

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1999

	Page
Introduction:	
Firms Entered in Tests	2
Experimental Methods and Evaluations	3
Statistical Method	4
Acknowledgments	4
References	5
Dryland Grain Sorghum Hybrid Performance Tests	
Early Maturing at Vilas	6
Vilas	10
Walsh	14
Irrigated Grain Sorghum Hybrid Performance Tests	
Hartman	18
Walsh	22
Dryland Forage Sorghum Hybrid Performance Test at Walsh	26
Irrigated Forage Sorghum Hybrid Performance Tests	
Walsh	31
Rocky Ford	36
Row Spacing for Dryland Sorghum Production for Southeastern Colorado	39
Dryland Grain Sorghum Seeding Rate and Seedrow Hydrogel Comparison	42
Seedrow P and N on Dryland Grain Sorghum	45

SORGHUM HYBRID PERFORMANCE TESTS IN COLORADO, 1999

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

Introduction

The 1999 Colorado grain sorghum crop was estimated at 8.8 million bushels, 17% lower than the 1998 production level. The decrease in production was due to an decrease in yield from the record level of 57 Bu/A in 1998 to 44 Bu/A in 1999. Production decrease occurred even though there was an 8% increase in acreage from 185,000 harvested acres in 1998 to 200,000 harvested acres in 1999. The yield of 44 Bu/A is slightly above average, which reflects the near normal rainfall for the sorghum producing areas of Colorado. Sorghum silage production in 1998 was 143,000 tons, down 39% from 1997. Sorghum silage production was the lowest recorded over the past ten years. The decrease in silage production was attributed to less acres, 11,000 acres and 13 Tons/A for 1997, and 18,000 acres and 13 Tons/A for 1997 (Colorado Agricultural Statistic Service, 1999).

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 who are interested in entering sorghum hybrids in any of the tests are invited to write Kevin Larson, Plainsman Research Center, Box 477, Walsh, Colorado 81090, or phone (719) 324-5643 for further details. Names and addresses of firms submitting entries in 1999 are shown in Table 1. The firms 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 for each test. 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, 1999), soil analysis and 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;
Research Farm Tech I, Plainsman Research Center, Walsh.

Table 1.--Entrants in the Colorado Sorghum Performance Tests, 1999.

Brand	Entered by
ASGROW	Asgrow Seed Co., 2533 S. Hertzler Road, Halstead, KS 67056
BUFFALO BRAND	Sharp Brothers Seed Co., P.O. Box 140, Healy, KS 67850
CARGILL	Cargill Hybrid Seeds, RR 2, Box 82, Lockney, TX 79241
DEKALB	Dekalb Genetics Corporation, Route 2, P.O. Box 56, Lubbock, TX 79415
MYCOGEN	Mycogen Seeds, 1117 Recharge Road, York, NE 68467
NC+	NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504
NK Brand	Novartis Seeds, 1060 Wheatland Rd., Buhler, KS 67522
PIONEER	Pioneer Hi-Bred International, Inc., 1616 South Kentucky St., C-150, Amarillo, TX 79102
RICHARDSON	Richardson Seed's, 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 TXR2436 (399 X 2436); forage sorghum, NB 305F; corn hybrids, MYCOGEN 2725 and CARGILL 7821 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, then 50 °F is used. Temperatures above 111 °F are converted to a maximum temperature of 111 °F:

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

Experimental Methods and Evaluations

Trials were seeded 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 an individual test and allows easy comparisons between 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 from any of the locations. 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. We are also grateful to the NOAA weather observer, William Davis, Holly, 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, 1999

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 (July 5), under dryland conditions with 3000 sorghum heat units in a Silty Clay Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 43,500 Seed/A. **PLANTED:** July 5. **HARVESTED:** November 9.

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

PEST CONTROL: Preemergence
Herbicides: LandMaster 54 Oz/A. Post
Emergence Herbicides: Atrazine 0.75 Lb/A,
Banvel 2 Oz/A, COC 1Qt/A. **CULTIVATION:**
Once. **INSECTICIDES:** None.

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

COMMENTS: Planting conditions were marginal (but received a good rain the same night we planted). Weed control was good. Above normal precipitation for the growing season, due mainly to above average rainfall in August. No greenbug infestation. None of the hybrids lodged. An early freeze (10 days earlier than average), lowered test weights and grain yields..

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-----		
July	1.55	751	20	2	26
August	3.75	787	19	0	57
September	2.25	462	5	0	87
October	0.00	34	0	0	91
Total	7.55	2034	44	2	91

\1 Growing season from July 5 (planting) to October 4 (first freeze, 28 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"	7.5	0.4	1.2	4	2.6	349	0.7	8.4
8"-24"				7				
Comment	Alka	VLo	Mod	Mod	VLo	VHi	Lo	Adeq
Manganese and Copper levels were adequate.								

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	25	40	2	0
Applied	50/6	20	0	0
Yield Goal: 50 Bu/A.				
Actual Yield: 45 Bu/A.				

