging from second-generation corn borer larvae. Grain yields were poor because of the hot, dry weather and the lack of irrigation during silking.

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

Summary: Soil Analysis from Sprinkler Site.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------PPM----------				
0-8"	7.6	0.4	1.3	9	1.5	215	0.4	5.0
8"-24"				25				
Comment	Alka	VLo	Mod	Hi	VLo	VHi	VLo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization for Sprinkler Site.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	21	20	2.0	0
Applied	150	40	0.3	0

Yield Goal: 140 Bu/A.
Actual Yield: 114 Bu/A.

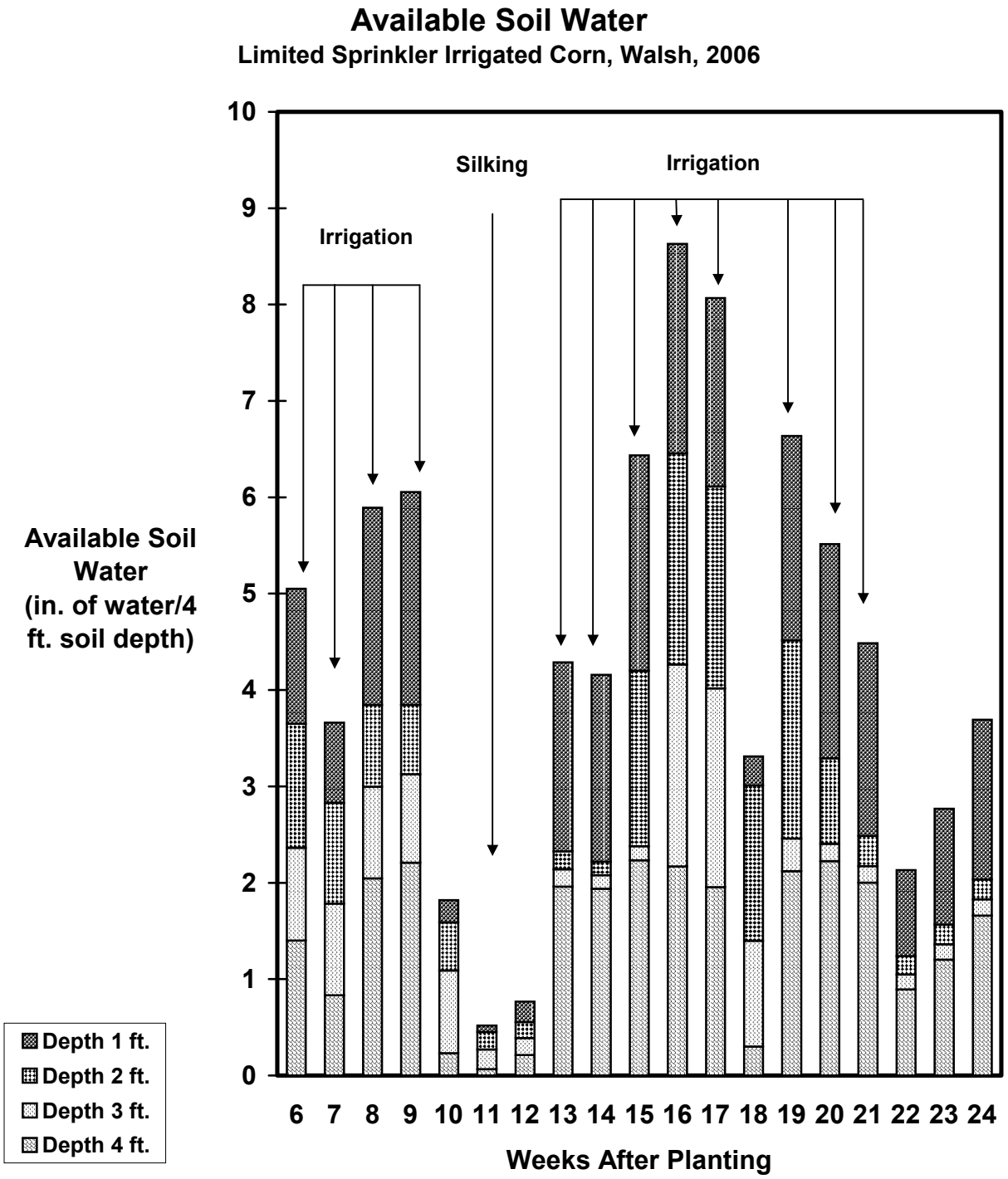

Fig. . Available soil water in limited sprinkler irrigation corn at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 17.34 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table .Limited Sprinkler Irrigation Corn, Plainsman Research Center, 2006.

Firm	Hybrid	50% Silking Date	Plant Density	Seed Moisture	Test Weight	Grain Yield
			Plants/A (X 1000)	%	Lb/Bu	Bu/A
NK BRAND	N68-B8	23-Jul	29.0	16.6	57	133
PIONEER	33B54	19-Jul	26.6	16.9	59	131
MYCOGEN	2T801	21-Jul	27.8	17.4	58	128
GARST	8378 YG1	20-Jul	26.4	16.7	60	121
NK BRAND	N65-C5	21-Jul	28.0	16.3	58	119
PIONEER	33H26	24-Jul	28.8	16.4	57	117
TRIUMPH	1416 Bt	21-Jul	27.0	15.8	60	116
MYCOGEN	2T780	21-Jul	28.4	19.2	58	113
GARST	8247 YG1	23-Jul	27.8	18.7	58	111
NK BRAND	N70-C7	20-Jul	28.4	17.2	59	105
MYCOGEN	2E683 (Non Bt)	20-Jul	26.0	15.7	57	103
TRIUMPH	1756 CbRR	24-Jul	28.6	17.5	57	99
NK BRAND	N67-D6	22-Jul	28.4	15.9	58	88
Average		22-Jul	27.8	16.9	58	114
LSD 0.20						20.8

Planted: May 1; Harvested: October 30, 2006.
Grain Yield corrected to 15.5% moisture content.
Twelve sprinkler rotations applied a total of 18.0 acre-in./A of water.

Corn Borer Resistant and Nonresistant Hybrid Comparisons, Walsh, 2006

K. Larson, D. Thompson, D. Harn, C. Thompson

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

RESULTS: Only the nonresistant corn borer hybrids displayed any first generation corn borer damage and this shot hole damage was very minor. Compared to damage recorded in previous years, the nonresistant corn borer hybrid had relatively typical amounts of stock holes and lodging damage caused by the second generation corn borer larvae. Grain yields were poor considering that we applied 18 inches of irrigation.

DISCUSSION: All 13 Bt hybrids tested showed excellent resistance to corn borer compared to the nonresistant hybrid. The nonresistant corn borer hybrid had 55% of its plants with stock holes and 27% lodging due to corn borer damage Last year we observed no stock holes or corn borer lodging on any of the hybrids. We attributed the lack of corn borer damage to the application of Capture to control a late infestation of mites. It appears that our assumption was correct, this year we did not apply Capture for mite control and we had corn borer damage. 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.

