

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 2001

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## SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 2001

K.J. Larson, F.C. Schweissing, and D.L. Thompson \1

The 2001 Colorado grain sorghum crop was estimated at 12 million bushels, 84% higher than in 2000. The increase in sorghum production was due mainly to an increase in harvested acres, and secondarily to an increase in per acre yield. There was a large, 42%, increase in acreage from 210,000 in 2000 to 300,000 harvested acres in 2001. In 2001 the average yield was 40 Bu/A, whereas, in 2000 average yield was only 31 Bu/A. The 300,000 harvested acres for 2001 is the highest harvested acres in more than a decade. The yield of 40 Bu/A is only 1 Bu/A less than the 10-year average. Sorghum silage production in 2000 was 192,000 tons, up 13% from 1999. Sorghum silage production for 2000 was the second highest recorded over the past five years. The increase in silage production was attributed to higher harvested acres, 12,000, in 2000 with 16 Tons/A, whereas in 1999 the average yield was 17 Tons/A from 10,000 acres (Colorado Agricultural Statistic Service, 2001).

This publication is a progress report of the sorghum variety trials conducted by the Department of Soil and Crop Sciences at Colorado State University, Colorado Agricultural Experiment Station, and Cooperative Extension. The sorghum tests were located at four sites in Southeastern Colorado: dryland grain sorghum trials were conducted at Vilas and Walsh; irrigated grain sorghum trials at Hartman and Walsh; irrigated forage sorghum trials at Rocky Ford and Walsh; and a dryland forage sorghum trial at Walsh.

Tests are partially funded by entry fees paid by commercial firms. Commercial seed representatives interested in entering sorghum hybrids in any of the tests should write to Kevin Larson, Plainsman Research Center, Box 477, Walsh, Colorado 81090, or phone (719) 324-5643, or email [Kevin.Larson@colostate.edu](mailto:Kevin.Larson@colostate.edu) for further details. Names and addresses of firms submitting entries in 2001 are shown in Table 1. Each firm selected entries for testing and furnished seed for the tests. Selected open-pedigree hybrids were included by the Agricultural Experiment Station as a standard of comparison. A closed-pedigree corn hybrid was included in the forage sorghum trials as a comparative standard and was sponsored by the Colorado State Agricultural Experiment Station.

Summary tables for weather data (on-site portable weather stations and NOAA, 2001), soil analysis, fertilization (Soil Testing Laboratory, Colorado State University), and available soil water graphs derived from gypsum block readings are provided for each trial location. Other information, where available, was included: site description, emergence date, irrigation, pest control, field history, and pertinent comments.

\1 Superintendent, Plainsman Research Center, Walsh;  
Superintendent, Arkansas Valley Research Center, Rocky Ford;  
Technician III, Plainsman Research Center, Walsh.

Table 1.--Entrants in the 2001 Colorado Sorghum Performance Tests.

Brand	Entered by
ASGROW	Monsanto, RR 3, Box 119, Plainview, TX 79072
BUFFALO BRAND	Sharp Brothers Seed Co., P.O. Box 140, Healy, KS 67850
DEKALB	Monsanto, RR 3, Box 119, Plainview, TX 79072
GOLDEN HARVEST	Golden Harvest Seeds/The J.C. Robinson Seed Company, P.O. Box A, Waterloo, NE 68069
NC+	NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504
NK BRAND	Sorghum Partners, Inc., 403 S. Monroe, P.O. Box 189, New Deal, TX 79350
PIONEER BRAND	Pioneer Hi-Bred International, Inc., 1616 South Kentucky St., C-150, Amarillo, TX 79102
RICHARDSON	Richardson Seeds, Inc., P.O. Box 60, Vega, TX 79092
TRIUMPH	Triumph Seed Co., Inc., P.O. Box 1050, Hwy. 62 Bypass, Ralls, TX 79357

Colorado Agricultural Experiment Station entered the following as checks: grain sorghum, TXms399 X TXR2737 (399 X 2737); forage sorghum, NB 305F; corn hybrids, MYCOGEN 2725 and ASGROW RX 799 Bt.

Growing Degree Days for sorghum were calculated using maximum (111 °F) and minimum (50 °F) threshold temperatures under which sorghum growth occurs (Peacock and Heinrich, 1984). They are calculated by averaging daily high and low temperatures and subtracting the base temperature of 50 °F from the average. When daily temperatures are less than 50 °F, 50 °F is used, when temperatures are above 111 °F a maximum temperature of 111 °F is used:

$$\frac{(\text{Daily Minimum Temp.} + \text{Daily Maximum Temp.})}{2} - 50 \text{ } ^\circ\text{F}$$

### Experimental Methods and Evaluations

Trials were planted with a four-row cone planter and harvested with a modified, self-propelled John Deere 4420 combine equipped with a four-row row-crop head to enhance harvest of lodged tillers. Sorghum forage was cut and chopped with a single row John Deere 8 silage cutter.

Days to Emergence. Seedling emergence was determined as the number of days after planting until approximately half of the seedlings become visible down a planted row.

50 % Bloom. Number of days after planting until half of the main heads had pollinating florets. Number of days to half bloom provides a good measure of relative maturity between hybrids.

50 % Maturity. Number of days after planting until half of the kernels in half of the main heads reached physiological maturity, i.e., the black layer becomes visible at the base of the kernel.

Plant Height. Plant height was measured in inches from the soil to the tip of the main head.

Lodging. The percentage of tillers with broken basal stems or broken peduncles or were leaning more than a 45 degree angle were considered lodged. Since the combine was equipped with a row crop head, most of the leaning tillers were harvested.

Harvest Density. Plant population in plants per acre was counted prior to harvest.

Test Weight. Test weight was determined using a hand-held bushel weight tester. A low test weight indicates that a hybrid did not fully mature prior to the first freeze or that it suffered environmental stress, such as a water deficiency.

Grain Yield. The yield of grain in bushels per acre was corrected to 14 percent moisture content.

Yield as a % of Test Average. Yield as a percentage of test average provides a comparison between yields within a trial and allows easy comparisons among years, irrespective of annual growing conditions.

Forage Yield. Forage harvested in tons per acre corrected to 70 % moisture content. A representative sample of fresh silage was oven-dried at 167 °F (75 °C) until there was no more water loss, then yields were adjusted to 70 % moisture content.

Stem Sugar. The sugar content, expressed as a percent, in the stem of forage sorghums at harvest. It was measured with a hand refractometer.

#### Available Soil Water

Available soil water was measured by placing gypsum blocks at 6, 18, 30, and 42 inches below the soil surface. Electrical resistance readings were made weekly. Resistance readings vary with the amount of soil water present. Using resistance readings, available soil water was determined by extrapolating from soil water depletion curves for each particular soil.

#### Statistical Method

Tests were planted in a randomized complete block design with four replications. No less than three replications were harvested. Analysis of variance was applied to the results and the least significant difference (LSD) was computed at  $\alpha = 0.20$ . Analysis of variance and regression were performed with CoStat Statistical Software a product of Cohort Software, Berkeley, California.

#### Acknowledgments

We are sincerely grateful to the grower-cooperators for their assistance in the off-station trials: Fred Williams, Hartman; and Terrill Swanson, Vilas, Colorado. We are also grateful to the NOAA weather observer, William Davis, Holly, Colorado for collecting the weather data utilized at Hartman.

## References

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Peacock, J.M. and G.M. Heinrich. 1984. Light and temperature response in sorghum. pp. 143-158. In: Agrometeorology of Sorghum and Millet in the Semi-Tropics: Proceedings of the International Symposium. November 15-20, 1982. India, ICRISAT, WMO.

## Early Maturing Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2001

**COOPERATORS:** Terrill Swanson Farm, Vilas and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

**PURPOSE:** To identify high yielding hybrids, when planted late in the season (June 22), under irrigated conditions with 2600 sorghum heat units in a Silty Clay Loam soil.

**PLOT:** Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 39,200 Seed/A. **PLANTED:** June 22. **HARVESTED:** October 25.

**EMERGENCE DATE:** 11 days after planting (35% emerged before July 15).  
**SOIL TEMP:** 70 F.

**PEST CONTROL:** Preemergence Herbicides: Roundup 16 Oz/A, two applications. Post Emergence Herbicides Aim 0.33 Oz/A, Atrazine 0.75 Lb/A: None. **CULTIVATION:** None. **INSECTICIDES:** None.

**FIELD HISTORY:** Last Crop: Wheat.  
**FIELD PREPARATION:** No-Till.

**COMMENTS:** Soil moisture at planting was marginal. Only 35% of the crop emerged before July 15<sup>th</sup>. Weed control was very good. Near normal precipitation for the growing season, with a wet July and a very dry September. Minor greenbug infestation. None of the hybrids lodged. An early freeze (about a week earlier than average), lowered test weights and grain yields.

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

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	1.38	239	7	0	8
July	4.21	950	30	9	38
August	2.18	804	19	0	69
September	0.07	578	10	1	100
October	0.02	79	0	0	106
Total	7.86	2650	66	10	106

\1 Growing season from June 22 (planting) to October 6 (first freeze, 29 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	0.3	0.8	5	3.8	270	0.7	7.0
8"-24"				4				
Comment	Alka	VLo	Lo	Lo	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	20	20	0	0
Applied	56	20	0	0

Yield Goal: 60 Bu/A.

Actual Yield: 54 Bu/A.

**Available Soil Water**  
 Dryland Grain Sorghum, Early Maturing, Vilas, 2001

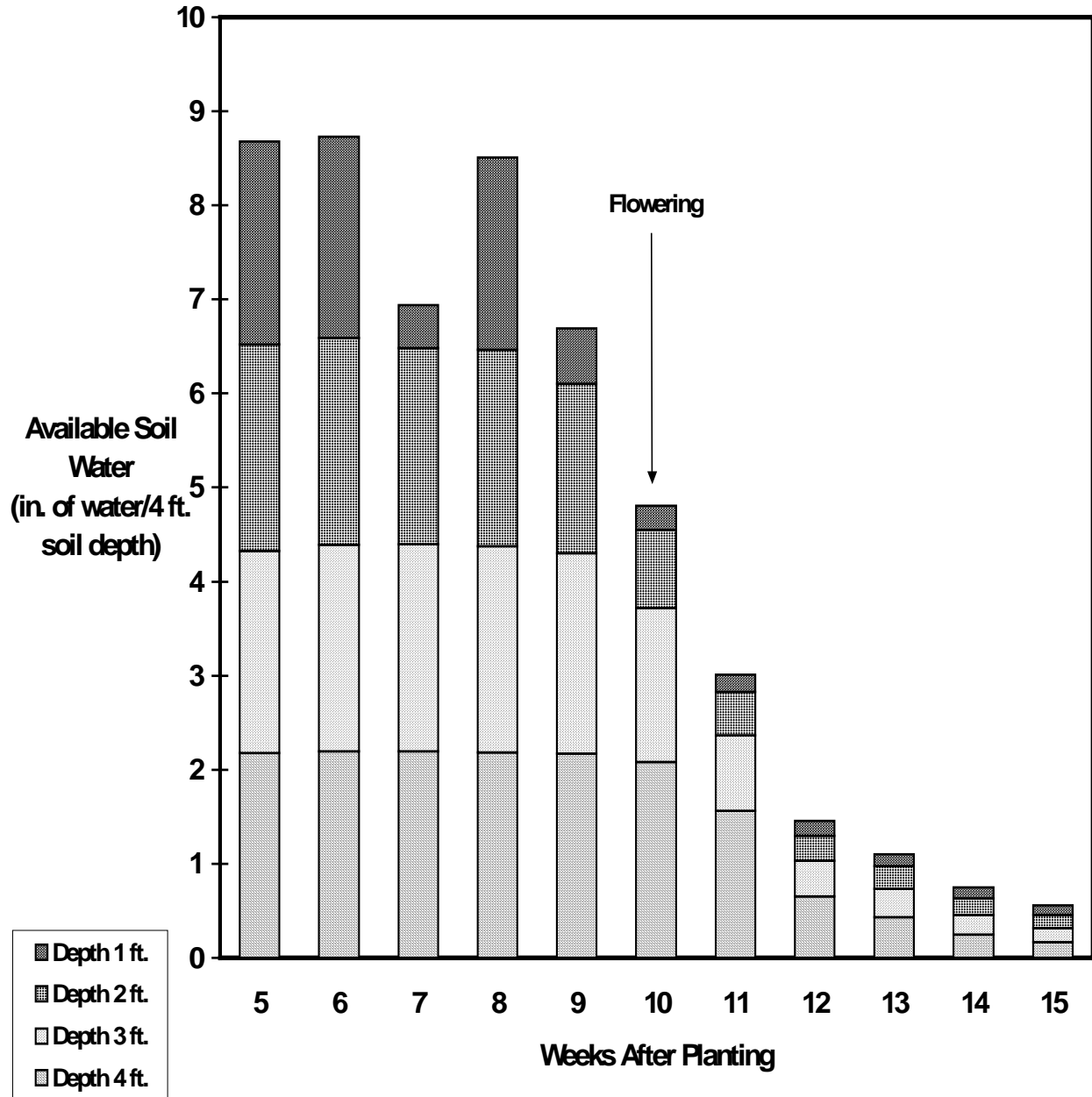


Fig. 1. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 7.86 in. Any increase in available soil water between weeks is from rain.