Available Soil Water
Dryland Grain Sorghum, Early Maturing, Vilas, 1999

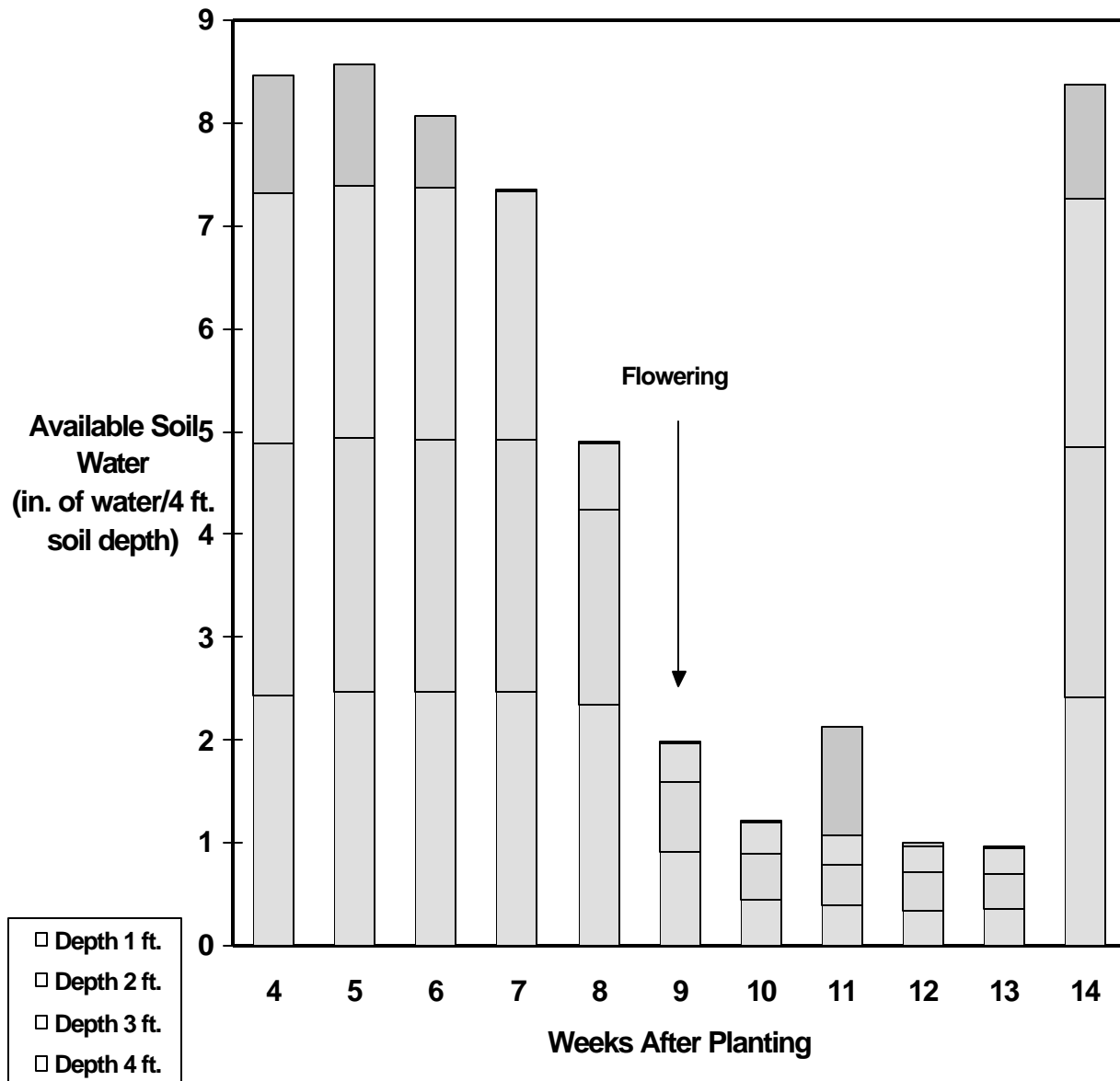


Fig. 1. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 7.55 in. Any increase in available soil water between weeks is from rain.

Table 2.--Dryland Grain Sorghum Early Maturing Hybrid Performance Test at Vilas, 1999. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								In	Plants/A	%	Lb/Bu	Bu/A	%
								(1000 X)					
MYCOGEN	3556	7	52	1395	HD	E	42	20.1	0	53	61	122	
DEKALB	DK-28E	8	50	1339	HD	E	42	20.1	0	53	60	119	
PIONEER	87G57	7	56	1508	HD	E	45	27.1	0	53	59	118	
ASGROW	A298	7	51	1367	HD	E	45	20.9	0	53	56	111	
PIONEER	8699	7	57	1538	SD	E	47	28.3	0	52	55	110	
CARGILL	576	7	58	1569	SD	E	43	26.7	0	50	50	100	
ASGROW	A201	7	58	1569	SD	E	41	23.6	0	50	41	81	
TRIUMPH	TR 438	8	61	1647	SD	ME/E	49	23.6	0	50	50	100	
(Check)	299 X 2436	6	66	1749	EM	M	44	23.2	0	38	20	39	
Average		7	57	1520	ED	ME	44	23.7	0	50	50		
LSD	0.20											7.0	

\1 Planted: July 5; Harvested: November 9.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze (28 F, October 4).

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 3.--Summary: Grain Sorghum Early Maturing Hybrid Performance Tests, 1997-99.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%------				
ASGROW	A298	--	56	56	56	--	--	124	111	118	--
ASGROW	A201	--	44	41	43	--	--	98	81	90	--
CARGILL	576	--	46	50	48	--	--	103	100	102	--
DEKALB	DK-28E	--	45	60	53	--	--	100	119	110	--
MYCOGEN	3556	--	48	61	55	--	--	107	122	115	--
PIONEER	87G57	--	41	59	50	--	--	92	118	105	--
(Check)	399 X 2436	--	36	20	28	--	--	80	39	60	--
Average		--	45	50	48	--					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland at Walsh for 1998; Dryland at Vilas for 1999.

Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1999

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

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

PLOT: Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 43,600 Seed/A. **PLANTED:** May 31. **HARVESTED:** November 9.

EMERGENCE DATE: 9 days after planting. **SOIL TEMP:** 61 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides: Atrazine 0.75 Lb AI/A, Banvel 2 Oz/A, COC 1.0 Qt/A.

CULTIVATION: Once. **INSECTICIDE:** None.

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

COMMENTS: Planted in good soil moisture. Broadleaf and grass control was very good. Near normal precipitation for the growing season, with a dry June and a wet August. No greenbug infestation. 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"	7.5	0.4	1.2	4	2.6	349	0.7	8.4
8"-24"				7				
Comment	Alka	VLo	Mod	Mod	VLo	VHi	Lo	Adeq
Manganese and Copper levels were adequate.								

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	0.05	19	0	0	1
June	0.56	625	13	0	31
July	1.91	869	23	5	62
August	3.75	787	19	0	93
September	2.25	462	5	0	123
October	0.00	34	0	0	127
Total	8.52	2796	60	5	127

\1 Growing season from May 31 (planting) to October 4 (first freeze, 28 F).
 \2 GDD: Growing Degree Days for sorghum.
 \3 DAP: Days After Planting.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	35	40	2	0
Applied	50/6	20	0	0
Yield Goal: 70 Bu/A. Actual Yield: 120 Bu/A.				