We define limited sprinkler corn as receiving 10 inches or less of irrigation above normal precipitation. This year we applied 18 inches of irrigation. The extra 8 inches of irrigation was to offset the stored soil moisture deficit from the lack of winter moisture. Despite applying 18 inches of irrigation, grain yield were poor. The limited sprinkler corn trial averaged only 114 Bu/A. We attribute the poor yields to irrigation timing. We had to shut down the sprinkler during silking to lay some new irrigation lines. Inadvertently, we demonstrated the importance of moisture during silking, one of the most critical water use stages.

Table .Limited Sprinkler Irrigated Corn, Corn Borer Ratings, Plainsman Research Center, 2006.

Firm	Hybrid	50% Silking Date	Plant Density	1st Gen Shot Holes	2nd Gen Stock Holes	2nd Gen Plant Lodging	Test Weight	Grain Yield
			Plants/A (X 1000)				Lb/Bu	Bu/A
NK BRAND	N68-B8	23-Jul	29.0	0	0	0	57	133
PIONEER	33B54	19-Jul	26.6	0	3	3	59	131
MYCOGEN	2T801	21-Jul	27.8	0	0	0	58	128
GARST	8378 YG1	20-Jul	26.4	0	0	0	60	121
NK BRAND	N65-C5	21-Jul	28.0	3	0	0	58	119
PIONEER	33H26	24-Jul	28.8	0	0	0	57	117
TRIUMPH	1416 Bt	21-Jul	27.0	0	0	0	60	116
MYCOGEN	2T780	21-Jul	28.4	0	0	0	58	113
GARST	8247 YG1	23-Jul	27.8	0	3	0	58	111
MYCOGEN	2T780	21-Jul	28.8	0	0	0	60	106
NK BRAND	N70-C7	20-Jul	28.4	0	3	0	59	105
MYCOGEN	2E683 (Non Bt)	20-Jul	26.0	3	55	28	57	103
TRIUMPH	1756 CbRR	24-Jul	28.6	0	0	0	57	99
NK BRAND	N67-D6	22-Jul	28.4	0	0	0	58	88
Average		21-Jul	27.9	0	5	2	58	114
LSD 0.20				1.3	3.0	1.7		20.8

Planted: May 1; Harvested: October 30, 2006.
Grain Yield adjusted to 15.5% moisture content.
Twelve sprinkler rotations applied a total of 18.0 acre-in./A of water.

Dryland Crop Rotation Study

Kevin Larson and Dennis Thompson

This is the second year for our new 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, to this rotation study.

Materials and Methods

This is our second 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 (M-W) this year. We planted wheat, Hatcher, at 50 Lb/A on October 5, 2005; Proso millet, Huntsman, at 18 Lb/A on June 22, 2006; grain sorghum, Mycogen 627, at 34,000 Seeds/A on May 26, 2006; and sunflower, Mycogen 8H419CL, at 16,000 Seeds/A on June 21, 2006. We applied 50 Lb N/A to the study site. Before planting we sprayed two applications of Glystar Plus at 24 Oz/A and VoVol at 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 and grain sorghum, Banvel 4 Oz/A and Saber 10 Oz/A; sunflower, Prowl 48 Oz/A and Spartan 2 Oz/A; and fallow, Glystar Plus 24 Oz/A and LoVol 0.5 Lb/A two times. We harvested the crops with a self-propelled combine equipped with a digital scale: wheat, June 21; millet, September 18; grain sorghum, November 9; and the sunflower crop was not harvested. There was no sunflower crop to harvest because we failed to establish a stand due to chemical damage. We recorded cost of production and yields in order to determine rotation revenues.

Results and Discussion

The W-GS-F rotation produced the highest total crop production, 2243 Lb/A, and highest variable net income, $110.01/A, for 2006. The newly established M-W rotation produced the second lowest total crop production, 568 Lb/A (millet was the only crop harvested so far for this rotation), but it had the second highest variable net income, $61.57/A, for 2006. The W-Sun-F rotation produced the least variable net income of $24.02 and like the M-W rotation it also had only one crop harvested for its rotation: the wheat was harvested and the sunflower crop was a failure.

We are still in the establishment phase with these rotations and we already have had crop failures, therefore rotational affects are, at best, difficult to generalize and quantify. The dry conditions have depressed yields particularly for the spring crops. We have had little or no sunflower yield. This year we even failed altogether to get a sunflower stand. Since we failed to establish a sunflower stand this year, the wheat planted in 2007 for this rotation will actually be double summer fallow. Winter wheat has performed better than the spring crops. This is primarily due to more favorable

moisture during the wheat growing season. The higher wheat yield suggests that having a winter grain in the rotation spreads the cropping risk and increases crop rotation revenue.

Table .-Dryland Crop Rotation Study, Crop Production Summary 2006.

	Crop Production					
	2006 Crop					2006 Total
Rotation	Wheat	Grain Sorghum	Millet	Sunflower	Fallow	Rotation Production
	Lb/A					
W-S-F	1179	1064			0	2243
W-Sun-F	1116			0	0	1116
M-W			568			568
S-M		157	283			440
Average	1148	611	426	0	0	1092
LSD 0.20	507.6	327.6	413.8			

The M-W rotation was started this year (2006), therefore, there was no wheat planted in 2005 for the M-W.
The sunflowers were not harvested because of chemical damage.

Table .-Dryland Crop Rotation Study, Walsh, 2006.

Crop	Seeding Density	Seed Cost	Weed Control Cost	Yield	Crop Price	Gross Income	Variable Net Income
	*/A	$/A	$/A	*/A	$/*	$/A	$/A
Wheat	50 lb	4.17	12.20	19 bu	4.75/bu	90.25	73.88
Millet	18 lb	2.41	7.02	8 bu	7.00/bu	56.00	46.57
Grain Sorghum	34,000 seeds	2.50	7.02	11 bu	3.20/bu	35.20	25.68
Sunflower	16,000 seeds	12.00	17.72	None	0.12/lb	0.00	-29.72
Fallow	---	---	18.24	---	---	0.00	-18.24
Average			12.44			36.29	19.63

Planted: Grain Sorghum Mycogen 627 at 34,000 Seeds/A on May 26; Millet, Huntsman at 18 Lb/A on June 22; and Sunflower Mycogen 8H419CL at 16,000 Seeds/A on June 21; Wheat, Hatcher at 50 Lb/A on October 5, 2005.
Harvested: Millet, September 18; Sunflower, Not harvested; and Grain Sorghum, November 9; Wheat, June 21, 2006.
Weed control cost is herbicide cost and $4/A application cost for each application.

Table .-Dryland Crop Rotation Study, Variable Net Income Summary 2006.

Rotation	2006 Crop: Wheat	Grain Sorghum	Millet	Sunflower	Fallow	2006 Total Rotation Production
	$/A					
W-S-F	76.97	51.28			-18.24	110.01
M-W	0		61.57			61.57
S-M		-0.55	25.95			25.40
W-Sun-F	71.98			-29.72	-18.24	24.02
Average	74.48	25.37	43.76	-29.72	-18.24	55.25
LSD 0.20	32.93	13.61	42.51			

The M-W rotation was started this year (2006), therefore, there was no wheat planted in 2005 for the M-W rotation.
The sunflowers were not harvested because of chemical damage.
Variable Net Income is gross income minus seed cost and weed control cost.