Table 2.--Dryland Grain Sorghum Early Maturing Hybrid Performance Test at Vilas, 2001. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield %									
			DAP	GDD	DAP	Group						of Test Average									
												In	Plants/A	%	Lb/Bu	Bu/A	%				
												(1000 X)									
PIONEER	87G57	10	71	2013	SD	E	47	17.6	0	53	69	128									
DEKALB	DK-28E	12	70	1993	SD	E	42	16.5	0	53	62	115									
ASGROW	Reward	11	71	2013	ED	E	40	17.6	0	50	59	109									
NK BRAND	K35-Y5	11	72	2037	ED	E	43	19.4	0	51	53	98									
NK BRAND	KS 310	12	72	2037	ED	E	44	18.8	0	51	49	91									
PIONEER	85Y34	10	75	2109	LM	ME	48	16.6	0	49	44	81									
(Check)	399 X 2737	9	85	2298	EM	M	48	19.0	0	44	39	72									
Average		11	74	2071	LM	ME	45	17.9	0	50	54										
LSD 0.20											9.7										

\1 Planted: June 22 (65% emerged July 15); Harvested: October 25.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze (28 F, September 25).

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, 1999-2001.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A298	56	43	--	50	--	111	123	--	117	--
DEKALB	DK-28E	60	51	62	57	58	119	115	115	115	116
MYCOGEN	3556	61	40	--	51	--	122	114	--	118	--
PIONEER	87G57	59	52	69	61	60	118	149	128	139	132
(Check)	399 X 2737	20	4	39	22	21	39	11	72	42	41
Average		50	35	54	45	46					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland at Vilas for 1999; Irrigated at Walsh for 2000; Dryland at Vilas for 2001.

Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2001

COOPERATORS: Terrill Swanson Farm, Vilas, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 3200 sorghum heat units in a Sandy Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 39,200 Seed/A. PLANTED: May 25. HARVESTED: October 24.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 63 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides: Aim 0.33 Oz/A, Atrazine 0.75 Lb AI/A. CULTIVATION: None. INSECTICIDE: None.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season, with a wet July and a very dry September. Minor greenbug infestation. None of the hybrids lodged. Grain yields were very good.

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

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	0.03	109	0	0	0
June	3.26	670	13	0	36
July	4.21	950	30	9	67
August	2.18	804	19	0	98
September	0.07	578	10	1	128
October	0.02	79	0	0	134
Total	9.77	3190	72	10	134

\1 Growing season from May 25 (planting) to October 6 (first freeze, 29 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	0.3	0.8	5	3.8	270	0.7	7.0
8"-24"				4				
Comment	Alka	VLo	Lo	Lo	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	20	20	0	0
Applied	56	20	0	0

Yield Goal: 60 Bu/A.  
Actual Yield: 83 Bu/A.

### Available Soil Water Dryland Grain Sorghum, Vilas, 2001

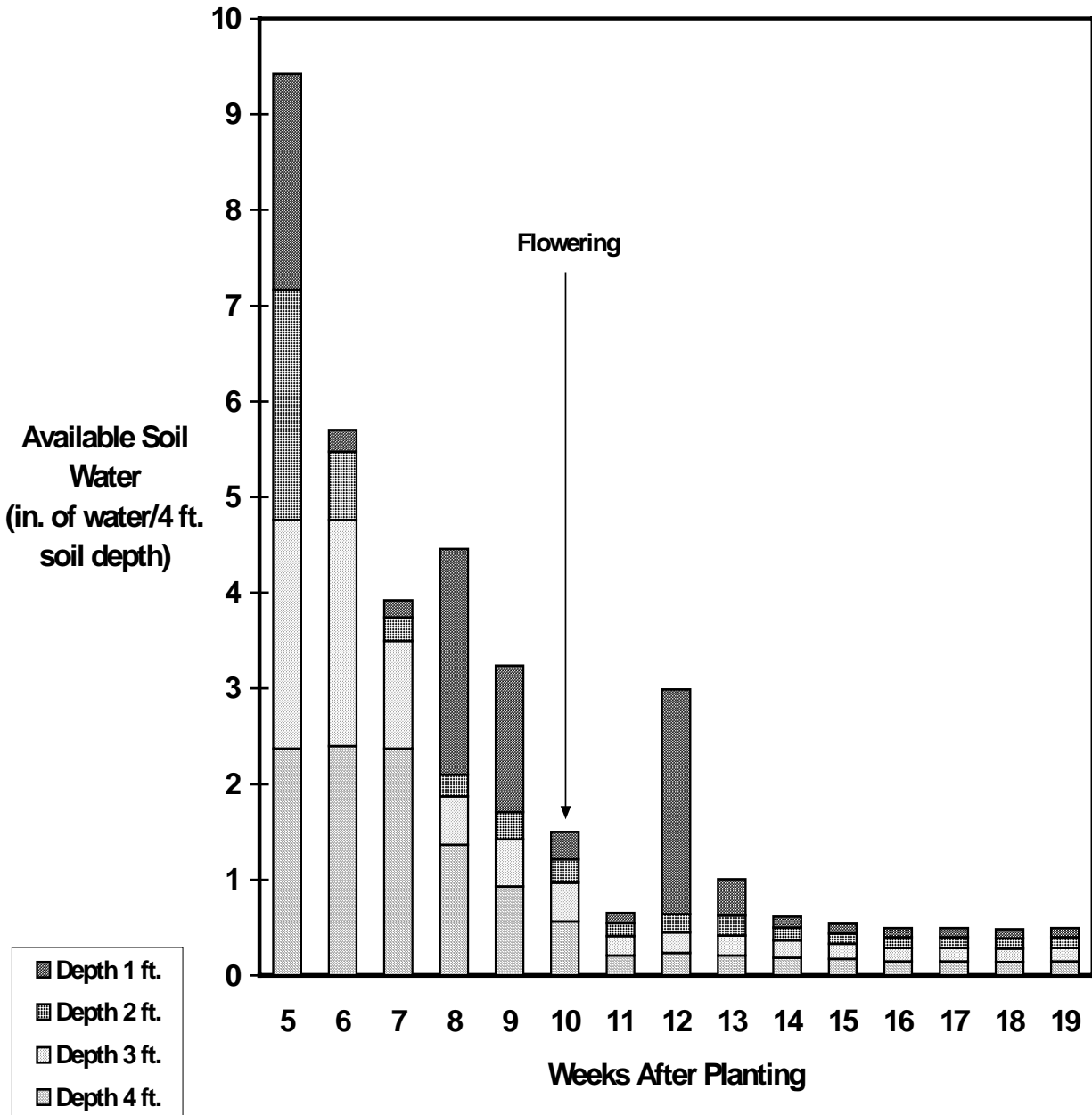


Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 9.77 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2001. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield %					
			DAP	GDD	DAP	Group						of Test Average					
												In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
TRIUMPH	TR 438	9	62	1581	103	E	45	20.5	0	61	72	87					
PIONEER	85G85	9	66	1696	112	ME/M	41	19.4	0	62	87	105					
ASGROW	Seneca	8	68	1762	114	ME	43	23.4	0	62	87	105					
PIONEER	8505	8	63	1609	108	ME/M	44	21.7	0	62	85	103					
PIONEER	85Y34	8	62	1581	105	ME	42	19.4	0	59	82	99					
DEKALB	DK-44	9	65	1664	113	ME	43	19.4	0	63	82	98					
DEKALB	DK-40y	9	64	1637	111	ME	46	18.2	0	62	79	95					
NK BRAND	KS 585	8	74	1892	116	M	42	21.5	0	63	92	110					
ASGROW	Eclipse	9	72	1892	116	M	40	19.6	0	62	76	92					
NK BRAND	K59-Y2	8	76	1924	118	ML/M	48	20.9	0	59	90	109					
TRIUMPH	TR 465	9	74	1924	119	ML	47	17.2	0	62	87	104					
(Check)	399 X 2737	8	77	1954	120	ML	43	19.0	0	61	82	99					
Average		9	69	1760	113	ME	44	20.0	0	62	83						
LSD 0.20											6.5						

\1 Planted: May 25; Harvested: October 24.

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 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 1999-2001.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	116	40	87	64	81	96	118	105	112	106
DEKALB	DK-40y	114	--	79	97	--	94	--	95	95	--
DEKALB	DK-43A	126	32	--	79	--	105	94	--	100	--
DEKALB	DK-44	122	40	82	61	81	101	118	98	108	106
DEKALB	X-944	117	35	--	76	--	97	103	--	100	--
MYCOGEN	1482	119	36	--	78	--	98	106	--	102	--
PIONEER	8505	120	35	85	60	80	99	103	103	103	102
PIONEER	85Y34	116	38	82	60	79	96	112	99	106	102
PIONEER	85G85	--	39	87	63	--	--	115	105	110	--
TRIUMPH	TR 438	--	34	72	53	--	--	100	82	91	--
TRIUMPH	TR 459	118	31	--	75	--	98	91	--	95	--
(Check)	399 X 2737	122	25	82	54	76	101	74	99	87	91
Average		120	34	83	59	79					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2001

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 3200 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 39,200 Seed/A. PLANTED: May 24. HARVESTED: October 11.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 63F.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Clarity 4.0 Oz/A, Atrazine 1.0 Lb/A, COC 1 Qt/A. CULTIVATION: None. INSECTICIDES: None.

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season, with a wet July and very dry September. Moderate greenbug infestation naturally controlled by parasitic wasps. A few of the hybrids lodged. Grain yields were fair.

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

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	0.04	123	0	0	7
June	3.26	670	13	0	37
July	4.21	950	30	9	68
August	2.18	804	19	0	99
September	0.07	578	10	1	129
October	0.02	79	0	0	135
Total	9.78	3204	72	10	135

\1 Growing season from May 24 (planting) to October 6 (first freeze, 29 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.4	1.2	4	0.9	297	0.6	8.5
8"-24"				5				
Comment	Alka	Vlo	Mod	Lo	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	56	20	0	0

Yield Goal: 50 Bu/A.  
 Actual Yield: 44 Bu/A.

### Available Soil Water Dryland Grain Sorghum, Walsh, 2001

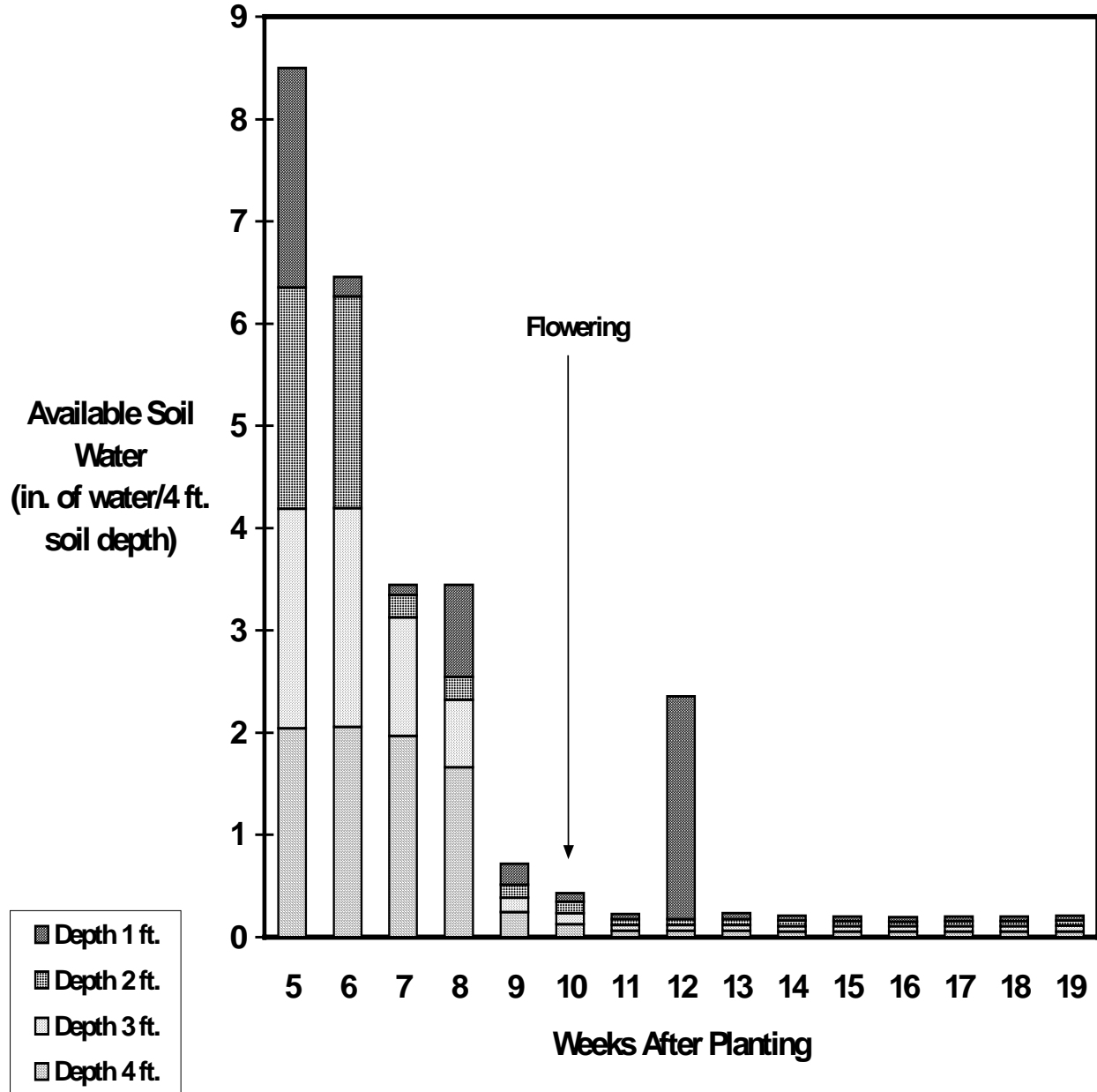


Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 9.78 in. Any increase in available soil water between weeks is from rain.



Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2001. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield %					
			DAP	GDD	DAP	Group						of Test Average					
												In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
TRIUMPH	TR 438	9	65	1650	103	E	43	25.9	7	60	48	109					
PIONEER	8505	8	68	1742	107	ME/M	43	25.6	13	60	61	138					
PIONEER	85G85	9	72	1871	114	ME/M	39	23.6	0	61	55	125					
PIONEER	85Y34	9	67	1709	105	ME	41	27.1	6	59	54	122					
NC+	5B74E	9	69	1774	111	ME	41	28.7	0	61	52	118					
ASGROW	Seneca	8	72	1871	114	ME	40	27.9	0	62	51	116					
DEKALB	DK-40y	9	69	1774	112	ME	42	25.2	4	62	48	110					
NC+	6B50	8	72	1871	115	ME/M	40	22.8	0	60	37	85					
DEKALB	DK-44	9	71	1838	114	ME	40	27.5	2	62	35	80					
ASGROW	Eclipse	9	75	1964	117	M	39	23.2	0	61	35	80					
NK BRAND	KS 585	8	75	1964	120	M	39	28.7	0	62	31	70					
NK BRAND	K59-Y2	8	77	2017	121	ML/M	40	24.4	0	58	37	83					
(Check)	399 X 2737	8	79	2062	124	ML	39	27.9	0	59	31	71					
Average		9	72	1854	114	ME	40	26.0	2	61	44						
LSD 0.20												15.4					

\1 Planted: May 24; Harvested: October 11.

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: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 1999-2001.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	85	50	51	51	62	103	100	116	108	106
DEKALB	X-944	79	53	--	66	--	96	106	--	101	--
DEKALB	DK-40y	85	44	48	46	59	103	88	110	99	100
DEKALB	DK-43A	85	57	--	71	--	104	114	--	109	--
DEKALB	DK-44	86	55	35	45	59	104	110	80	95	98
MYCOGEN	1482	83	56	--	70	--	101	112	--	107	--
NC+	6B50	--	49	37	43	--	--	98	85	92	--
NC+	5B74E	79	40	52	46	57	96	80	118	99	98
NK BRAND	KS 310	78	48	--	63	--	95	96	--	96	--
NK BRAND	KS 585	83	55	31	43	56	103	110	70	90	94
PIONEER	85G85	--	49	55	52	--	--	4996	125	2561	--
PIONEER	8505	84	50	61	56	65	102	100	138	119	113
PIONEER	85Y34	86	56	54	55	65	105	112	122	117	113
TRIUMPH	TR 438	85	54	48	51	62	103	108	109	109	107
(Check)	399 X 2737	75	38	31	35	48	92	76	71	74	80
Average		82	50	44	47	59					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 2001

COOPERATORS: Fred Williams Farm, Hartman, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2900 sorghum heat units in a Silty Clay soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 113,250 Seed/A. PLANTED: June 4. HARVESTED: November 1.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 69 F.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Banvel 3 Oz/A, COC 1 Qt/A. CULTIVATION: None. INSECTICIDE: Lorsban 16 oz/A for greenbug control.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Below normal precipitation for the growing season, with all monthly averages except July well below normal. A greenbug infestation was controlled with insecticide. Some of the hybrids lodged. Grain yields were very good.

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

Summary: Growing Season Precipitation and Temperature \1  
Holly, Prowers County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.00	0	0	0	0
June	1.07	582	14	0	26
July	2.86	989	30	12	57
August	0.95	873	25	12	88
September	0.06	551	12	0	118
October	0.00	82	1	0	124
Total	4.94	2877	82	24	124

\1 Growing season from June 4 (planting) to October 6 (first freeze, 27 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.9	1.4	15	1.0	204	0.9	6.1
8"-24"				8				
Comment	Alka	VLo	Mod	Hi	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	75	40	0	0
Applied	156	20	0	0

Yield Goal: 140 Bu/A.  
Actual Yield: 137 Bu/A.

### Available Soil Water Irrigated Grain Sorghum, Hartman, 2001

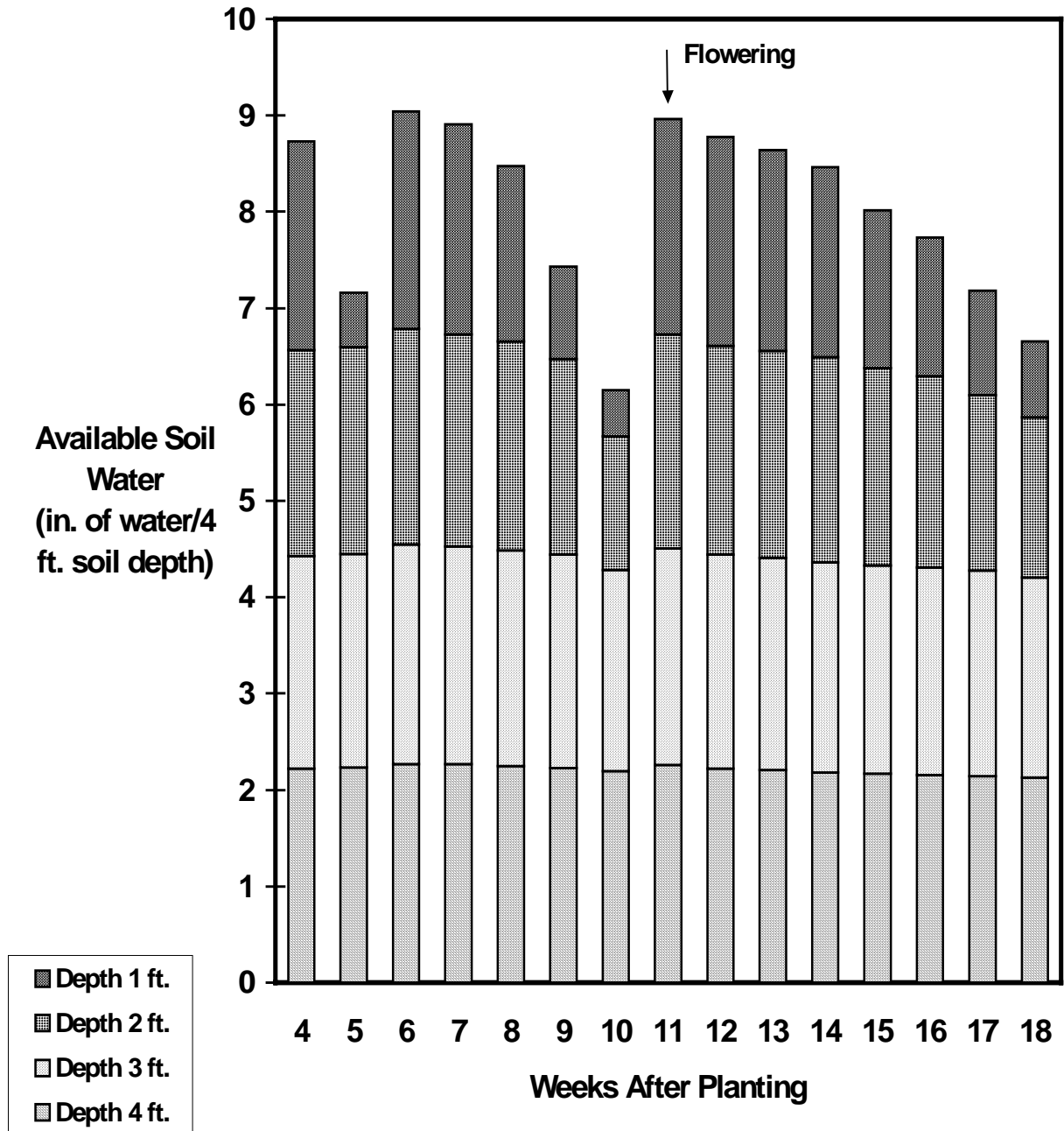


Fig. 4. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 4.94 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 2001. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
			DAP	GDD	DAP	Group						
							In.	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
NK BRAND	X828	9	71	2000	117	M/ML	54	43.4	0	60	144	105
NK BRAND	K73-J6	7	71	2000	117	M/ML	55	54.6	5	61	143	104
ASGROW	A459	9	70	1972	116	M	56	38.3	0	60	130	95
PIONEER	84G62	7	73	2053	122	ML	50	51.5	0	60	162	118
DEKALB	DK-53	9	72	2028	122	ML	55	28.3	2	60	143	104
ASGROW	A571	8	76	2128	128	ML	56	41.0	6	58	137	100
NK BRAND	KS 711Y	7	75	2100	126	ML	46	37.6	0	61	134	98
DEKALB	DKS 54-00	8	73	2053	125	ML	53	34.5	0	58	128	94
(Check)	399 X 2737	7	73	2053	124	ML	50	48.4	0	57	128	93
TRIUMPH	TR 481	9	72	2028	120	ML	55	34.5	4	61	122	89
Average		8	73	2042	122	ML	53	41.2	2	60	137	
LSD 0.20											6.1	

\1 Planted: June 4; Harvested: November 1.

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 9.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Hartman, 1999-2001.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A459	--	139	130	135	--	106	108	95	102	--
ASGROW	A571	--	124	137	131	--	--	96	100	98	--
DEKALB	DK-53	--	127	143	135	--	97	98	104	101	--
PIONEER	84G62	153	178	162	170	164	111	138	118	128	122
TRIUMPH	TR 481	--	130	122	126	--	--	101	89	95	--
(Check)	399 X 2737	114	138	128	133	127	105	107	93	100	102
Average		127	129	137	133	131					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2001

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3200 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: May 23. HARVESTED: October 15.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 62 F.

IRRIGATION: Three furrow irrigations: July 13, August 2 and August 17, total applied 14 acre-in./A.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: Clarity 4 Oz/A, 2,4-D 0.28 Lb/A. CULTIVATION: None. 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	0.04	135	0	0	8
June	3.26	670	13	0	38
July	4.21	950	30	9	69
August	2.18	804	19	0	100
September	0.07	578	10	1	130
October	0.02	79	0	0	136
Total	9.78	3216	72	10	136

\1 Growing season from May 23 (planting) to October 6 (first freeze, 29 F).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep plow.

COMMENTS: Planted in good moisture. Weed control was good. Near normal precipitation for the growing season, with a wet July and a very dry September. Moderate greenbug infestation naturally controlled by parasitic wasps. None of the hybrids lodged. Grain yields were excellent.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.8	1.7	25	0.7	477	1.7	7.1
8"-24"				18				
Comment	Alka	VLo	Hi	VHi	VLo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	0	0
Applied	131	20	0.3	0

Yield Goal: 125 Bu/A.  
Actual Yield: 152 Bu/A.

## Available Soil Water Irrigated Grain Sorghum, Walsh, 2001

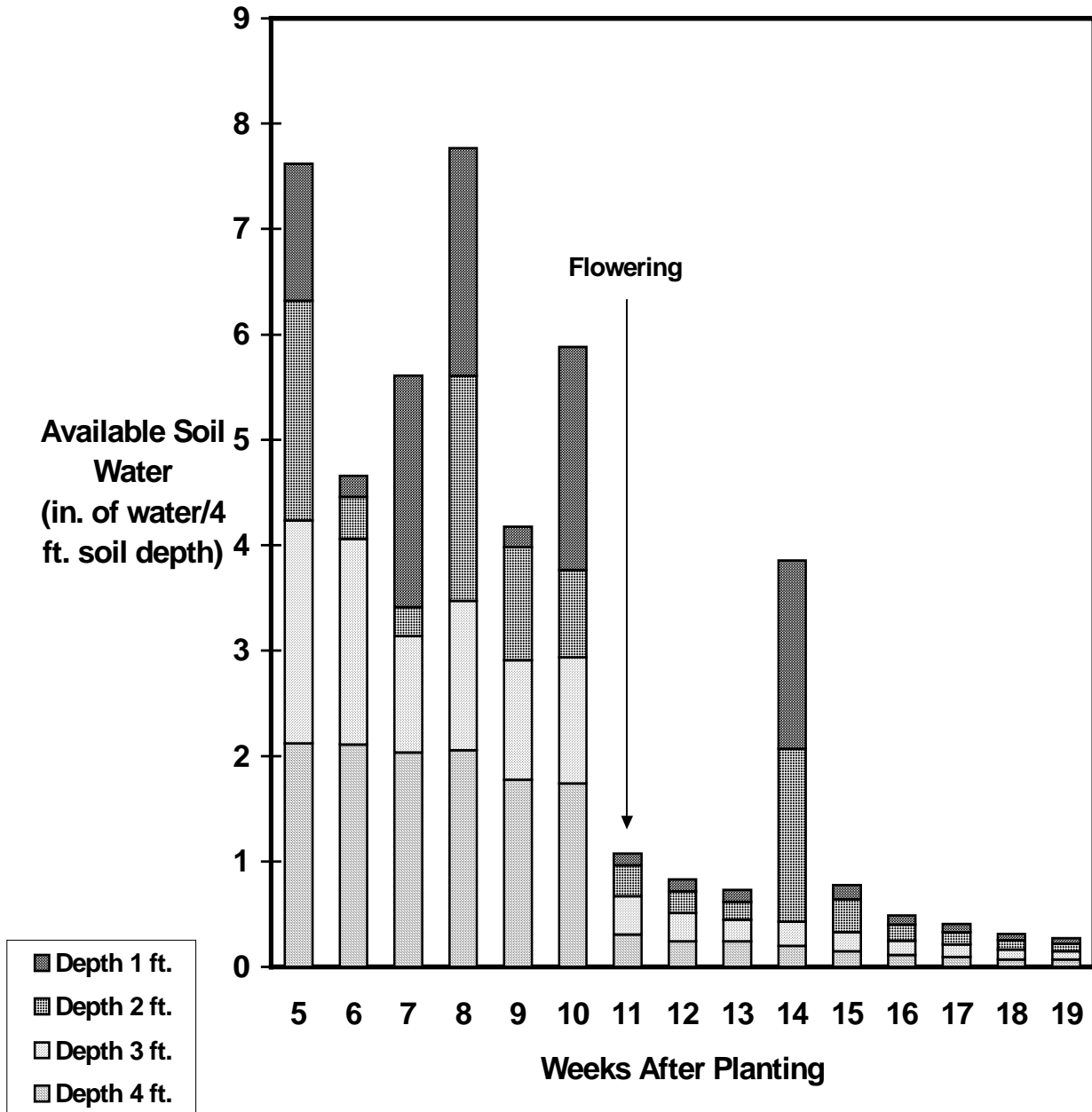


Fig. 5. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 9.78 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.



Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2001. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
RICHARDSON	RS 125	8	66	1663	108	E	50	45.7	0	60	125	82	
RICHARDSON	RS 150	8	69	1755	110	ME	51	49.2	0	62	123	81	
DEKALB	DK-47	8	74	1916	116	M	52	51.5	0	63	152	100	
ASGROW	A459	8	75	1947	117	M	57	52.3	0	63	151	99	
PIONEER	84G62	8	77	2003	126	ML	53	49.6	0	61	171	113	
NC+	7R83	8	80	2074	125	ML	58	51.1	0	61	171	113	
TRIUMPH	TR 465	8	78	2030	126	ML	55	49.6	0	63	163	107	
DEKALB	DKS-54-00	9	78	2030	124	ML	57	49.6	0	62	161	106	
NK BRAND	K73-J6	8	76	1977	123	ML	57	45.3	0	62	161	106	
NK BRAND	KS 711Y	9	78	2030	127	ML	48	43.4	0	63	159	105	
NK BRAND	X828	8	76	1977	120	ML	56	49.9	0	62	156	103	
(Check)	399 X 2737	8	77	2003	126	ML	50	48.0	0	62	147	97	
DEKALB	DK-53	9	76	1977	122	ML	54	50.3	0	63	141	93	
Average		8	75	1952	121	ML	54	48.9	0	62	152		
LSD 0.20											5.4		

\1 Planted May 23; Harvested: October 15.

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 11.--Summary: Irrigated Grain Sorghum Hybrid Performance Tests at Walsh, 1999-2001.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	A459	111	127	151	139	130	99	96	99	98	98
DEKALB	DK-47	113	137	152	145	134	101	104	100	102	102
DEKALB	DK-53	108	125	141	133	125	96	95	93	94	95
MYCOGEN	3696	114	130	--	122	--	102	98	--	100	--
NC+	6B70	119	132	--	126	--	106	100	--	103	--
NK BRAND	KS 585	115	130	--	123	--	103	98	--	101	--
NK BRAND	KS 73-J6	113	--	161	137	--	101	--	106	104	--
PIONEER	84G62	119	146	171	159	145	106	111	113	112	110
(Check)	399 X 2737	106	132	147	140	128	95	100	97	99	97
Average		112	132	152	142	132					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2001

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 2900 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 69,700 Seed/A. PLANTED: May 24. HARVESTED: September 19.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 63 F.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Clarity 4 Oz/A, COC 1Qt/A. CULTIVATION: None. INSECTICIDES: None.

FIELD HISTORY: Last Crop: Wheat. FIELD PREPARATION: Sweep plow.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season with a wet July and a very dry September. Moderate greenbug infestation naturally controlled by parasitic wasps. Forage yields were good.

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

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	0.04	123	0	0	7
June	3.26	670	13	0	37
July	4.21	950	30	9	68
August	2.18	804	19	0	99
September	0.07	397	7	1	118
Total	9.76	2944	69	10	118

\1 Growing season from May 24 (planting) to September 19 (harvest).  
 \2 GDD: Growing Degree Days for sorghum.  
 \3 DAP: Days After Planting.

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.4	1.2	4	0.9	297	0.6	8.5
8"-24"				5				
Comment	Alka	VLo	Mod	Lo	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	0	0
Applied	56	20	0	0

Yield Goal: 10 Ton/A.  
 Actual Yield: 8.8 Ton/A @ 70% MC.

### Available Soil Water Dryland Forage Sorghum, Walsh, 2001

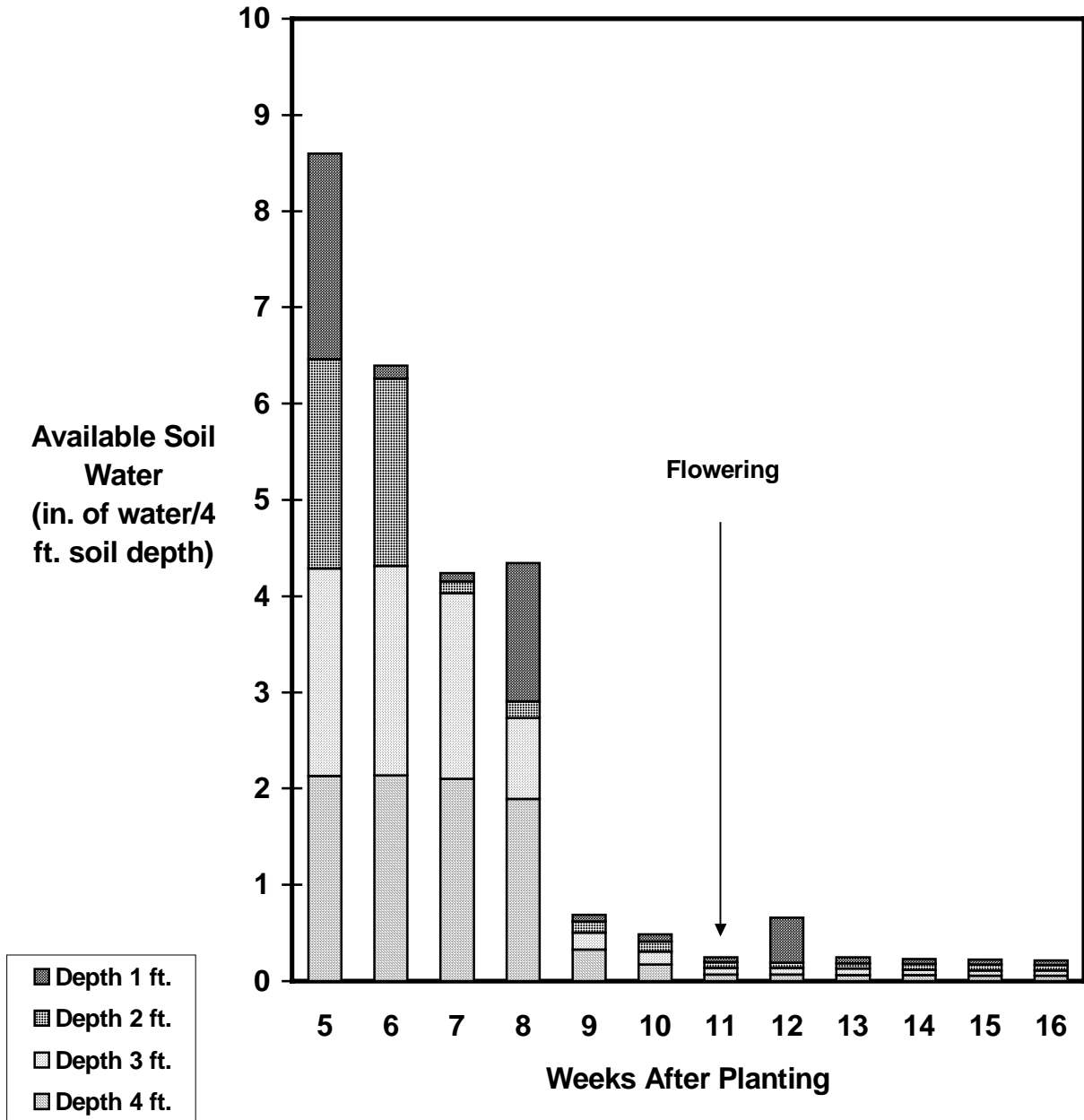


Fig. 6. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 9.76 in. Any increase in available soil water between weeks is from rain.

Table 12.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2001. \1

Brand	Hybrid	Forage Type \2	Days			Stage \3			Yield %		
			Days to Emerge	to 50% Bloom	Harvest Density	Plant Ht.	at Harvest	Stem Sugar	Plants Lodged	Forage Yield	of Test Average
				Plants/A (1000 X)	In.		%	%	Tons/A	%	
BUFFALO BRAND	Canex II	FS	8	78	41.8	74	MT	16	3	10.9	124
BUFFALO BRAND	Canex	FS	8	77	33.3	74	MT	17	12	10.8	122
(Check)	NB 305F	FS	9	85	37.2	74	HD	13	0	10.2	116
NK BRAND	Hi Kane II	FS	9	77	38.7	68	MT	14	1	9.7	111
NK BRAND	NK 300	FS	8	86	38.3	47	HD	9	1	9.6	109
BUFFALO BRAND	Canex BMR 702	FS	8	76	33.3	70	MT	10	2	8.8	100
BUFFALO BRAND	Canex BMR 208	FS	8	76	35.6	75	MT	11	20	8.1	92
BUFFALO BRAND	Canex BMR 310	FS	8	76	44.5	67	MT	10	18	7.3	83
BUFFALO BRAND	Grazex BMR 727	SS	8	73	31.4	76	MT	10	7	11.2	128
GOLDEN HARVEST	Re-Gro H-33	SS	8	77	31.8	72	MT	10	1	9.0	102
BUFFALO BRAND	Grazex BMR 16	SS	8	75	32.9	81	MT	14	2	8.9	102
BUFFALO BRAND	Grazex II	SS	8	73	40.7	83	MT	13	1	8.6	97
GOLDEN HARVEST	Re-Gro H-22B	SS	8	71	40.7	85	MT	12	3	8.4	96
BUFFALO BRAND	Buffalo Brand	SS	8	74	34.5	88	MT	15	4	8.4	96
BUFFALO BRAND	Grazex BMR 720	SS	8	72	32.5	77	MT	11	15	8.4	95
BUFFALO BRAND	Grazex II W	SS	7	70	37.6	81	MT	13	4	6.0	69
ASGROW	RX 799 Bt	Corn	6	72	24.4	78	HD	10	0	5.9	67
Average		FS	8	76	35.8	75	MT	12	6	8.8	
LSD 0.20										1.01	

\1 Planted: May 24; Harvested: September 19.

\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 corrected to 70% moisture content based on oven-dried sample.

Table 13.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 1999-2001.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Canex	15.7	12.1	10.8	11.5	12.9	111	110	122	116	114
BUFFALO BRAND	Canex II	10.9	11.7	10.9	11.3	11.2	77	106	124	115	102
BUFFALO BRAND	Canex BMR 208	10.3	12.2	8.1	10.2	10.2	73	111	92	102	92
BUFFALO BRAND	Buffalo Brand	15.7	12.1	8.4	10.3	12.1	111	110	96	103	106
BUFFALO BRAND	Grazex II	13.4	11.8	8.6	10.2	11.3	95	107	97	102	100
BUFFALO BRAND	Grazex II W	14.5	10.6	6.0	8.3	10.4	103	96	69	83	89
BUFFALO BRAND	Grazex BMR 727	--	9.2	11.2	10.2	--	--	84	128	106	--
BUFFALO BRAND	Grazex BMR 737	15.6	12.1	--	13.9	9.2	111	110	--	111	74
BUFFALO BRAND	Grazex BMR 116	--	10.3	8.9	9.6	--	--	94	102	98	--
(Check)	NB 305F	15.1	15.1	10.2	11.0	13.5	107	100	116	108	108
(Check)	Corn	10.2	10.2	5.9	7.6	8.8	72	69	69	69	70
Average		14.1	11.0	8.8	9.9	11.3					

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

Table 14.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2001.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	ADF	NDF	TDN	P	Ca	RFV	<u>Net Energy</u>		
												Main.	Gain	Lact.
					In	-----%-----						-----MCal/lb-----		
BUFFALO BRAND	Canex BMR 702	FS	68	57	11.0	34.7	62.1	63.7	0.29	0.34	92.6	0.65	0.39	0.65
BUFFALO BRAND	Canex BMR 208	FS	69	64	10.9	36.0	62.7	62.2	0.32	0.41	90.2	0.63	0.37	0.64
NK BRAND	Hi Kane II	FS	68	62	10.7	39.0	64.6	58.9	0.28	0.59	84.3	0.58	0.32	0.60
BUFFALO BRAND	Canex BMR 310	FS	69	58	9.9	35.6	62.4	62.7	0.29	0.37	91.2	0.64	0.37	0.64
NK BRAND	NK 300	FS	77	39	9.9	38.7	64.5	59.2	0.27	0.63	84.7	0.58	0.32	0.61
BUFFALO BRAND	Canex II	FS	69	67	9.4	41.2	66.3	56.5	0.27	0.56	79.7	0.54	0.29	0.57
BUFFALO BRAND	Canex	FS	69	65	9.2	38.4	65.0	59.5	0.26	0.56	84.4	0.59	0.33	0.61
(Check)	NB 305F	FS	76	67	8.6	40.2	66.1	57.5	0.26	0.45	81.0	0.56	0.30	0.59
GOLDEN HARVEST	Re-Gro H-33	SS	68	61	12.6	36.6	64.6	61.6	0.32	0.43	86.9	0.62	0.36	0.63
BUFFALO BRAND	Grazex BMR 727	SS	65	67	12.1	35.0	60.4	63.4	0.33	0.52	94.9	0.65	0.38	0.65
BUFFALO BRAND	Grazex BMR 720	SS	64	62	11.1	38.0	63.4	60.1	0.32	0.41	87.0	0.60	0.34	0.61
BUFFALO BRAND	Grazex II	SS	67	62	11.0	39.6	65.5	58.3	0.27	0.63	82.5	0.57	0.31	0.59
BUFFALO BRAND	Grazex II W	SS	63	74	10.8	38.9	64.5	59.0	0.27	0.63	84.5	0.58	0.32	0.60
GOLDEN HARVEST	Re-Gro H-22B	SS	64	64	10.6	38.4	64.1	59.6	0.25	0.61	85.6	0.59	0.33	0.61
BUFFALO BRAND	Grazex BMR 16	SS	68	67	10.4	38.8	66.2	59.1	0.30	0.43	82.5	0.58	0.32	0.60
BUFFALO BRAND	Buffalo Brand	SS	68	74	9.8	43.6	69.6	53.8	0.26	0.60	73.4	0.50	0.25	0.54
ASGROW	RX 799 Bt	Corn	67	72	13.0	35.4	60.2	62.9	0.33	0.60	94.7	0.64	0.37	0.65
Average		FS	64	64	10.6	38.1	64.2	59.9	0.29	0.52	85.9	0.59	0.33	0.61

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

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients;

P, Phosphorus; Ca, Calcium; RFV, Relative Feed Value.