Available Soil Water
Dryland Grain Sorghum, Vilas, 1999

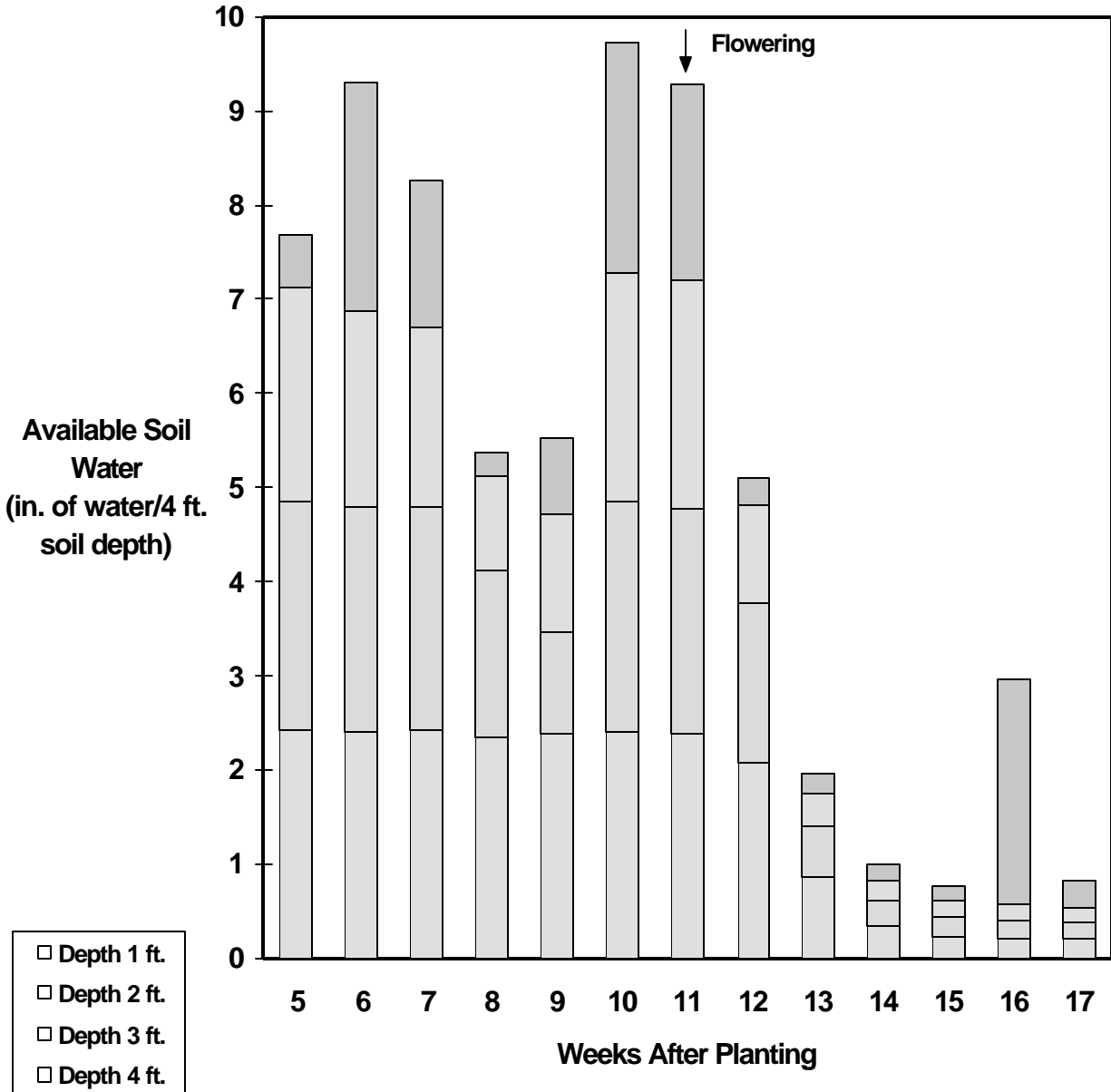


Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Vilas from planting to first freeze was 8.47 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 1999. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		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)					
DEKALB	DK-43A	10	66	1614	111	ME	48	21.7	0	62	126	105					
DEKALB	DK-44	9	67	1637	113	ME	49	26.7	0	61	122	101					
ASGROW	X 9880	9	64	1575	111	ME	48	24.4	0	61	121	100					
CARGILL	627	9	64	1575	110	ME	50	25.9	0	61	120	100					
PIONEER	8505	9	63	1560	109	ME/M	48	21.9	0	62	120	99					
MYCOGEN	1482	8	65	1596	108	ME	46	24.4	0	59	119	98					
TRIUMPH	TR 459	9	65	1596	113	ME	45	24.4	0	62	118	98					
TRIUMPH	TR 447	9	67	1637	113	ME	47	25.6	0	60	118	98					
DEKALB	X-944	9	68	1663	113	ME	50	21.7	0	62	117	97					
PIONEER	85Y34	9	62	1538	106	ME	49	27.5	0	60	116	96					
ASGROW	Seneca	9	67	1637	113	ME	45	25.6	0	61	116	96					
CARGILL	647	10	66	1614	112	ME	51	22.5	0	62	114	95					
DEKALB	DK-40y	10	66	1614	112	ME	50	23.2	0	61	114	94					
DEKALB	DK-38y	10	64	1575	108	ME	43	18.3	0	58	108	90					
PIONEER	84G62	9	71	1743	121	M/ML	50	23.2	0	61	138	115					
ASGROW	A355	10	68	1663	114	M/ME	50	25.2	0	59	127	106					
CARGILL	697	10	71	1743	119	M/ME	53	23.2	0	61	127	105					
CARGILL	770Y	9	71	1743	117	M	50	25.6	0	59	125	104					
ASGROW	A459	8	70	1714	115	M	53	24.4	0	60	122	101					
(Check)	399 x 2436	8	72	1771	123	ML/M	49	24.0	0	60	122	101					
Average		9	67	1640	113	ME	49	24.0	0	61	120						
LSD	0.20										7.0						

\1 Planted: May 31; Harvested: November 9.

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, 1997-99.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	--	109	116	113	--	--	99	96	98	--
CARGILL	627	42	123	120	122	95	100	111	100	106	104
CARGILL	647	40	120	114	117	91	95	108	85	97	96
CARGILL	697	--	116	127	122	--	--	105	105	105	--
CARGILL	770Y	45	115	125	120	95	108	104	104	104	105
DEKALB	DK-38y	38	96	108	102	81	90	87	90	89	89
DEKALB	DK-43A	34	119	126	123		80	109	105	107	
DEKALB	DK-44	34	113	122	118	90	80	102	101	102	94
TRIUMPH	TR 447	--	121	118	120	--	--	110	98	104	--
TRIUMPH	TR 459	45	99	118	109	87	108	90	98	94	99
(Check)	399 X 2436	36	111	122	117	90	87	100	101	101	96
Average		40	110	120	115	90					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1999

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: 43,500 Seed/A. PLANTED: June 3. HARVESTED: October 28.

EMERGENCE DATE: 7 days after planting.
SOIL TEMP: 66 F.

PEST CONTROL: Preemergence
Herbicides: LandMaster 54 Oz/A. Post
Emergence Herbicides: Atrazine 1.0 Lb/A,
COC 1.0 Qt/A, Banvel 2.0 Oz/A.
CULTIVATION: Once. INSECTICIDES:
None.

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

COMMENTS: Planted in good soil moisture. Weed control was very good. Near normal precipitation for the growing season, with a dry June and a wet August. No greenbug infestation. None of the hybrids lodged. Grain yields were very good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.6	1.8	11	0.5	596	0.9	9.7
8"-24"				6				
Comment	Alka	Vlo	Hi	Mod	VLo	VHi	Lo	Adeq
Manganese and Copper levels were adequate.								

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	0.56	592	13	0	27
July	1.91	869	23	5	58
August	3.75	787	19	0	89
September	2.25	462	5	0	118
Total	8.47	2710	60	5	118
\1 Growing season from June 3 (planting) to September 29 (first freeze, 30 F).					
\2 GDD: Growing Degree Days for sorghum.					
\3 DAP: Days After Planting.					

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	50/6	20	0	0
Yield Goal: 50 Bu/A.				
Actual Yield: 82 Bu/A.				