Table .-Dryland Crop Rotation Study, Variable Net Income Summary 2006.

Rotation	Variable Net Income for 2006 Crops: 2006 Crop: Wheat	Grain Sorghum	Millet	Sunflower	Fallow	2006 Total Rotation Variable Net Income	6-Year Variable Net Income Rotation Projection
	$/A						
W-S-F	76.97	51.28			-18.24	110.01	220.02
M-W	0		61.57			61.57	184.71
S-M		-0.55	25.95			25.40	76.20
W-Sun-F	71.98			-29.72	-18.24	24.02	48.04
Average	74.48	25.37	43.76	-29.72	-18.24	55.25	132.24
LSD 0.20	32.93	13.61	42.51				

The M-W rotation was started this year (2006), therefore, there was no wheat planted in 2005 for the M-W.
The sunflowers were not harvested because of chemical damage.
Variable Net Income is gross income minus seed cost and weed control cost.

Crop Rotation Sequencing

Kevin Larson and Dennis Thompson

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 2E762 Bt/RR) on May 23 at 16,000 Seed/A, sunflower (Mycogen 8H419CL) on June 21 at 16,000 Seed/A, grain sorghum (Mycogen 627) on May 26 at 34,000 Seed/A, mung bean (Berkins) on June 23 at 17 Lb/A, and proso millet (Huntsman) on June 22 at 18 Lb/A. Before planting we sprayed two applications of Glystar Plus at 24 Oz/A and LoVol at 0.5 Lb/A. For in-season weed control, we chose short-residual herbicides that should not interfere with crop rotations: millet and grain sorghum, Banvel 4 Oz/A and 2,4-D amine (Saber) 10 Oz/A; corn, Roundup Ultra Max 24 Oz/A (two applications); mung bean, Beyond 5 Oz/A and Penetrant II 4 Oz/A; sunflower, Prowl 48 Oz/A and Spartan 2 Oz/A; and fallow, Glystar Plus 24 Oz/A and 0.5 Lb LoVol (two applications). We harvested the crops with a self-propelled combine equipped with a digital scale: millet, September 18; grain sorghum, November 11; corn, October 24; mung bean, October 5; and sunflower, not harvested. The sunflower crop was not harvested because we failed to establish a stand due to chemical damage.

Results and Discussion

This is the fourth 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. Last year, we went back to the original rotations where all crops followed themselves and every other crop.

The two-year rotation sequence with the highest variable net income for the last two years was Millet-Sorghum with $57.08/A. Only two crops, millet and grain sorghum, produced positive net income averages for 2006 when following all the crops and fallow. Easily the best three-year crop sequence for the past three years was Millet-Sorghum-Millet with a three-year total variable net income of $208.31/A. Last year, all three-year crop sequences ending with sunflower provided high variable net incomes, averaging $202.87. However, this year we unable to establish a sunflower stand, therefore there

was no sunflower harvest. Even without a 2006 sunflower harvest, rotations ending in sunflower did not have the worst two-year variable net income: rotation sequences ending in corn had the worst two-year variable net incomes. The dry conditions for the last few years, has produced less than 5 Bu/A corn yields and negative variable net incomes for all rotations. Currently, millet has the highest overall variable net income and corn 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 2006.

Previous Crop	2006 Crop						2006 Average Total Production
	Grain Sorghum	Millet	Corn	Mung Bean	Sunflower	Fallow	
	----------Lb/A----------						
Fallow	1445	756	302	83	0	0	517
Mung Bean	258	521	101	33	0	0	183
Grain Sorghum	202	308	106	94	0	0	142
Sunflower	179	213	213	51	0	0	131
Millet	179	179	134	120	0	0	123
Corn	162	274	62	43	0	0	108
Average	404	375	153	71	0	0	201
LSD 0.20	224.0	168.0	134.4	50.0			

The sunflowers were not harvested because of chemical damage.

Table .-Two-Year Crop Rotation Sequence, Variable Net Income Summary for 2005 and 2006.

	Total Variable Net Income for 2005 and 2006 Crops						Average 2-Year Variable Net Income
	2006 Crop (2004 Stubble)						
2005 Crop	Millet	Grain Sorghum	Fallow	Mung Bean	Sunflower	Corn	
	$/A						
Millet	39.95	57.08	42.12	30.32	-13.04	-13.16	23.88
Grain Sorghum	23.51	20.57	36.48	-11.67	-38.04	-44.08	-2.21
Sunflower	38.53	20.28	21.90	-47.70	-35.44	-29.16	-5.27
Fallow	22.98	53.17	-38.75	-39.30	-50.23	-49.93	-17.01
Mung Bean	27.92	1.67	-6.75	-74.02	-41.63	-55.83	-24.77
Corn	-39.45	-48.83	-61.62	-26.92	-79.25	-93.78	-58.31
Average	18.91	17.32	-1.10	-28.22	-42.94	-47.66	-13.95

Variable Net Income: Gross Income - Seed Cost - Weed Control Cost.
The highest two-year variable net income of $57.08 was the Millet-Sorghum rotation.

Table .-Three-Year Crop Rotation Sequence, Variable Net Income Summary for 2004, 2005, and 2006.

	Total Variable Net Income for 2004, 2005 and 2006 Crops						Average 3-Year Variable Net Income
	2004 and 2006 Crops						
2005 Crop (2003 Stubble)	Millet	Grain Sorghum	Sunflower	Mung Bean	Fallow	Corn	
	$/A						
Grain Sorghum	208.31	111.26	93.62	41.42	16.66	4.36	79.27
Millet	187.67	118.07	79.02	50.21	22.30	0.72	76.33
Fallow	187.62	128.02	77.11	-7.01	-58.57	9.31	56.08
Mung Bean	195.92	52.76	66.63	-61.93	-26.57	-50.59	29.37
Sunflower	176.29	25.83	-8.42	-36.61	2.08	-49.84	18.22
Corn	115.11	-9.62	17.61	-2.43	-81.44	-84.22	-7.50
Average	178.49	71.05	54.26	-2.73	-20.92	-28.38	41.96

Variable Net Income: Gross Income - Seed Cost - Weed Control Cost.
The highest three-year variable net income of $208.31 was the Millet-GS-Millet rotation.