Net Energy: Maintenance, Gain, Lactation.

## Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2001

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

**PURPOSE:** To identify high yielding hybrids under irrigated conditions with 3000 sorghum heat units in a Silty Clay Loam soil.

**PLOT:** Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 113,250 Seed/A. **PLANTED:** May 23. **HARVESTED:** September 21.

**EMERGENCE DATE:** 8 days after planting. **SOIL TEMP:** 63 F.

**IRRIGATION:** Three furrow irrigations: July 13, August 2 and August 17, total applied 14 acre-in./A.

**PEST CONTROL:** Preemergence Herbicides: Roundup 16 oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: Clarity 4 Oz/A, 2,4-D 0.28 Lb/A. **CULTIVATION:** Once. **INSECTICIDES:** None.

**FIELD HISTORY:** Last Crop: Wheat. **FIELD PREPARATION:** Sweep plow.

**COMMENTS:** Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season with a wet July and a very dry September. Moderate greenbug infestation naturally controlled by parasitic wasps. Forage yields were very good.

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

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	0.04	135	0	0	8
June	3.26	670	13	0	38
July	4.21	950	30	9	69
August	2.18	804	19	0	100
September	0.07	419	8	1	121
Total	9.76	2978	90	17	121

\1 Growing season from May 23 (planting) to September 21 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
mmhos/cm		%	-----ppm-----					
0-8"	8.0	0.8	1.7	25	0.7	477	1.7	7.1
8"-24"				18				
Comment	Alka	VLo	Hi	VHi	VLo	VHi	Adeq	Adeq
Manganese and Copper levels were adequate.								

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	0	0
Applied	131	20	0.3	0
Yield Goal: 18 Ton/A.				
Actual Yield: 19.7 Ton/A @ 70% MC.				



### Available Soil Water Irrigated Forage Sorghum, Walsh, 2001

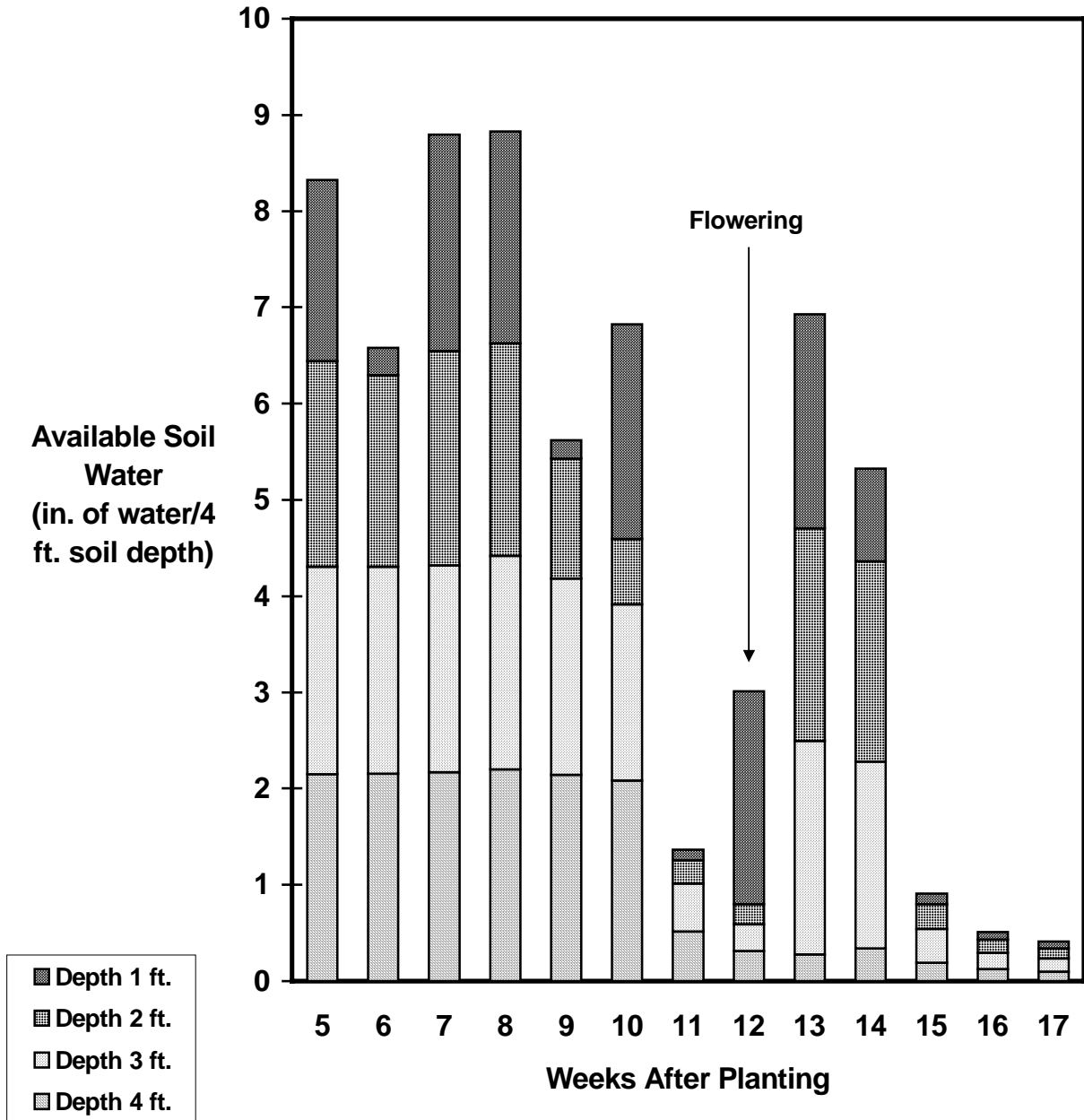


Fig. 7. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 9.76 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2001. \1

Brand	Hybrid	Forage Type \2	Days		Harvest Density	Stage			Yield %		
			Days to Emerge	to 50% Bloom		Plant Ht.	at Harv /3	Stem Sugar %	Plants Ldg. %	Forage Yield Tons/A	of Test Average %
					Plants/A (1000 X)	In.		%	%	Tons/A	%
NK BRAND	NK 300	FS	8	87	51.1	79	SD	6	0	24.0	122
BUFFALO BRAND	Canex	FS	8	78	48.0	102	MT	14	0	22.5	114
BUFFALO BRAND	Canex II	FS	8	78	71.6	98	MT	15	0	22.1	112
RICHARDSON SEEDS	Dairy Master BMR	FS	8	82	50.3	102	HD	13	2	21.7	110
BUFFALO BRAND	Canex BMR 208	FS	8	78	58.1	95	MT	12	0	21.5	109
BUFFALO BRAND	Canex BMR 310	FS	8	80	51.1	89	MT	12	0	20.5	104
GOLDEN HARVEST	Si-Gro H-45	FS	7	86	65.0	86	SD	7	0	20.3	103
NK BRAND	Hi Kane II	FS	9	77	53.0	101	MT	10	1	20.2	102
GOLDEN HARVEST	Si-Gro EX-47	FS	8	78	63.1	95	MT	14	2	19.1	97
(Check)	NB 305F	FS	8	83	69.7	108	HD	11	1	17.8	90
BUFFALO BRAND	Canex BMR 702	FS	9	79	52.3	87	MT	13	0	17.2	87
RICHARDSON SEEDS	Sweeter 'N Honey BMR	SS	9	81	59.6	98	MT	8	0	20.8	105
GOLDEN HARVEST	Re-Gro H-33	SS	8	77	48.8	108	MT	9	2	20.6	105
RICHARDSON SEEDS	Honey Graze BMR	SS	7	80	63.9	102	MT	9	1	19.5	99
BUFFALO BRAND	Grazex II	SS	8	74	64.3	118	MT	8	0	19.3	98
BUFFALO BRAND	Grazex BMR 16	SS	8	77	49.2	103	MT	9	1	18.4	93
BUFFALO BRAND	Grazex BMR 727	SS	8	76	51.1	98	MT	11	1	18.1	92
BUFFALO BRAND	Grazex II W	SS	7	70	63.1	120	MT	11	0	17.1	87
BUFFALO BRAND	Grazex BMR 720	SS	9	76	48.0	99	MT	11	1	17.0	86
BUFFALO BRAND	Buffalo Brand	SS	7	72	68.1	113	MT	14	0	16.5	84
GOLDEN HARVEST	Re-Gro H-22B	SS	7	72	60.4	115	MT	9	0	16.0	81
ASGROW	RX 799 Bt	Corn	6	70	35.6	91	HD	10	0	22.4	114
Average		FS	8	78	56.6	100	MT	11	1	19.7	
LSD 0.20										1.76	

\1 Planted May 23; Harvested: September 21.

\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 corrected to 70% moisture content based on oven-dried sample.

Table 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1999-2001.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Canex	18.5	24.5	22.5	23.5	21.8	99	113	114	114	109
BUFFALO BRAND	Canex II	15.3	24.0	22.1	23.1	20.5	82	111	112	112	102
BUFFALO BRAND	Canex BMR 208	16.1	20.5	21.5	21.0	19.4	86	95	109	102	97
BUFFALO BRAND	Buffalo Brand	18.3	17.8	16.5	17.2	17.5	98	82	84	83	88
BUFFALO BRAND	Grazex II	18.9	20.6	19.3	20.0	19.6	101	95	98	97	98
BUFFALO BRAND	Grazex II W	19.1	17.4	17.1	17.3	17.9	102	81	87	84	90
BUFFALO BRAND	Grazex BMR 727	--	21.0	18.1	19.6	--	--	97	92	95	--
BUFFALO BRAND	Grazex BMR 737	17.3	17.6	--	17.5	--	93	81	--	87	--
BUFFALO BRAND	Grazex BMR 116	--	20.6	18.4	19.5	--	--	95	93	94	--
GOLDEN HARVEST	Si-Gro H-45	--	25.7	20.3	23.0	--	--	119	103	111	--
GOLDEN HARVEST	Si-Gro EX-47	--	19.0	19.1	19.1	--	--	88	97	93	--
GOLDEN HARVEST	Re-Gro H-33	--	23.9	20.6	22.3	--	--	111	105	108	--
GOLDEN HARVEST	Re-Gro H-22B	--	25.6	16.0	20.8	--	--	119	81	100	--
RICHARDSON	Dairy Master BMR	17.6	22.0	21.7	21.9	20.4	94	102	110	106	102
RICHARDSON	Honey Graze BMR	17.7	--	19.5	18.6	--	95	--	99	97	--
(Check)	NB 305F	17.9	22.9	17.8	20.4	19.5	96	106	90	98	97
(Check)	Corn	20.1	17.4	22.4	19.9	20.0	107	81	114	98	101
Average		18.7	21.6	19.7	20.7	20.0					

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

Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2001.