Available Soil Water
Dryland Grain Sorghum, Walsh, 1999

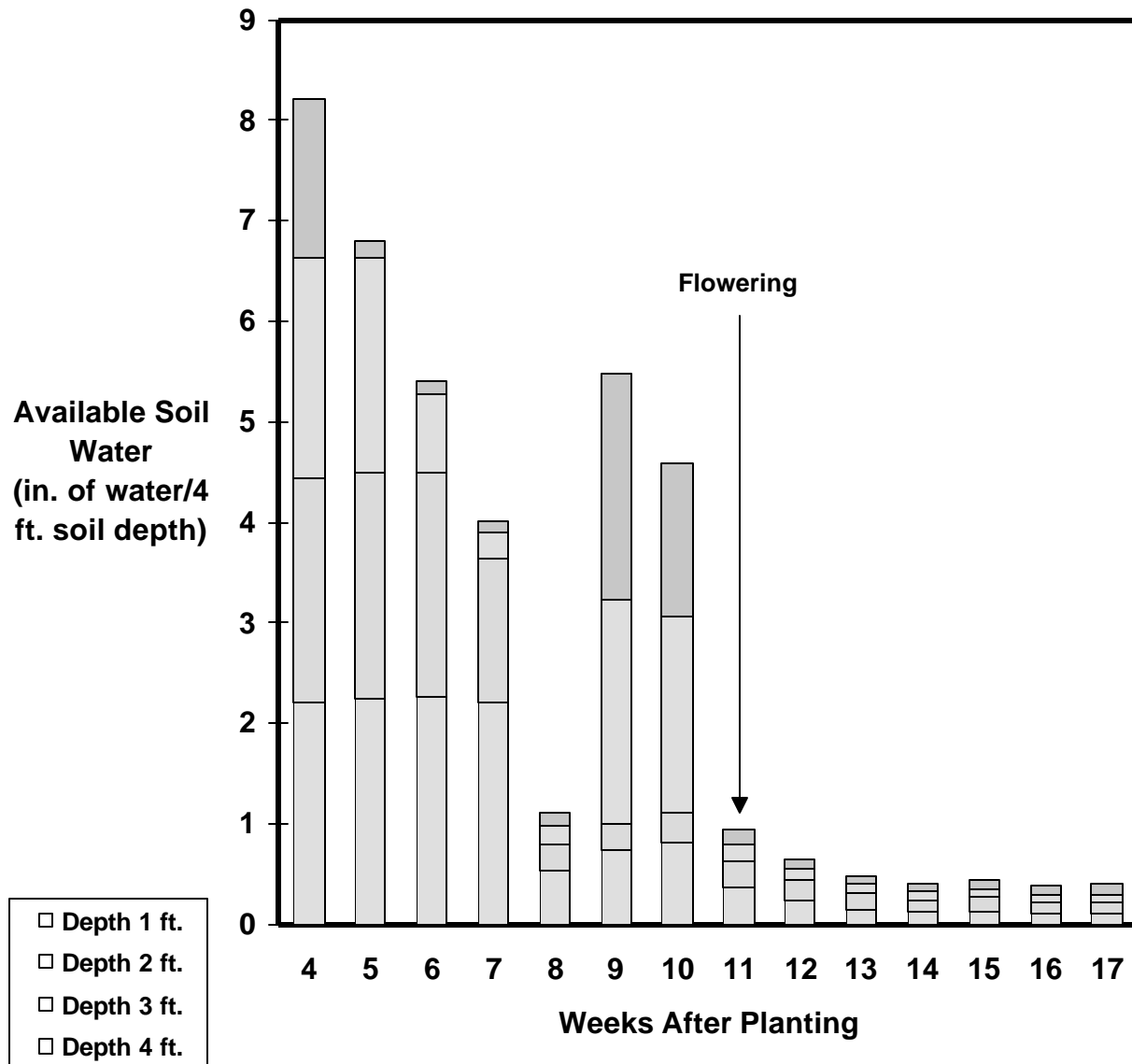


Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 8.47 in. Any increase in available soil water between weeks is from rain.

Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 1999. \1

Brand	Hybrid	Days to Emerge	50% Bloom		50% Mature		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	%
PIONEER	85Y34	8	67	1661	104	ME	45	23.2	0	57	86	105					
DEKALB	DK-44	8	73	1816	119	ME	43	27.5	0	60	86	104					
DEKALB	DK-43A	8	74	1844	117	ME	43	25.2	0	59	85	104					
MYCOGEN	X 9880	7	72	1788	116	ME	42	26.3	0	60	85	104					
ASGROW	Seneca	7	74	1844	119	ME	42	28.3	0	61	85	103					
TRIUMPH	TR 438	8	67	1661	104	ME	46	23.6	0	60	85	103					
DEKALB	DK-40y	8	73	1816	118	ME	46	22.5	0	61	85	103					
PIONEER	8505	7	69	1718	107	ME	47	25.2	0	61	84	102					
MYCOGEN	1482	7	69	1718	109	ME	41	25.6	0	61	83	101					
NC+	5B74E	7	70	1746	111	ME	40	24.8	0	59	79	96					
DEKALB	X-944	8	74	1844	119	ME	43	29.4	0	60	79	96					
NK BRAND	KS 310	7	69	1718	105	ME	43	26.7	0	60	78	95					
DEKALB	DK-38y	9	71	1770	114	ME	39	23.6	0	56	77	94					
PIONEER	84G62	7	78	1950	123	M/ML	44	28.3	0	58	87	107					
CARGILL	737	7	77	1925	121	M	42	25.6	0	59	83	102					
NK BRAND	KS 585	7	75	1872	120	M	42	31.0	0	61	83	101					
CARGILL	730	7	78	1950	122	M	43	27.1	0	59	83	101					
CARGILL	770Y	7	76	1900	120	M	44	27.5	0	59	81	99					
ASGROW	A355	8	76	1900	121	M/ME	41	22.5	0	58	80	98					
NC+	6R30	7	75	1872	120	M	39	27.9	0	58	72	88					
CARGILL	837	7	77	1925	124	ML	45	24.8	0	59	85	103					
(Check)	399 X 2436	7	79	1977	124	ML/M	42	27.1	0	60	75	92					
Average		7	73	1828	116	ME	43	26.1	0	59	82						
LSD 0.20											2.9						

\1 Planted: June 3; Harvested: October 28.