Table .-Mung Bean: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Seed Yield	Gross Income	2006 Mung Bean Variable Net Income	2005 Mung Bean Variable Net Income	2004 Mung Bean Variable Net Income	Total Variable Net Income
	Lb/A	$/A	$/A	$/A	$/A	$/A
Grain Sorghum	94	14.10	-17.14	-4.81	53.09	31.14
Fallow	83	12.45	-18.79	11.49	32.29	24.99
Millet	120	18.00	-13.24	0.89	19.89	7.54
Corn	43	6.45	-24.79	-13.81	24.49	-14.11
Sunflower	51	7.65	-23.59	-11.91	11.09	-24.41
Mung Bean	33	4.95	-26.29	-21.41	12.09	-35.61
Average	71	10.60	-20.64	-6.59	25.49	-1.74
LSD 0.20	50.0	7.47	-14.54	2.67	7.13	

Planted: Mung Bean (Berkins) on June 23, 2006 at 17 Lb/A.
Mung Bean Seed Cost: $6.80/A ($40/cwt).
Harvested: Mung Bean on October 5, 2006.
Millet Market Price $0.15/Lb.
Weed Control: Raptor, 5 oz; Penetrant II, 4 oz.
Chemical Cost: $20.44/A; Application Cost $4/A.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Corn: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Seed Yield	Gross Income	2006 Corn Variable Net Income	2005 Corn Variable Net Income	2004 Corn Variable Net Income	Total Variable Net Income
	Bu/A	$/A	$/A	$/A	$/A	$/A
Fallow	5.4	18.90	-29.42	-43.38	59.24	-13.56
Grain Sorghum	1.9	6.65	-41.67	-48.91	48.44	-42.14
Millet	2.4	8.40	-39.92	-49.23	13.88	-75.27
Corn	1.1	3.85	-44.47	-49.31	9.56	-84.22
Mung Bean	1.8	6.30	-42.02	-49.23	5.24	-86.01
Sunflower	3.8	13.30	-35.02	-49.53	-20.68	-105.23
Average	2.7	9.57	-38.75	-48.26	19.28	-67.74
LSD 0.20	2.4	8.51	-34.44	-8.36	13.39	

Planted: Corn (Mycogen 2E762 Bt/RR) on May 23, 2006 at 16,000 Seed/A.
Corn Seed Cost: $24.00/A ($1.50/1000 Seeds).
Harvested: Corn on October 24, 2006.
Corn Market Price $3.50/Bu.
Weed Control: Roundup Ultra Max, 24 oz/A (two applications).
Chemical Cost: $16.32/A; Application Cost $8/A.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Fallow: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Seed Yield	Gross Income	2006 Fallow Variable Net Income	2005 Fallow Variable Net Income	2004 Fallow Variable Net Income	Total Variable Net Income
	Bu/A	$/A	$/A	$/A	$/A	$/A
Fallow	0	0.00	-18.24	-20.51	-19.82	-58.57
Grain Sorghum	0	0.00	-18.24	-20.51	-19.82	-58.57
Millet	0	0.00	-18.24	-20.51	-19.82	-58.57
Mung Bean	0	0.00	-18.24	-20.51	-19.82	-58.57
Corn	0	0.00	-18.24	-20.51	-19.82	-58.57
Sunflower	0	0.00	-18.24	-20.51	-19.82	-58.57
Average	0	0.00	-18.24	-20.51	-19.82	-58.57
LSD 0.20						

Weed Control: Glystar 24 oz; LoVol 0.75 lb.
Chemical Cost: $5.12/A; Application Cost $4/A; sprayed 2X.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Grain Sorghum: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Seed Yield	Gross Income	2006 Grain Sorghum Variable Net Income	2005 Grain Sorghum Variable Net Income	2004 Grain Sorghum Variable Net Income	Total Variable Net Income
	Bu/A	$/A	$/A	$/A	$/A	$/A
Fallow	26	83.20	73.68	54.72	74.85	203.25
Grain Sorghum	4	12.80	3.28	17.29	90.69	111.26
Millet	3	9.60	0.08	11.38	60.99	72.45
Mung Bean	5	16.00	6.48	5.47	51.09	63.04
Corn	3	9.60	0.08	-2.41	39.21	36.88
Sunflower	3	9.60	0.08	-8.32	5.55	-2.69
Average	7	23.47	13.95	13.02	53.73	80.70
LSD 0.20	4.0	13.41	7.97	8.80	20.65	

Planted: Grain Sorghum (Mycogen 627) on May 26, 2006 at 34,000 Seed/A.
Grain Sorghum Seed Cost: $2.50/A ($1.00/lb).
Harvested: Grain Sorghum November 11, 2006.
Grain Sorghum Market Price $3.20/Bu.
Weed Control: Banvel, 4 oz; Saber, 10 oz.
Chemical Cost: $3.02/A; Application Cost $4/A.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Millet: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Grain Yield	Gross Income	2006 Millet Variable Net Income	2005 Millet Variable Net Income	2004 Millet Variable Net Income	Total Variable Net Income
	Bu/A	$/A	$/A	$/A	$/A	$/A
Fallow	13.5	52.92	43.49	60.36	154.44	258.29
Grain Sorghum	5.5	21.56	12.13	57.00	174.60	243.73
Mung Bean	9.3	36.46	27.03	43.56	157.80	228.39
Millet	3.2	12.54	3.11	36.84	147.72	187.67
Corn	4.9	19.21	9.78	26.76	144.36	180.90
Sunflower	3.8	14.90	5.47	16.68	127.56	149.71
Average	7	26.26	16.83	40.20	151.08	208.11
LSD 0.20	3.0	11.25	7.21	11.79	14.48	

Planted: Millet (Huntsman) on June 22, 2006 at 18 Lb/A.
Millet Seed Cost: $2.41/A ($7.50/Bu).
Harvested: Millet on September 18, 2006.
Millet Market Price $3.92/Bu.
Weed Control: Banvel, 4 oz; Saber, 10 oz.
Chemical Cost: $3.02/A; Application Cost $4/A.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Table .-Sunflower: Crop Rotation Sequencing Study, Walsh, 2006.

Previous Crop	Seed Yield	Gross Income	2006 Sunflower Variable Net Income	2005 Sunflower Variable Net Income	2004 Sunflower Variable Net Income	Total Variable Net Income
	Bu/A	$/A	$/A	$/A	$/A	$/A
Fallow	0	0.00	-29.72	40.14	127.34	137.76
Grain Sorghum	0	0.00	-29.72	20.20	131.66	122.14
Millet	0	0.00	-29.72	33.06	92.06	95.40
Mung Bean	0	0.00	-29.72	-3.33	108.26	75.21
Corn	0	0.00	-29.72	5.86	96.86	73.00
Sunflower	0	0.00	-29.72	-5.72	27.02	-8.42
Average	0	0.00	-29.72	15.04	97.20	82.52
LSD 0.20				37.77	37.77	

Planted: Sunflower (Mycogen 8H419CL) on June 21, 2006 at 16,000 Seeds/A.
Sunflower Seed Cost: $12.00/A ($0.75/1000 Seeds).
Harvested: Sunflower not harvested.
Sunflower Market Price $0.12/Lb.
Weed Control: Prowl, 48 oz; Spartan, 2 oz.
Chemical Cost: $13.72/A; Application Cost $4/A.
Variable Net Income: Gross Income - Seed Cost - Weed Control.