Brand	Hybrid	Forage Type \1	Days Plant		CP	ADF	NDF	TDN	P	Ca	RFV	Net Energy		
			to Boot	at Height								Main.	Gain	Lact.
			In		-----%-----							-----MCal/lb-----		
BUFFALO BRAND	Canex	FS	70	80	11.5	38.8	64.2	59.2	0.30	0.54	85.1	0.58	0.32	0.60
(Check)	NB 305F	FS	75	88	11.2	40.8	65.5	56.9	0.32	0.49	81.2	0.55	0.29	0.58
BUFFALO BRAND	Canex BMR 208	FS	70	73	11.0	36.9	63.0	61.2	0.33	0.37	88.9	0.61	0.35	0.63
NK BRAND	Hi Kane II	FS	67	80	10.8	41.2	67.1	56.5	0.29	0.41	78.7	0.54	0.29	0.57
RICHARDSON	Dairy Master BMR	FS	74	82	10.5	0.9	64.9	58.9	0.32	0.26	84.0	0.58	0.32	0.60
BUFFALO BRAND	Canex BMR 310	FS	71	72	10.3	38.5	65.3	59.5	0.31	0.26	83.9	0.59	0.33	0.61
GOLDEN HARVEST	Si-Gro H-45	FS	77	54	9.9	41.3	68.3	56.3	0.26	0.53	77.2	0.54	0.28	0.57
BUFFALO BRAND	Canex II	FS	70	84	9.8	42.3	66.8	55.2	0.27	0.44	77.9	0.52	0.27	0.56
GOLDEN HARVEST	SI-Gro EX-47	FS	70	73	9.0	39.6	65.5	58.3	0.30	0.25	82.5	0.57	0.31	0.59
NK BRAND	NK 300	FS	78	67	9.0	44.0	71.9	53.4	0.25	0.54	70.7	0.49	0.24	0.54
GOLDEN HARVEST	Re-Gro H-33	SS	69	71	13.8	36.1	62.1	62.1	0.35	0.39	91.0	0.63	0.36	0.64
BUFFALO BRAND	Grazex BMR 720	SS	68	69	13.1	38.6	34.6	59.3	0.36	0.37	84.7	0.59	0.33	0.61
BUFFALO BRAND	Grazex BMR 727	SS	69	75	13.0	37.7	64.6	60.3	0.35	0.38	85.7	0.60	0.34	0.62
RICHARDSON	Sweeter N' Honey BMR	SS	73	62	12.2	37.5	63.4	60.6	0.35	0.26	87.6	0.60	0.34	0.62
RICHARDSON	Honey Graze BMR	SS	72	82	11.7	39.1	65.0	58.8	0.31	0.35	83.7	0.58	0.32	0.60
BUFFALO BRAND	Canex BMR 702	SS	70	72	11.7	36.8	63.8	61.4	0.33	0.37	87.8	0.62	0.35	0.63
BUFFALO BRAND	Grazex II W	SS	62	91	11.2	42.1	67.6	55.4	0.28	0.55	77.1	0.53	0.27	0.56
GOLDEN HARVEST	Re-Gro H-22B	SS	63	77	11.1	42.7	68.0	54.8	0.27	0.51	76.1	0.52	0.26	0.56
BUFFALO BRAND	Grazex II	SS	66	87	10.7	42.3	68.3	55.2	0.27	0.51	76.2	0.52	0.27	0.56
BUFFALO BRAND	Grazex BMR 16	SS	69	76	10.5	40.2	66.2	57.6	0.31	0.37	80.9	0.56	0.30	0.59
BUFFALO BRAND	Buffalo Brand	SS	63	80	10.2	44.1	69.3	53.3	0.26	0.49	73.3	0.49	0.24	0.54
ASGROW	RX 799 Bt	Corn	66	88	14.0	38.9	63.8	59.1	0.34	0.58	85.5	0.58	0.32	0.60
Average		SS	70	77	11.2	38.2	64.5	57.9	0.31	0.42	81.8	0.56	0.30	0.59

\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;

P, Phosphorus; Ca, Calcium; RFV, Relative Feed Value.

Net Energy: Maintenance, Gain, Lactation.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2001

COOPERATORS: Frank C. Schweissing, Superintendent, Arkansas Valley Research Center, Rocky Ford, Colorado.

PURPOSE: To identify high yielding hybrids under irrigated conditions.

PLOT: Two rows with 30" row spacing, 32' long. SEEDING DENSITY: 96,800 Seed/A. PLANTED: June 11. HARVESTED: September 11.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 67 °F.

IRRIGATION: Three furrow irrigations: June 13, July 27, August 10, total applied 15 acre-in/A.

PEST CONTROL: PrePlant Herbicide: GlyStar plus 1 lb. AI/A. Preemergence Herbicides: Bifenox 2 lbs. AI/A. Insecticide: None.

Summary: Growing Season Precipitation and Temperature \1  
Arkansas Valley Research Center, Rocky Ford, Otero County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
June	0.87	432	15	5	19
July	1.91	804	30	9	50
August	0.27	694	25	3	81
September	0.34	182	9	0	92
Total	3.39	2112	79	17	92

\1 Growing season from June11 (planting) to September 11 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

CULTURAL PRACTICES: Previous crop: onions. Field Preparation: disc 2X, plow, disc, roller-pack, float. Cultivation: 1X.

SOIL: Silty Clay Loam, 1 - 1.5 % O.M., pH-ca. 7.8. FERTILIZER: 50 lbs. P<sub>2</sub>O<sub>5</sub> and 150 lbs. N/A.

COMMENTS: Excessive rain in May and early June. Late planted in cloddy soil. Hot and dry after June. Shorted one irrigation. No lodging. Greenbugs not a problem. Forage yields below average.

Table 18.-Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2001. \1

Brand	Hybrid	Forage Type \2	Days		Plant Stand \3	Stage \4		Dry Matter	Forage Yield	Yield % of Test Average
			to 50% Bloom			at Harvest	Stem Sugar			
				Plants/A (1000 X)	In.	%	%	Tons/A	%	
GOLDEN HARVEST	Re-Gro H-22B	SS	67	56.6	94	LM	10	30	26.9	111
NK BRAND	HiKane II	FS	68	53.7	91	LM	11	28	26.2	109
GOLDEN HARVEST	Si-Gro H-45	FS	79	55.0	69	LM	12	26	24.7	102
NK BRAND	NK 300	FS	79	58.3	68	LM	7	25	24.5	102
(Check)	NB 305F	FS	75	46.8	90	LM	16	27	24.4	101
GOLDEN HARVEST	Re-Gro H-33	SS	72	53.4	93	LM	11	28	24.2	100
MYCOGEN	2725	Corn	62	33.0	76	LM	11	28	21.7	90
GOLDEN HARVEST	Si-Gro Ex-47	FS	70	53.4	79	LM	11	28	20.6	85
Average		FS	72	51.3	83	LM	11	28	24.1	
LSD 0.20									1.56	
CV%									6.91	

\1 Planted June 11, 2001; Harvested: September 11, 2001.

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

\3 Plant Population per acre on July 10, 2001.

\4 Seed Maturation: PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough.

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

Table 19.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Rocky Ford, 1999-2001.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1999	2000	2001	2-Year Avg	3-Year Avg	1999	2000	2001	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
BUFFALO BRAND	Buffalo Brand	33.5	42.2	--	37.9	--	110	123	--	117	--
BUFFALO BRAND	Canex	29.9	34.1	--	32.0	--	99	100	--	100	--
BUFFALO BRAND	Canex II	29.1	34.6	--	31.8	--	96	101	--	99	--
BUFFALO BRAND	Canex BMR 208	29.7	26.0	--	27.8	--	98	76	--	87	--
BUFFALO BRAND	Grazex II	29.3	34.9	--	32.1	--	97	102	--	100	--
BUFFALO BRAND	Grazex II W	29.7	36.6	--	33.2	--	98	107	--	103	--
BUFFALO BRAND	Grazex BMR 737	26.1	33.5	--	29.8	--	86	98	--	92	--
(Check)	NB 305F	24.7	29.4	24.4	26.9	26.2	82	86	101	94	90
(Check)	Corn	23.5	31.1	21.7	26.4	25.4	78	91	90	91	86
Average		30.3	34.2	24.1	29.2	29.5					

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

## Row Spacing for Dryland Grain Sorghum Production for Southeastern Colorado Kevin Larson and Calvin Thompson

Row spacing for dryland grain sorghum varies greatly throughout the sorghum producing counties of Southeastern Colorado. When there is a wheat failure, the traditional wheat-fallow growers plant grain sorghum on the same row spacing as their wheat drill, typically 12 in. row spacing; whereas, the traditional dryland continuous sorghum growers in Kiowa County plant grain sorghum in 48 in. row spacing. In Baca County the dryland continuous sorghum is usually planted on 40 in. row spacing, while the irrigated is on 30 in. row spacing. In this fourth year of our multiple year study, we tested five row spacing widths to determine the optimum spacing for dryland grain sorghum production.

### Materials and Methods

The five row spacing widths tested were, 1, 2, 3, 4, and 5 ft. We used a six-row cone planter with 12 in. row spacing. We plugged the seed spouts as needed to provide the proper row spacings. The grain sorghum hybrid used was CARGILL 627 and the seeding rate for all row spacings was 40,000 Seeds/A. Weed control was achieved by a post emergence broad-spectrum weed herbicide mixture (Atrazine 1.0 Lb/A, Clarity 4 Oz/A, COC 1Qt/A). The treatments were not cultivated. The plots were 12 ft. by 500 ft, with two replications. We harvested the plots with a self-propelled combine equipped with a digital weigh scale. Only treatment rows adjacent to identically treated rows were recorded for harvest.

### Results and Discussion

This year was a near normal precipitation season with 9.8 inches of rainfall, 95% of average. This year the narrowest row spacing produced the highest yield; moreover there was a 4.5 Bu/A yield decrease with each one foot increase in row width (Fig. 8). In two of our previous studies, one wet year 1999 (18.32 in., 78% above average) and one near normal year 1998 (9.68 in., 94% of average), the narrowest row spacing (1 ft.) produced the highest yields (Fig. 9). Year 2000 was a dry year (5.86 in., 43% below average rainfall for the growing season, May through September) and the 3 ft. wide row spacing produced the highest yield (Fig. 9). Nonetheless, even in a very dry year such as 2000 there was no yield difference between the 3 ft. spacing and narrower spacings (CI 95%). One of the reasons for the higher yield with the narrow row spacing was weed suppression. The narrowest row spacings (1 ft. and 2 ft.) closed their canopies early and suppressed grassy weeds; the wider row spacings did not. Weed suppression was evident this year, but not as pronounced as in the wet year. Therefore, narrow row spacing (1 ft.) is recommended for wet, normal or dry years in Southeastern Colorado.

There are two disadvantages to narrow row spacing: cultivation is not possible and lodged plants are more difficult to harvest. Wider row spacings allow weed cultivation between rows, but with narrow row spacing weed suppression occurs with canopy closure, making supplemental weed control less critical. Plant lodging is more problematic with narrow rows. Row crop headers are designed to pick up lodged plants in wider rows. Plastic sorghum fingers are beneficial for picking up lodged plants in



narrow rows, but they are not as effective as row crop heads. Nonetheless, there tends to be less lodging with narrow rows because of the close proximity to adjacent standing plants helping prop up their lodged neighbors.

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### Dryland Grain Sorghum Row Spacing Walsh, 1998, 1999 and 2001

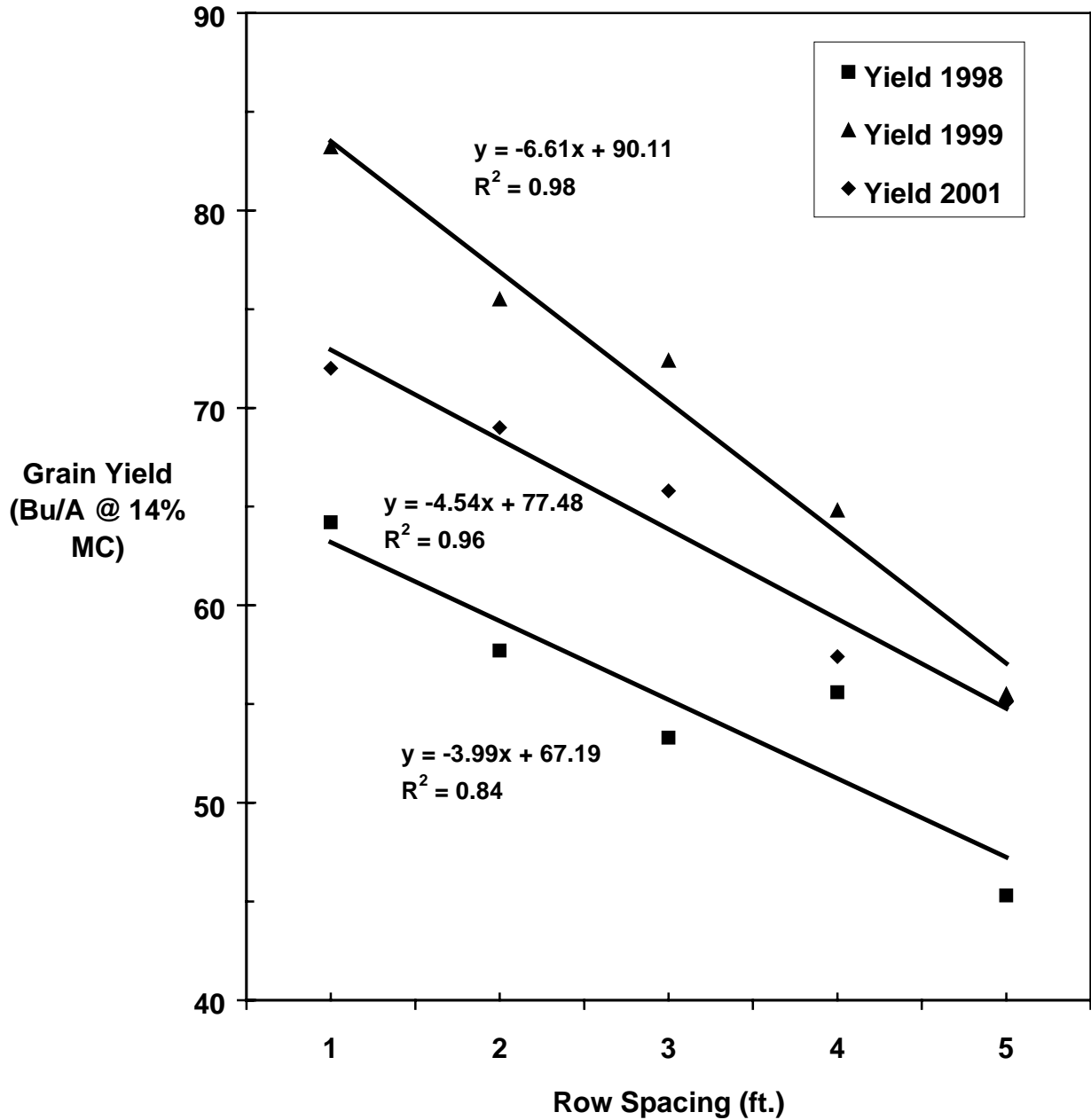


Fig. 8. Row spacing on dryland grain sorghum at Walsh for 1998, 1999 and 2001.