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, 1997-99.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	Seneca	--	80	85	83	--	--	89	103	96	--
CARGILL	627	86	84	--	85	--	104	93	--	99	--
CARGILL	647	79	87	--	83	--	95	96	--	96	--
CARGILL	730	82	--	83	83	--	99	---	101	100	--
CARGILL	737	94	--	83	89	72	113	---	102	108	72
CARGILL	770Y	92	99	81	90	91	110	110	99	105	106
CARGILL	837	98	--	85	92	--	118	--	103	111	--
DEKALB	DK-38y	96	96	77	87	90	116	107	94	101	106
DEKALB	DK-43A	83	113	85	99	--	100	126	104	115	--
DEKALB	DK-44	88	88	86	87	87	106	98	104	101	103
GOLDEN HARVEST	H-430Y	91	82	--	87	--	110	91	--	101	--
NC+	6B50	96	85	--	91	--	116	95	--	106	--
NC+	5B74E	96	101	79	90	92	116	112	96	104	108
NK BRAND	KS 310	70	--	78	74	--	84	--	95	90	--
NK BRAND	KS 585	103	97	83	90	94	123	108	103	106	111
PIONEER	8500	89	99	--	94	--	108	109	--	109	--
PIONEER	8505	77	95	84	90	85	92	106	102	104	100
PIONEER	85Y34	53	99	86	93	79	64	110	105	108	93
PIONEER	87G57	63	80	--	72	--	75	88	--	82	--
(Check)	399 X 2436	86	74	75	75	78	103	82	92	87	92
Average		83	90	82	86	85					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1999

COOPERATORS: Fred Williams Farm, Hartman, 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 soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 104,500 Seed/A. PLANTED: May 28. HARVESTED: October 27.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 60 F.

PEST CONTROL: Preemergence Herbicides: Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: Banvel 3 Oz/A; 2,4-D 6 Oz/A. CULTIVATION: Once. INSECTICIDE: None.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----No. of Days-----		
May	0.00	66	0	0	3
June	3.05	640	15	0	33
July	1.65	885	22	6	64
August	5.20	803	21	1	95
September	1.28	446	5	0	124
Total	11.18	2840	63	7	124

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

COMMENTS: Planted in good soil moisture. Weed control was good. Above normal precipitation for the growing season with August well above average. No greenbug infestation. None 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: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	8.0	0.7	2.9	7	1.7	304	2.3	14
8"-24"				6				
Comment	Alka	VLo	VHi	Mod	VLo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	37	40	0	0
Applied	100	20	0	0

Yield Goal: 140 Bu/A.
 Actual Yield: 138 Bu/A.