Long-Term N Effects on Wheat-Sunflower-Fallow Rotation, Walsh, 2006

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

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

Materials and Methods: We planted wheat, Hatcher, at 50 Lb Seed/A on October 1, 2005, and sunflower on July 3, 2006 at 16,000 Seeds/A using MYCOGEN 8N419CL. 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 17, 2006 for wheat and to only the N side August 18, 2006 for sunflower. The N fertilizer treatments were applied to both sides of the wheat plots and only one side of the sunflower plots to test the response of sunflower to residual N left by the wheat. We seedrow applied 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 Glystar Plus 24 Oz/A and postemergence Express, 0.33 Oz/A and 2,4-D, 0.38 Lb/A. For weed control in the sunflower, we applied pre-emergence Glystar Plus 24 Oz/A, Spartan 2 Oz/A, and Prowl 48 Oz/A. We harvested two replications of the 20 ft. by 1045 ft. plots on June 21 for wheat and November 16 for sunflower with a self-propelled combine and weighed them in a digital weigh cart. Yields were adjusted to 12.0% for wheat and 10% for sunflower.

Results: There was a nonsignificant trend for wheat to decrease yield with increasing N rates. Only 3 Bu/A separated the lowest and highest wheat yields. Wheat yields were low, ranging from 9 Bu/A to 13 Bu/A. Sunflower yields were non-responsive to both applied and residual N rates. There was a nonsignificant trend for sunflower yields to increase with increasing applied N rates. Sunflower yield response to residual N left from the wheat crop had a nonsignificant trend of decreasing yield with increasing N rates. Sunflower yields were poor, 320 to 410 Lb/A. For both wheat and sunflower, the no N fertilizer treatments produced the highest yields.

Discussion: This is the sixth 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 is the sixth year that the dryland wheat yields did not response to applied N. The non-response of wheat yields to increasing N rates can be explained by sufficient residual N for the first year and low yields for the subsequent years. For this study moisture has been the primary yield-limiting factor, not N.

This year the sunflower yields were poor and sunflower yields did not respond to increasing N rates. Sunflower displayed a similar flat yield response to both residual and applied N. Neither applied nor residual N contributed to sunflower yield. With only flat yield responses to N rates, N was a costly expense without benefit for both wheat and sunflower.

We have reported no wheat yield response to N rate since establishing this wheat-sunflower-fallow rotation study. Wheat yields in this rotation were very low to fair, 6 to 26 Bu/A. The low to fair wheat yields can be attributed to the lack of moisture remaining after sunflower extracted all available soil water and little soil water

replenishment due to dry conditions during fallow. For wheat production in this wheat-sunflower-fallow rotation, moisture was probably the limiting factor, not N.

Most years 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 because of drought). This year, the no fertilizer treatment produced the highest sunflower yield (although it was only a few pounds higher than the N treatments). 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.

Seed oil content tends to decrease with increasing N rates. This year there was very little change in oil content with increasing N rate: 33.6%, 34.1%, 33.9%, and 33.5% for 0, 30, 60, and 90 Lb N/A, respectively. In previous years, we observed a decline in oil content with increasing N rate. This negative correlation of oil content with N rate has been previously reported (Vigil and Bowman, 1998).

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.

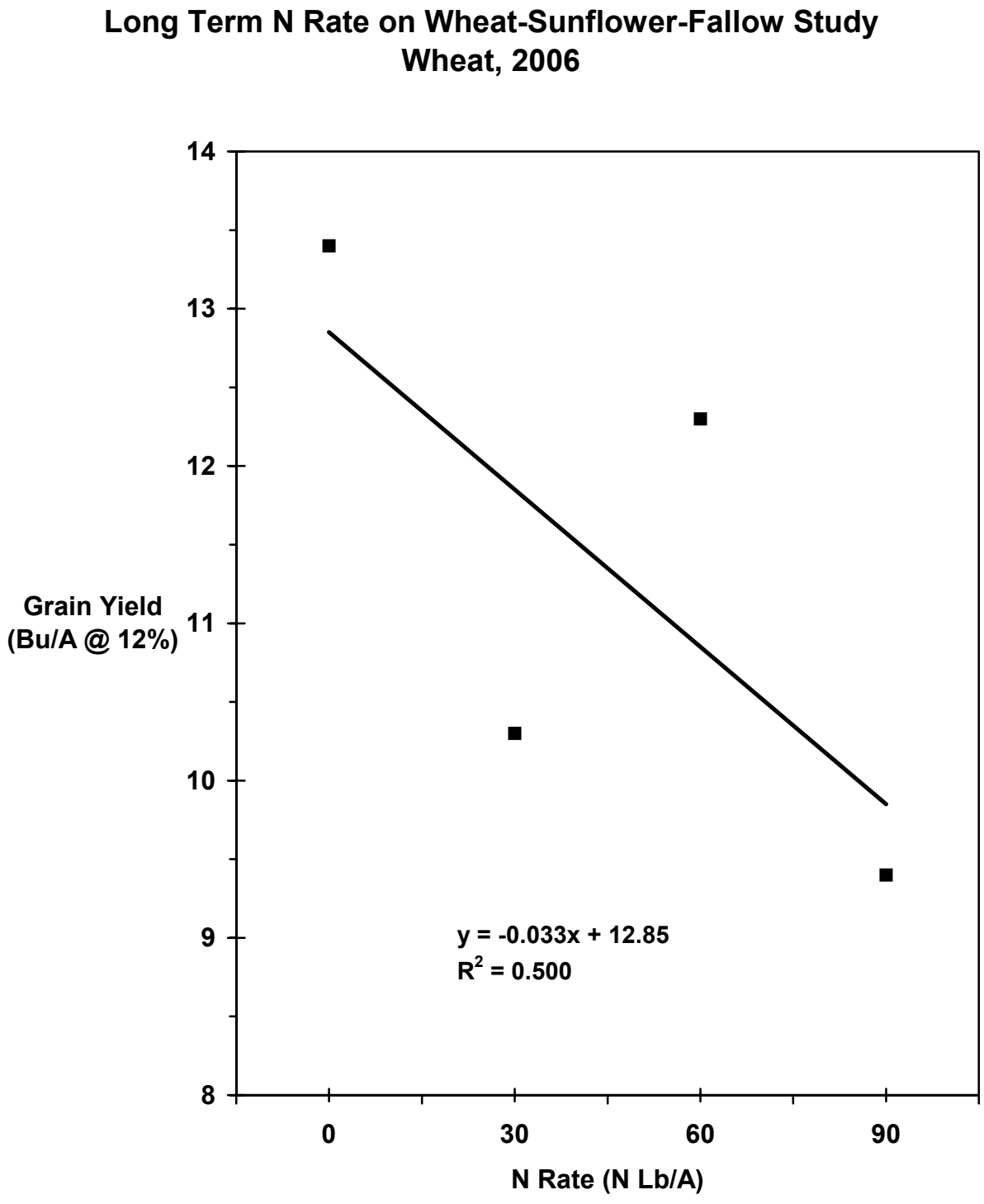

Fig. . N rate on dryland wheat in Wheat-Sunflower-Fallow rotation at Walsh. The N rates were 0, 30, 60, and 90 Lb N/A as 28-0-0. The wheat variety was Hatcher sown at 50 Lb/A.