The five row spacings tested were: 1 ft., 2 ft., 3 ft., 4 ft., and 5 ft. CARGILL 627 was planted at 40,000 Seeds/A.

### Dryland Grain Sorghum Row Spacing Walsh, 2000

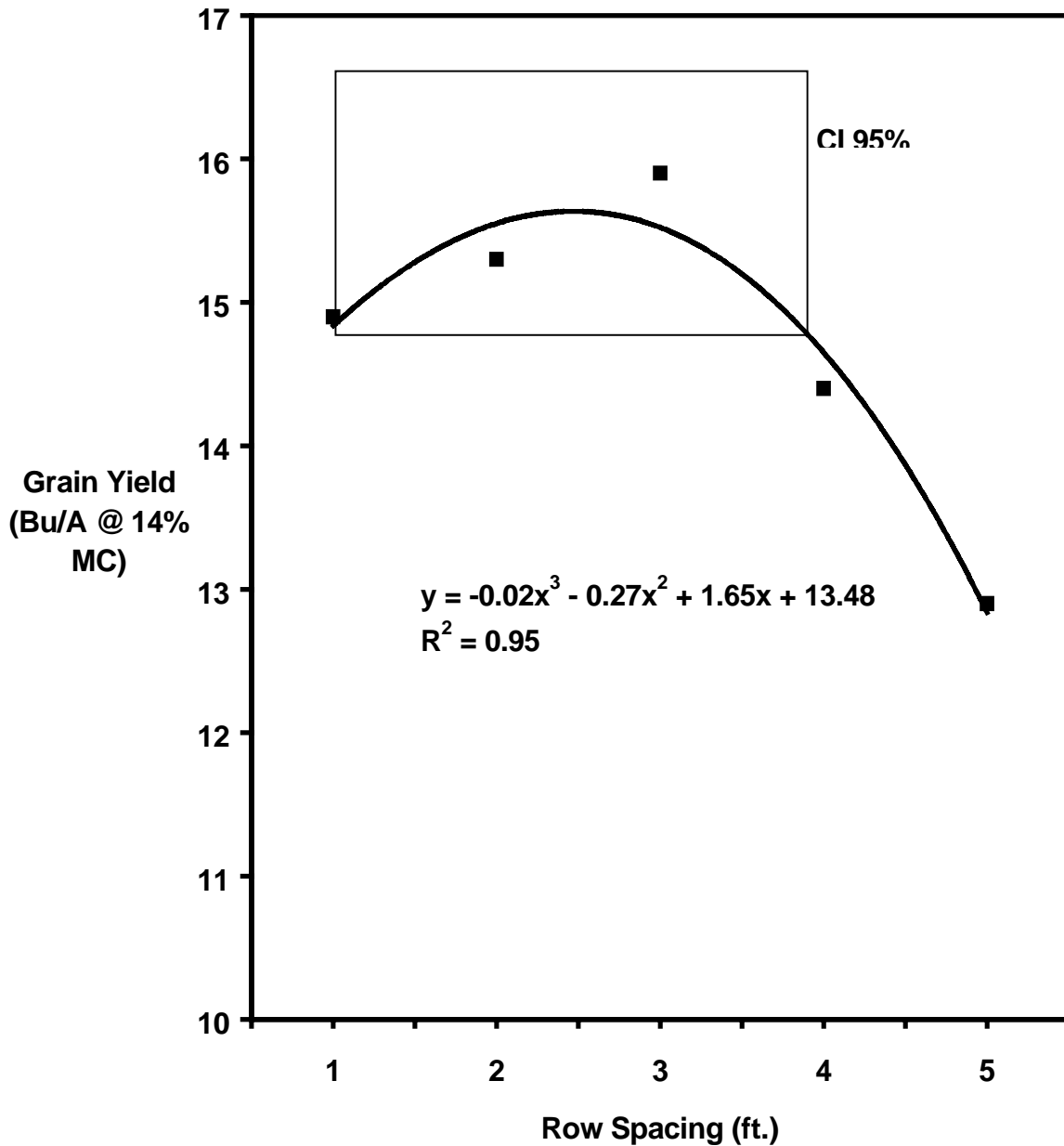


Fig. 9. Row spacing on dryland grain sorghum at Walsh. The five row spacings tested were: 1ft., 2 ft., 3 ft., 4 ft. and 5 ft. CARGILL 606 was planted at 40,000 Seeds/A.

## Dryland Grain Sorghum Seeding Rate Study Kevin Larson and Dennis Thompson

The seeding rate for dryland grain sorghum in Colorado varies almost as widely as does row spacing. The old standard, using the old hybrids, was about one to two pounds per acre with no consideration of seed size. With modern hybrids the seeding rate has increased to about two to three pounds per acre, but there are some dryland growers who plant as much as five pounds per acre. With such a broad spectrum of seeding rates used for dryland sorghum production, we decided to test a wide range of seeding rates, over multiple years, to determine the optimum dryland grain sorghum rate with 30 in. row spacing. This is the fourth year of this continuing study. Since seed size varies from hybrid to hybrid, even bag to bag, we reported our seeding rates not only in the traditional pounds per acre, but, more importantly, in seeds per acre and corresponding plants per acre.

### Materials and Methods

The eight seeding rates tested were 1, 2, 3, 4, 5, 6, 7 and 8 Lb/A, which corresponds to 14,000 to 112,000 Seeds/A at 14,000 Seed/A increments. We planted with a four-row cone planter on 30 in. row spacing. The grain sorghum hybrid was CARGILL 627. We fertilized the site with 50 Lb N/A as anhydrous and seedrow applied 5 Gal 10-34-0/A. Weed control was achieved with post emergence herbicides (Atrazine 1.0 Lb/A, Clarity 4 Oz/A, COC 1Qt/A). We harvested the study with a self-propelled combine equipped with a digital scale.

### Results and Discussion

For this near normal precipitation year (9.8 inches, 95% of average), the highest yielding seeding rate was 3 Lb/A, which corresponds to 42,000 Seeds/A and 32,500 Plants/A (Fig. 10). There was no significant difference in grain yield from about 2.25 Lb/A (31,500 Seeds/A) up to the 3.75 Lb/A (52,500 Seeds/A) seeding rate (CI 95%). The seeding rate response this year is quite similar to the results from our study in 2000, even though 2000 was very dry (43% below normal precipitation for the growing season). The studies this year and last year both produced their highest yields at the 3 Lb/A seeding rate. In 2000, there was no significant difference in yield from about 28,000 up to 52,000 Seeds/A (22,000 to 35,000 Plants/A), and in 2001, there was no significant difference in yield from about 32,000 up to 53,000 (26,000 to 39,000 Plants/A) (Larson, Schweissing, Thompson, 2001). In the first two years of this study, one with abundant and one with near normal rainfall, yields increased linearly up to the highest seeding rate 112,000 Seeds/A (57,000 Plants/A) for the wet year, or peaked around 76,000 Seeds/A (34,000 Plants/A) for the near normal year (Larson, Schweissing, Thompson, 1999 and 2000). Summarizing the last three years of this study with rainfall varying from marginal, near normal to abundant, suggests that seeding rate is dependent on seasonal rainfall. Since the optimum seeding rate varies with rainfall, making an accurate dryland seeding rate recommendation would necessitate predicting the weather. Nonetheless, a general seeding rate recommendation for dryland grain sorghum can be made, if we favor drier conditions, which is a rational bias considering that moisture is the limiting factor for dryland

production. Across the wide-ranging rainfall experienced during the last four years of this study, at least 90% of the maximum yield can be realized with a plant density of 26,000 Plants/A.

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## Dryland Grain Sorghum Seeding Rate Walsh, 2001

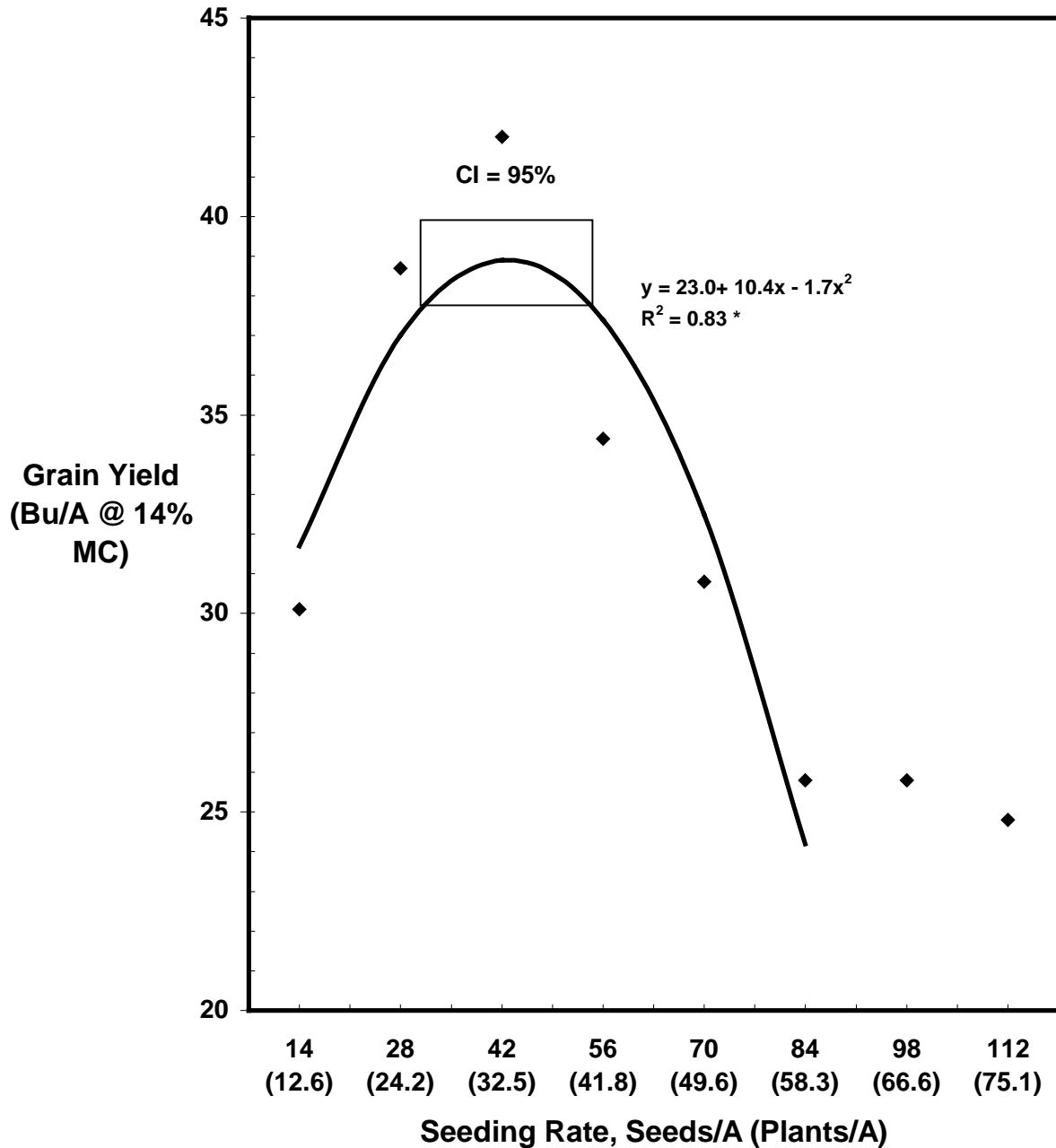


Fig. 10. Dryland grain sorghum seeding rate at Walsh. The eight seeding rates tested were 1 to 8 Lb/A at 1 Lb/A increments (14,000 Seeds/A to 112,000 Seeds/A at 14,000 Seeds/A increments) using CARGILL 627.

## Limited Furrow and Sprinkler Irrigation Grain Sorghum Seeding Rate Study Kevin Larson, Dennis Thompson, Calvin Thompson, Deborah Harn

Seeding rate recommendations vary with amount of irrigation. The optimum seeding rate for limited irrigation grain sorghum is not well studied. For this study, limited furrow irrigation is defined as receiving a pre-irrigation (if winter moisture is lacking) and one in-season irrigation at flowering, and limited sprinkler irrigation is defined as similar amount of water used for furrow irrigation but applied with a sprinkler. Typically, the amount of water applied ranges from 6 in./A (if only the in-season irrigation is needed) to 12 in./A (if both the pre-irrigation and the in-season irrigation are needed).

### Materials and Methods

We tested four seeding rates under limited furrow and sprinkler irrigation 30.5, 50, 68, and 78 X 1000 Seeds/A. This resulted in 26.4, 36.6, 46.0, and 50.4 X 1000 Plants/A. The hybrid used for this study was NK BRAND K59-Y2. We used a randomized complete block design with three replications for this study. The soil test recommendation for a 110 Bu/A yield goal for the sprinkler was 62 Lb N/A and 40 Lb P<sub>2</sub>O<sub>5</sub>/A; for the furrow, the recommendation was 90 Lb N/A and 40 Lb P<sub>2</sub>O<sub>5</sub>. We applied 125 Lb N/A, 20 Lb P<sub>2</sub>O<sub>5</sub>/A and 0.3 Lb Zn/A to both sites. Both sites were planted on June 1. The furrow site received one in-season irrigation on August 14 of 6.9 in./A of water. The sprinkler site received 5.0 in./A of applied water. We controlled weeds at the sprinkler site with a postemergence mixture of Atrazine 1.0 Lb/A, COC 1 Qt/A, and Clarity 4 Oz/A. For the furrow site, we controlled weeds with a pre-emergence application of Roundup 16 Oz/A and Atrazine 1.0 Lb/A. We cultivated the furrow site; the sprinkler site was not cultivated. Plant densities were taken prior to harvest. We harvested the plots on October 16 and 18 with a self-propelled combine equipped with a four-row crop head. Grain yields were adjusted to 14% seed moisture content.