Available Soil Water
Irrigated Grain Sorghum, Hartman, 1999

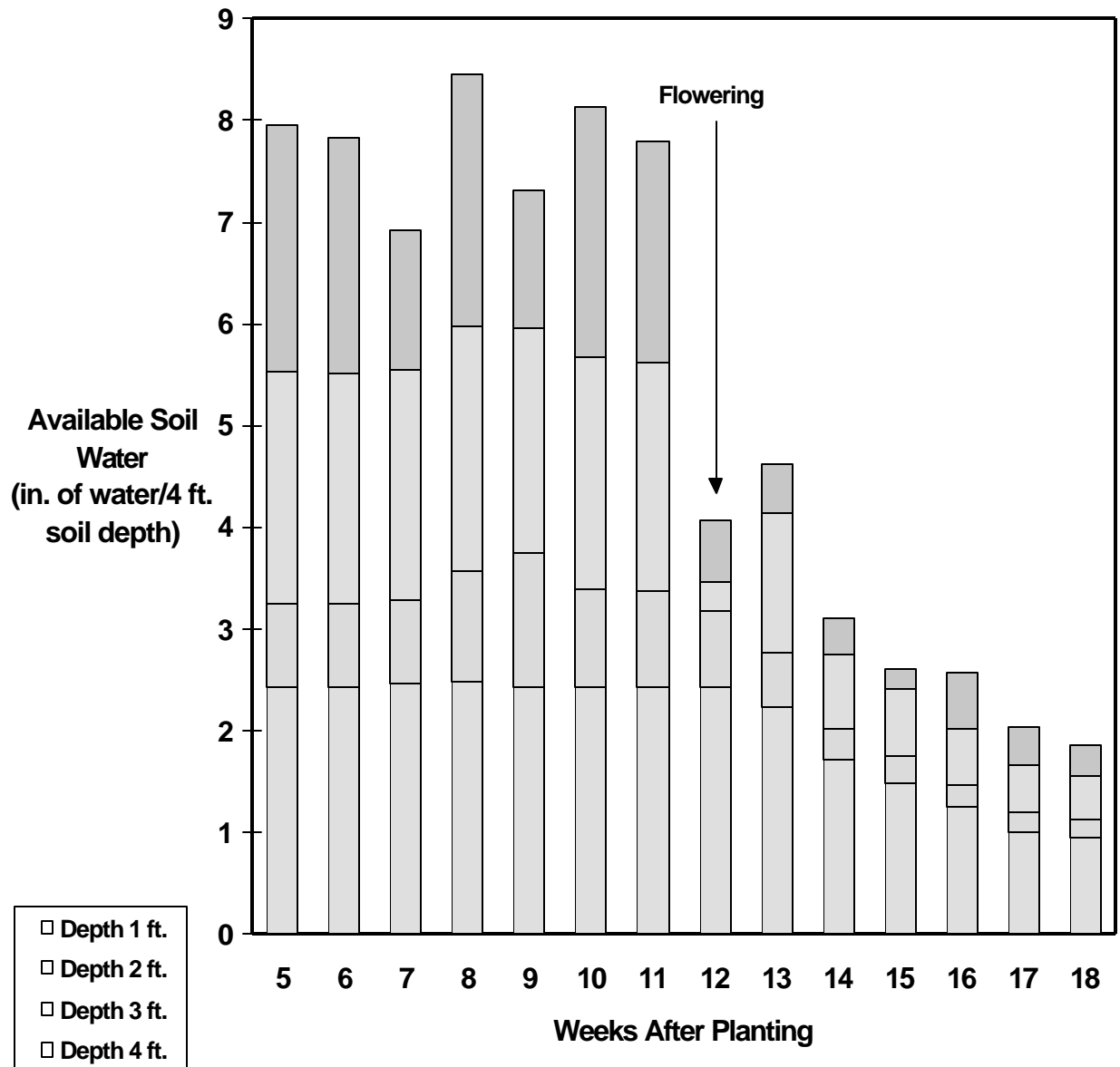


Fig. 4. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 11.18 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 1999. \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	%
PIONEER	84G62	10	77	1906	124	M/ML	52	28.9	0	59	153	111
ASGROW	A459	10	78	1926	124	M	52	35.5	0	62	146	106
DEKALB	DK-47	11	75	1854	123	M	52	36.2	0	61	144	104
MYCOGEN	1506	10	76	1881	124	M	61	36.2	0	60	136	98
DEKALB	DK-53	12	79	1954	125	M/ML	58	38.3	0	61	134	97
ASGROW	A355	10	75	1854	123	M/ME	50	33.1	0	60	133	97
MYCOGEN	3696	11	78	1906	124	M/ML	49	30.0	0	58	131	95
(Check)	399 X 2436	11	80	1982	126	ML/M	46	27.5	0	60	144	105
DEKALB	X-8854	11	81	1982	126	ML	60	33.8	0	58	131	95
DEKALB	DK-56	13	82	2040	127	ML	51	19.6	0	60	131	95
TRIUMPH	TR 461	12	80	1982	125	ML/M	52	28.9	0	59	131	95
Average		11	78	1933	125	M	53	31.6	0	60	138	
LSD	0.20										7.6	

\1 Planted: May 28; Harvested: October 27.

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, 1997-99.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
DEKALB	DK-47	139	140	144	142	141	97	109	104	107	103
DEKALB	DK-56	163	123	131	127	139	114	96	95	96	102
MYCOGEN	1506	154	145	136	141	145	108	113	98	106	106
TRIUMPH	TR 481	136	125	--	131	--	95	98	--	97	--
(Check)	399 X 2436	136	114	144	129	131	95	89	105	97	96
Average		142	127	138	133	136					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1999

COOPERATORS: Plainsman Agri-Search Foundation, 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 Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 78,400 Seed/A. PLANTED: June 3. HARVESTED: October 29.

EMERGENCE DATE: 7 days after planting.
SOIL TEMP: 66 F.

IRRIGATION: Two furrow irrigations: July 30 and August 25, total applied 9.8 acre-in./A.

PEST CONTROL: Preemergence
Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: Buctril 16 Oz/A; Banvel 3 Oz/A.
CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season, with a dry June and a wet August. No greenbug infestation. Some of the hybrids had minor lodging. Grain 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-----		
June	0.56	592	13	0	27
July	1.91	869	23	5	58
August	3.75	787	19	0	89
September	2.25	462	5	0	118
Total	8.47	2710	60	5	118

\1 Growing season from June 3 (planting) to September 29 (first freeze, 30 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"	7.8	0.6	1.8	26	0.5	612	0.9	7.7
8"-24"				6				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	125/6	20	0	0

Yield Goal: 120 Bu/A.

Actual Yield: 112 Bu/A.