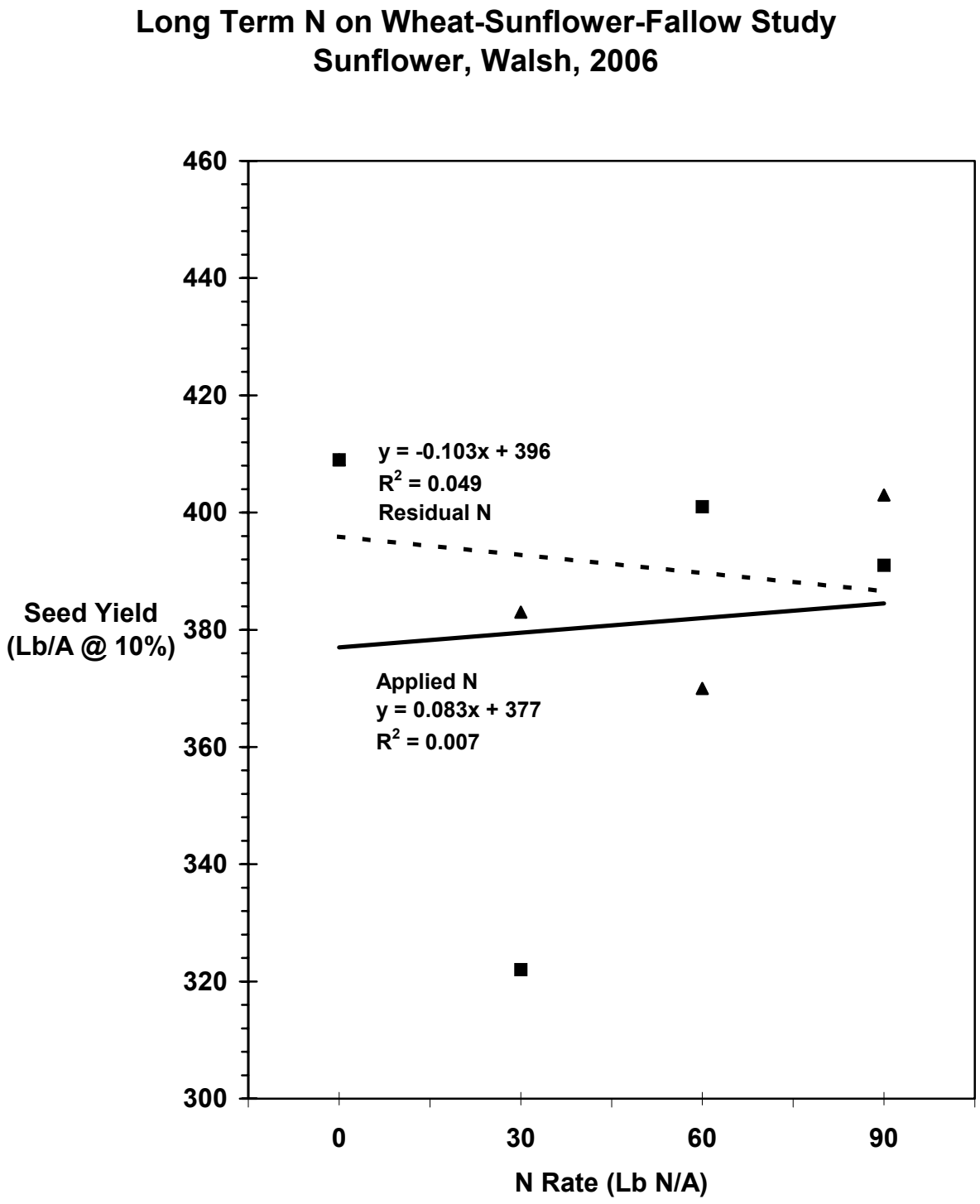

Fig. . N rate on dryland sunflower in Wheat-Sunflower-Fallow rotation at Walsh. The N rates were 0, 30, 60, and 90 Lb N/A as 32-0-0. Applied N is N applied to the sunflowers in the current season. Residual N is N applied to the wheat the previous season. The sunflower hybrid was MYCOGEN 8N419CL planted at 16,000 Seeds/A.

Long-Term N Effects on Irrigated Sunflower-Corn Rotation, Walsh, 2006

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

Purpose: To study the long-term N fertilizer effects on an irrigated Sunflower-Corn rotation where N is applied to the same treatment site for multiple years.

Materials and Methods: We planted corn, Mycogen 2T801, on May 2 at 34,000 Seeds/A, and sunflower, Pioneer 63M91 on July 12 at 26,000 Seeds/A. We banded liquid N (32-0-0) at 100, 150, and 200 Lb N/A to the treatment plots with two replications. We seedrow applied 20 Lb P_2O_5/A and 0.25 Lb Zn/A at planting to the corn but not the sunflowers. For weed control, we applied pre-emergence Glystar Plus 24 Oz/A and 0.5 Lb of 2,4-D to both the corn and sunflower plots. For Postemergence weed control in the corn, we applied two applications of Roundup Ultra Max at 24 Oz/A. For weed control in the sunflower, we applied pre-emergence Spartan 2 Oz/A and Prowl 48 Oz/A. The sites were subsurface drip irrigated. The corn received 16.8 in./A of irrigation and the sunflower received 12.6 in./A of irrigation. Other than herbicides, no other pesticides were applied because pests did not reach threshold levels due to late planting of the sunflower, or the pests were present but the corn hybrid was resistant. We harvested two replications of the 20 ft. by 650 ft. plots on November 1 for corn and November 16 for sunflower with a self-propelled combine and weighed them in a digital weigh cart. Yields were adjusted to 15.5% for wheat and 10% for sunflower.

Results: Both corn and sunflowers had similar responses to increasing N rates: 100 Lb N/A produced the highest yield, 150 Lb N/A produced the lowest yield, and 200 Lb/A produced a medium yield. After reviewing the soil test recommendation, it is not surprising that the 100 Lb N/A rate produced the highest yield. The recommend N fertilizer for our yield goal was about 90 Lb N/A for both corn and sunflowers. Yield levels for both corn and sunflowers were lower than expected. Our yield goal for the corn was 200 Bu/A and the yield goal for the sunflowers was 2500 Lb/A. We did not observe the typical percent oil decrease with increasing N. The oil percentages were: 39.5, 38.4, and 39.8, respectively for 100, 150, and 200 Lb N/A.

Table .-Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe	Mn	Cu
		mmhos/cm	%	ppm						
0-8”	7.4	0.5	1.9	18	6.8	535	2.6	5.9	8.7	3.8
8-24”				19						

Discussion: This is the first year of this long-term N on Sunflower-Corn rotation study. We started this study because of the lack of N response for dryland sunflower in our long-term N on Wheat-Sunflower-Fallow study, the role of N in reducing oil yield, and growers reports that irrigated corn following sunflower often produced their highest yields. Under dryland conditions, following sunflower in a rotation typically reduces the

subsequent crop yield. The yield reduction in the crop following sunflower is due to the deep and thorough extraction of the available water in the soil profile, leaving the subsequent crop with little soil water profile base. With irrigation, the dry soil profile left by sunflower is not a detriment since the soil profile can be refilled by irrigation. Moreover, we speculate that the reason irrigated corn is reported to yield well following sunflower is that the deep water extraction of sunflower loosens the soil and provides better root penetration by the corn.