### Results and Discussion

Most seeding rate recommendations for limited irrigation grain sorghum are between dryland and fully irrigated rates: 4 to 7 Lb/A or 55,000 to 100,000 Seeds/A. Currently, there is no grain sorghum seeding rate recommendation distinction between limited furrow irrigation and limited sprinkler irrigation.

In this study the highest yielding seeding rate for limited furrow irrigation was the lowest seeding rate tested 30,500 Seeds/A (26,400 Plants/A). Conversely, the highest yielding seeding rate for limited sprinkler irrigation was the highest seeding rate tested 78,000 Seeds/A (50,400 Plants/A) (Fig. 11). The limited furrow irrigation seeding rate response obtained this year is similar to the response reported in 2000 (Larson, Schweissing, Thompson, 2001): yields decreased linearly with increasing seeding rate. This year and in 2000 a high seeding rate produced the highest yield for limited sprinkler irrigation. In 2000, limited sprinkler irrigation produced a curvilinear yield response with an optimum near the second to the highest seeding rate. This year yields increased linearly up to the highest seeding rate with limited sprinkler irrigation. Therefore, we suggest that limited irrigation grain sorghum seeding rate

recommendations be based on irrigation method: for furrow, a low seeding rate similar to a dryland rate about 30,000 to 60,000 Seeds/A (26,000 Plants/A minimum), and a high seeding rate similar to a fully irrigated rate 70,000 to 115,000 Seeds/A (48,000 Plants/A minimum) for limited sprinkler irrigation.

Literature Cited

Larson, K.J., F.C. Schweissing, D.L. Thompson. 2001. Sorghum hybrid performance tests in Colorado, 2000. Technical Report TR01-2. AES, Dept. of Soil and Crop Sciences, CSU. 53p.



**Limited Irrigation Seeding Rate on Grain Sorghum  
Sprinkler and Furrow, Walsh 2001**

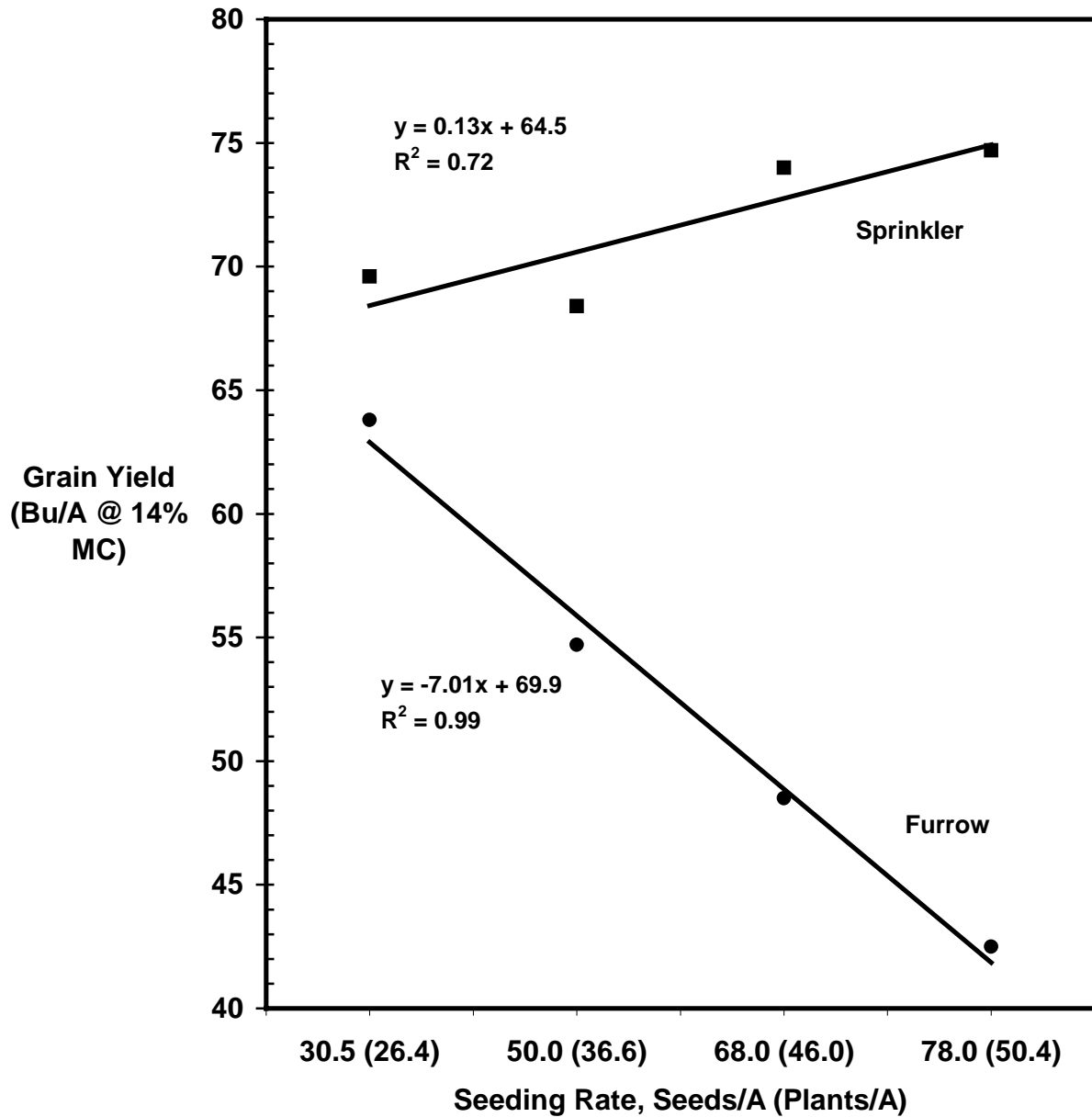


Fig. 11. Seeding rate and harvest density on limited irrigation grain sorghum at Walsh. Four seeding rates were tested: 30.5, 50, 68, and 78 Seeds/A X 1000. The hybrid was NK BRAND K59-Y2.

## Liquid N and Anhydrous N Comparison on Dryland Grain Sorghum Kevin Larson and Dennis Thompson

There is controversy on which form of nitrogen, liquid or anhydrous, is the most profitable to use. Some growers feel that they receive a better yield response from liquid N compared to anhydrous N, while other growers point out that anhydrous is always the least expensive form of N. We conducted this study to determine if there are yield and variable net income differences between preplant liquid N and anhydrous N for dryland grain sorghum production.

### Materials and Methods

We tested liquid N and anhydrous N at 50 Lb N/A. The anhydrous was applied with a sweep plow to a 4 in. depth with openings 15 in. apart on April 24. Liquid ure-ammonium-nitrate (32-0-0) was banded on top of the soil surface (streamed) at 18 in. spacing on May 8. Prior to planting, the soil was sampled at eight random locations at 0 to 8 in. (surface) and 8 to 24 in. (subsurface) depths. The soil samples were sent to Colorado State University Soil Testing Lab for analysis. The soil test recommendation for a 50 Bu/A yield goal was 25 Lb N and 40 Lb P<sub>2</sub>O<sub>5</sub>/A. The grain sorghum hybrid was CARGILL 627 sown at 40,000 Seed/A on June 1. At planting, we seedrow applied 5 Gal/A of 10-34-0 to all treatments. We harvested the 20 ft. by 1300 ft. plots on October 19 with a self-propelled combine with a four-row crop header. Grain yields were corrected to 14% seed moisture content.

### Results and Discussion

Liquid N produced the highest yield with 51 Bu/A, 8 Bu/A more than the 0 N check (Table 20). There was no significant yield difference between liquid and anhydrous N treatments (LSD 0.05). The 0 N check produced the lowest yield, but with no N cost it had the only non-negative variable net income of the N treatments tested.

There was a yield advantage to applying N; however, there was no variable net income advantage to applying N. The high cost of N fertilizers and application costs offset the yield increases obtain with anhydrous and liquid N fertilizers. One reason that N fertilization did not provide a positive net income may be attributed to applying twice the recommended N rate. If we followed the soil test recommendation and applied 25 Lb N/A instead of 50 Lb N/A, we may have had equally high yields at half the N fertilizer expensive and realized a positive net income with N fertilization.

We made an interesting observation during harvest: the anhydrous plots had 12% more barren headed plants than the 0 N check plots and 9% more than the liquid N plots. The increase in barren plants with anhydrous application is no doubt related soil moisture loss from using a sweep plow to apply the anhydrous. A better method of applying anhydrous is to combine it with a typical tillage operation, thereby eliminating soil moisture loss from a separate fertilizer operation.

Table 20.-Liquid N and Anhydrous N on Dryland Grain Sorghum at Walsh, 2001.

N Fertilizer Form	N Fertilizer Type	N Applied	Applied	Plant Height	Test Weight	Grain Yield	Barren Heads	Variable Net Income
		Lb N/A		In	Lb/Bu	Bu/A	% Area	\$/A
Gas	NH <sub>3</sub>	50	Sweep	37	60	49	87	-0.69
Liquid	32-0-0	50	Stream	39	60	51	96	-1.17
Check	None	0		41	59	43	99	0.00
Average				39	60	48	94	-0.62
LSD 0.05						2.3		

Planted: June 1; Harvested: October 19.

CARGILL 627 was planted at 40,000 Seeds/A with 5 gal 10-34-0/A seedrow applied.

Plot size: 20 ft. x 1300 ft.

Anhydrous N swept to 4 in. depth with openings 15 in. apart on April 24.

Liquid N streamed on at 18 in. spacings on May 8.

Grain Yield corrected to 14% seed moisture content.

Variable Net Income: treatment yield - check yield x \$ 1.76/Bu - treatment cost.

Treatment Cost: sweep, \$4/A; stream, \$3.50/A; NH<sub>3</sub>, \$0.145 N/lb; 32-0-0, \$0.235 N/lb.

Pigweed Control, Crop Injury and Net Return of  
Commonly Used Herbicides in Dryland Grain Sorghum  
Kevin Larson and Dennis Thompson

Weed control is an essential component of dryland grain sorghum production. In order to evaluate economic return of herbicide applications, it is important to record chemical costs and grain yields. We tested commonly used herbicide mixtures as well as some newer registered herbicides for pigweed control in grain sorghum. Pigweed is the most prevalent broadleaf weed in grain sorghum in Southeastern Colorado.

### Materials and Methods

We applied nine post emergent herbicide treatments on 6 in. tall pigweed in 10 in. high grain sorghum with 5 to 6 leaves. The herbicide treatments were applied on June 29 at 10 Gal/A with 110° flat fan nozzles spaced 18 in. apart. The site was planted June 5 with CARGILL 627 at 40,000 Seeds/A. A late-season cultivation was performed on all treatments to control grassy weeds.

### Results and Discussion

Ally is the only herbicide tested that is not registered for use in grain sorghum.

All herbicide treatments provided positive net incomes compared to the cultivation check (Table 21). The herbicide treatment that produced the highest variable net income was Clarity and 2,4-D at \$12.28/A. The Paramount, Atrazine, and Crop Oil Concentrate (COC) mixture produced the highest yield, but had one of the lowest net incomes due to its very high chemical cost. Of the herbicides tested, Aim was the least effective in controlling pigweed and had one of the highest crop injury ratings and produced the lowest grain yield. Not surprisingly, Aim also had the lowest net return of the herbicides tested. The low net return of the Aim treatment makes Aim an undesirable herbicide for pigweed control in grain sorghum.

In order to fully evaluate herbicides it is important to include, not only weed control and crop injury, but also, chemical cost and grain yield. Recording only weed control and crop injury efficacies for evaluation of herbicides produces a skewed, even misleading, economic picture. For example, the efficacy of 2,4-D for grain sorghum production appears questionable if weed control and crop injury are the only criteria. However, 2,4-D produced a moderate grain yield at a very low chemical cost, giving it one of the highest net returns.

Table 21.-Pigweed Control in Dryland Grain Sorghum at Walsh, 2001.

Herbicide Treatment	Rate	Pigweed Control	Crop Injury	Test Weight	Grain Yield	Chemical Cost	Variable Net Income
	*/A	%	%	Lb/Bu	Bu/A	\$/A	\$/A
1 Aim 1 Penetrant II	0.33 oz 1 qt/100 gal	65	12	61	55	2.91	2.39
2 Ally 2 2,4-D 2 Penetrant II	0.0625 oz 0.375 lb 1 qt/100 gal	95	10	60	56	2.94	4.12
3 Atrazine 3 Clarity 3 COC	0.75 lb 4 oz 1 qt	94	5	61	61	5.58	10.28
4 Clarity 4 2,4-D	4 oz 0.375 lb	95	10	61	61	3.58	12.28
5 Paramount 5 Atrazine 5 COC	5.33 oz 0.75 lb 1qt	93	3	61	65	18.48	4.42
6 Buctril 6 Atrazine	16 oz 0.75 lb	87	3	61	61	8.47	7.39
7 Tough 7 Atrazine	16 oz 0.75 lb	85	3	60	61	10.41	5.45
8 Atrazine 8 2,4-D 8 COC	0.75 lb 0.375 lb 1 qt	95	10	62	60	4.26	9.84
9 2,4-D	0.375 lb	75	12	60	58	1.13	9.45
10 Control	None	0	0	60	50	0.00	0.00
Average		78	7	61	59	5.78	6.56
LSD 0.20		2.7	1.3		5.3		

Planted: June 1, Cargill 627 at 40,000 Seeds/A; Harvested: October 30.

Variable Net Income: Treatment Yield - Control Yield x \$1.76/Bu - Chemical Cost - Application Cost (\$3.50/A). All treatments were cultivated