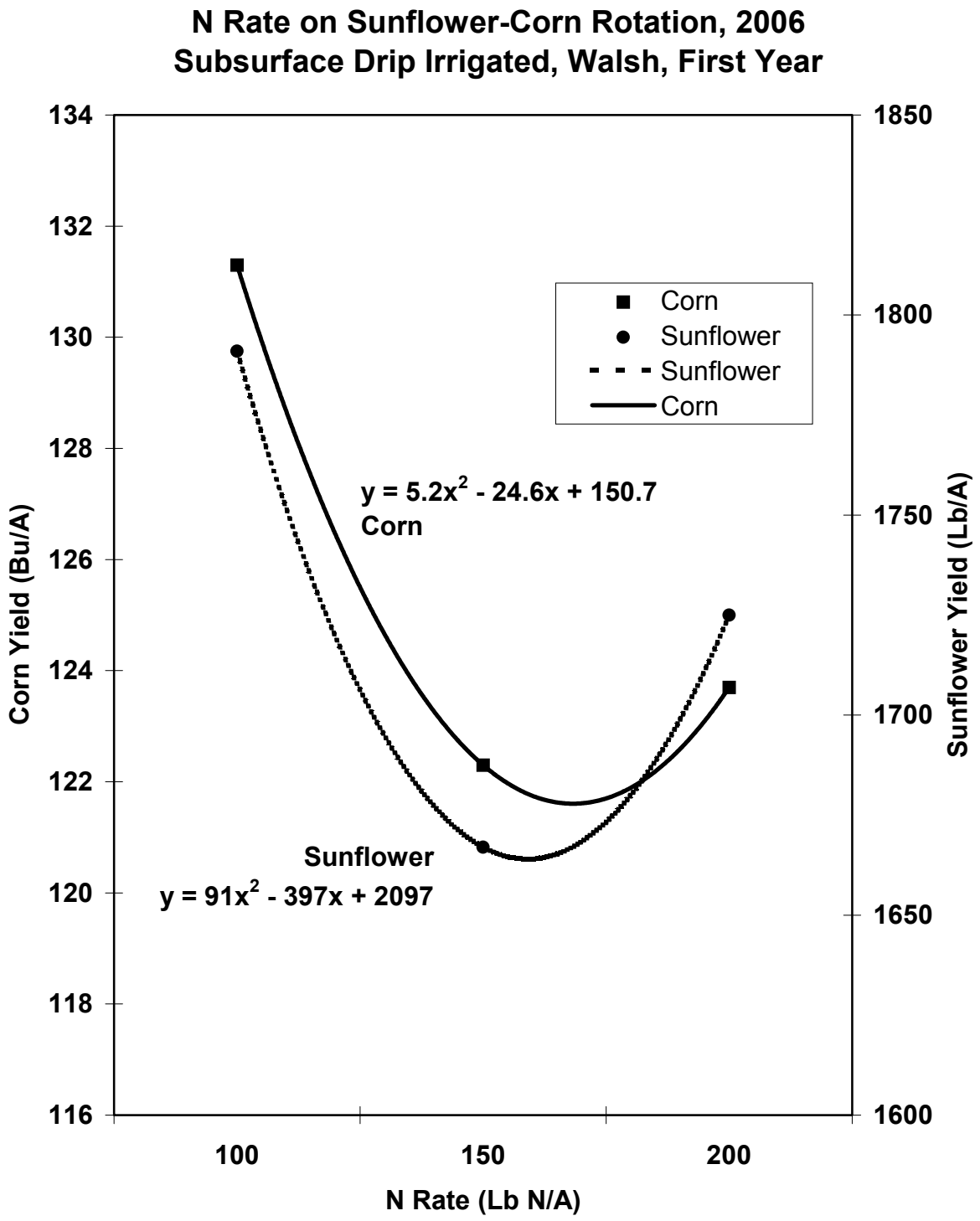

Fig. . N rate on drip irrigated sunflower and corn in Sunflower-Corn rotation at Walsh. The N rates were 100, 150, and 200 Lb N/A as 32-0-0. The sunflower hybrid was PIONEER 63M91 planted at 26,000 Seeds/A. The corn hybrid was MYCOGEN 2T801 planted at 34,000 Seeds/A.

Irrigated Mid and High Oleic Sunflower Hybrid Performance Trial at Walsh, 2006

COOPERATORS: Plainsman Agri-Search Foundation, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2200 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 650' long. SEEDING DENSITY: 26,000 Seed/A. PLANTED: July 3. HARVESTED: November 16.

IRRIGATION: Subsurface Drip Irrigated: total water applied 13.7 A-in./A.

PEST CONTROL: Preemergence Herbicides: Glyphosate 24 Oz/A, Spartan 2.0 Oz/A, Prowl 48 Oz/A. Post Emergence Herbicides: None. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
July	4.08	812	21	3	28
August	4.04	765	13	3	59
September	0.96	431	1	0	89
October	1.18	208	3	0	108
Total	10.26	2216	38	6	108

\1 Growing season from July 3 (planting) to October 19 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

FIELD HISTORY: Last Crop: Grain sorghum. FIELD PREPARATION: Disc.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season but poorly distributed: May and June were dry and July and August were wet. No insecticides were applied to control head moth because of the late planting date. Seed yields were good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.4	0.5	1.9	18	6.8	535	2.6	5.9
8"-24"				19				
Comment	Alka	VLo	Hi	Hi	Lo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	86	20	0	0
Applied	150	0	0	0

Yield Goal: 2500 Lb/A.
Actual Yield: 1950 Lb/A.

Table .-Drip Irrigated Sunflower, Mid and High Oleic Variety Trial, PRC, Walsh, 2006.

Firm	Hybrid	50% Flower	Plant Density	Plant Ht.	Test Wt.	Mid or High Oleic	Oleic	Oil	Seed Yield	Oil Yield
		Date	Plants/A (X1000)	In	Lb/Bu		%	%	Lb/A	Lb/A
PIONEER	63M91	8/26	24.8	61	29	mid	49.6	40.9	2152	880
TRIUMPH	s678	8/31	16.4	42	30	mid	N/A	40.8	2071	845
FONTANELLE	902 NS	8/27	21.2	57	27	mid	N/A	40.8	2067	843
TRIUMPH	s675	9/1	21.6	38	31	mid	N/A	43.2	1911	826
GARST	4651 NS	8/30	22.8	55	28	mid	N/A	37.8	2012	761
TRIUMPH	845HO	8/28	21.6	60	27	high	86.9	42.5	1737	738
MYCOGEN	8H419CL	8/29	24.4	62	28	high	84.9	39.0	1699	663
Average		8/29	21.8	54	29			40.7	1950	794
LSD 0.20									238.7	97.2

Planted: July 3; Harvested: November 16, 2006.
Seed Yield adjusted to 10% seed moisture content.
Total water applied with subsurface drip irrigation was 13.7 in.

Planting Date and Irrigation Method for Cotton Production in Southeastern Colorado

Kevin Larson

Cotton production has spread northward from Texas into Oklahoma and Kansas in recent years. In 2002, there was even a cotton gin built in Western Kansas near Moscow to serve this cotton expansion. Some of the reasons that cotton is being grown in Oklahoma and Kansas are its lower production costs compared to irrigated corn (Dumler and Duncan, 2004) and new recommendations for minimum planting temperatures which expanded the growing season enough to produce good quality lint when using early maturing stripper varieties. This is our first attempt at growing cotton at the Plainsman Research Center and with our 4000 ft. elevation we marginally meet the 1750 heat units needed for early maturing stripper cotton production for most years.

Material and Methods

We planted Paymaster PM 2280 BG/RR at 50,000 Seeds/A on 30 in. row spacing on two planting dates: PD 1, May 2 (62 F soil temperature) and PD 2, May 11 (59 F, soil temperature). We used two irrigation methods, furrow and subsurface drip irrigation, to irrigate the cotton planting dates. For the drip treatment, we applied 0.22 in./A of irrigation once daily for a seasonal total of 13.7 A-in/A. For furrow irrigation, we applied all irrigations preplant for a total of 7 A-in./A. For pre-emergence weed control, we applied Prowl H2O at 48 Oz/A and for post emergence weed control we applied Roundup Ultra Max at 24 Oz/A. Both furrow and drip irrigated sites were fertilized with 150 Lb N/A. We hand-harvested the raw cotton from the highest yielding areas on November 22 and used a lint conversion factor (0.625 x) for lint yield.

Results and Discussion

Extensive areas of our cotton study produce no harvestable bolls at all. The low cotton production for this trial was primarily due to 2,4-D damage. We applied 2,4-D to adjacent crops despite being warned that cotton plants are extremely sensitive to 2,4-D. When Rick Kochenower, Extension Specialist at OSU, viewed our cotton study, he said, “You sprayed 2,4-D nearby.” And he proceeded to identify 2,4-D symptoms on our cotton plants, such as, leaf strapping, boll abortion, and distorted stem growth. Since we had large areas without cotton production, we hand-harvested only high yielding areas with exposed lint.

At harvest, our treatments were visually different. There appeared to be much more exposed lint in the May 2 planting date than in the May 11 planting date; furthermore, there appeared to be more open bolls for the furrow irrigation site than for the subsurface drip irrigation site. Hand-harvesting the high cotton production areas confirmed the visual difference between the planting dates with May 2 producing 41% more cotton (statistically different at LSD 0.20) than May 11; however, there was no significant difference between furrow and drip irrigated treatments. If we had harvested representative areas of the furrow and drip sites, I am confident that there would have been significant yield differences. The furrow would have produced some cotton, whereas the drip would have produced almost no cotton.

From our limited cotton research, it appears that early May planting, when the soil temperature reaches 60 F, produces more cotton than later May planting. Our

cotton research visually suggests that there is a potential for higher cotton yields when irrigation is limited.

Cotton production has expanded into Oklahoma and Kansas because of its reduced irrigation requirements (one-third to one-half as much as irrigated corn) and fertilizer use (half as much as irrigated corn). According to previous cotton planting recommendations that required minimum soil temperatures of 65 to 70 F, the growing season for Southeastern Colorado was too short to produce quality stripper cotton. The new cotton planting minimum soil temperature was dropped to 60 F. By lowering the minimum soil temperature to 60 F, extreme Southeastern Colorado should have sufficient heat units to production quality cotton for most years when using the earliest maturing stripper cotton varieties.

Literature Cited

Dumler, Troy J. and Stewart R. Duncan. 2004. Cotton in Kansas. KSU, CE, AES. http://www.agmanager.info/crops/prodecon/production/Cotton.pdf. Accessed January 4, 2007.

Table .Cotton, Planting Date and Irrigation Method, Walsh, 2006.

Planting Date	Irrigation Method	Irrigation Timing	Irrigation Amount	Raw Cotton Yield	Lint Yield
			In/A	Lb/A	Lb/A
May 2	Furrow	Pre	7	628	393
May 11	Furrow	Pre	7	397	248
May 2	Drip	Continuous	13.7	379	237
May 11	Drip	Continuous	13.7	195	122
Average				400	250
May 2				504	315
May 11				296	185
PD LSD 0.20				88.5	55.3
	Furrow			513	321
	Drip			287	179
IRRIGATION LSD 0.20				290.2	181.4

Planted Paymaster PM 2280 BG/RR at 50,000 Seeds/A.
Hand Harvested: November 22, 10 ft. x 5 ft.
Cotton harvested from highest yielding areas.
Raw Cotton to Lint Yield conversion x 0.625.

Dry Bean Trial, Row Crop Head and Hand Harvest Comparison, Walsh, 2006

Kevin Larson and Mark Brick

PURPOSE: To test the suitability of dry bean varieties (9 pinto beans and 1 black bean) for direct row crop head harvesting.

MATERIALS and METHODS: We planted 9 pinto bean varieties and 1 black bean variety no-till into wheat stubble. For our plot design, we used a RCBD with four replications. We fertilized the site with 50 Lb N/A as 32-0-0. We planted the beans on June 22 at 22,000 Seeds/A. To control weeds, we applied Pursuit at 1.08 Oz/A, and cultivated once. We hand harvested a 2.5 ft. by 4 ft. area in each plot on November 22. We machine harvested the remaining 10 ft. by 44 ft. plot using a row crop head on November 27.

RESULTS: The hand harvesting averaged 126 Lb/A more seed than the row crop head harvesting. When machine harvested, there was a significant difference between the highest yielding variety, Cahone, and the lowest yielding variety, GTS 900 ($P > 0.05$). There were significant differences between the two highest yielding hand harvested varieties, Cahone and Montrose, and all the other dry bean varieties tested. The machine harvested yields where very low, even for the highest-producing, hand harvested bean varieties, due to dry weather causing short stature plants and low pod set.

DISCUSSION: This is the second edible dry bean trial that we have had at Plainsman since 1993. The renewed interest in dry beans occurred because of price drops in our commonly grown commodities and recent better-than-average prices for dry beans. The reason we tested direct head harvest was to minimize soil loss. Dry beans leave little residue to protect against wind erosion, even before undercutting which leaves soils especially venerable. The large yield difference between the higher-yielding, hand harvested varieties and direct machine harvesting is due the inability of our row crop head to get low enough to harvest short plants and low pod sets caused by dry weather. We are, however, encouraged by the 402 Lb/A hand harvested yield of Cahone under these dry conditions.

Table .Dryland Dry Bean Trial, Walsh, 2006.

Variety	Bean Type	Hand Harvested Yield	Row Head Harvested Yield
		Lb/A	Lb/A
Cahone	Pinto	402	35
Montrose	Pinto	313	23
Bill Z	Pinto	210	28
Fisher	Pinto	198	33
Vision	Pinto	156	33
Grand Mesa	Pinto	101	30
96731	Pinto	61	25
Condor	Black	45	25
15882	Pinto	24	20
GTS 900	Pinto	18	15
Average		153	27
LSD 0.05		99.6	14.2

Planted: June 20 at 22,000 Seeds/A
Weed Control: Pursuit, 1.08 Oz/A.
Hand Harvested: November 22, 2.5 ft X 4 ft.
Row Head Harvested: November 27, 10' X 44'.