Available Soil Water
Irrigated Grain Sorghum, Walsh, 1999

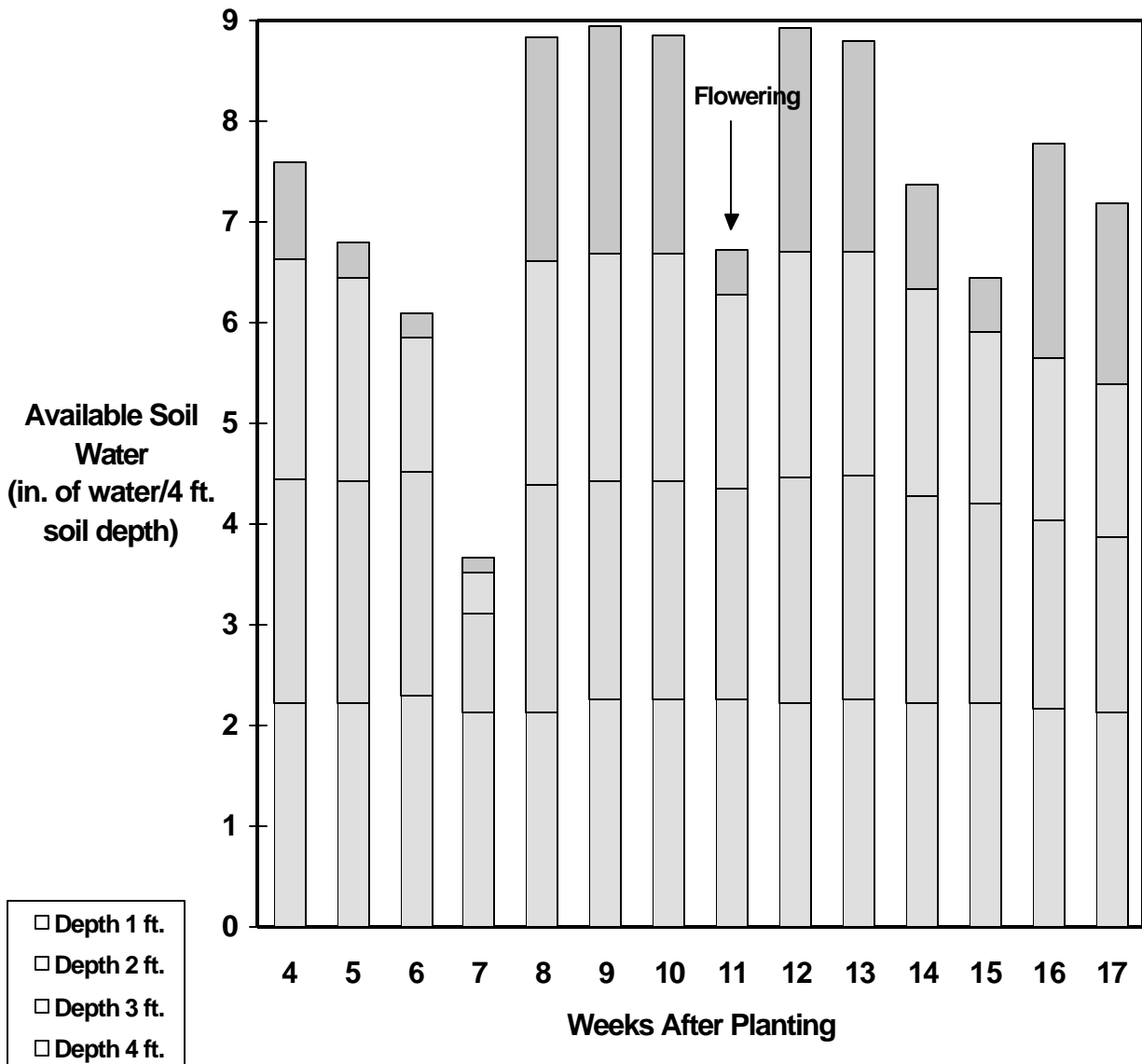


Fig. 5. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 8.47 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 1999. \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	%
TRIUMPH	TR 447	7	70	1771	117	ME	48	31.8	0	59	108	97	
PIONEER	84G62	7	73	1873	120	M/ML	51	34.9	0	60	119	106	
NK BRAND	KS 585	7	72	1789	118	M	53	32.5	0	61	115	103	
DEKALB	DK-47	8	71	1817	117	M	49	38.7	0	60	113	101	
ASGROW	A355	8	72	1789	118	M/ME	53	35.6	2	59	112	100	
MYCOGEN	1506	7	72	1789	118	M	60	30.6	8	58	111	99	
ASGROW	A459	7	73	1845	119	M	59	34.5	6	61	111	99	
DEKALB	X-8854	7	72	1845	118	M/ML	59	34.9	20	59	108	97	
DEKALB	DK-53	8	73	1873	119	M/ML	55	37.2	0	61	108	96	
NC+	6B70	8	74	1845	121	ML/M	52	32.5	0	60	119	106	
MYCOGEN	3696	7	74	1901	122	ML	48	33.7	0	55	114	102	
CARGILL	833	7	75	1926	122	ML	48	35.6	0	59	113	101	
NK BRAND	KS 73-J6	8	75	1873	122	ML	54	31.8	0	57	113	101	
(Check)	399 X 2436	7	74	1901	121	ML/M	49	37.6	0	58	106	95	
DEKALB	DK-56	9	75	1926	122	ML	56	23.2	4	59	102	91	
Average		7	73	1851	120	M	53	33.7	3	59	112		
LSD	0.20										6.0		

\1 Planted June 3; Harvested: October 29.

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, 1997-99.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
CARGILL	833	--	124	113	119	--	--	103	101	102	--
DEKALB	DK-47	94	115	113	114	107	104	96	101	99	100
DEKALB	DK-56	86	133	102	118	107	96	111	91	101	99
MYCOGEN	1506	102	123	111	117	112	113	102	99	101	105
NK BRAND	KS 585	100	--	115	108	--	111	---	103	107	--
NK BRAND	KS 73-J6	98	127	113	120	113	109	105	101	103	105
PIONEER	84G62	--	140	119	130	--	--	116	106	111	--
(Check)	399 X 2436	79	111	106	109	99	87	92	95	94	91
Average		90	120	112	116	107					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1999

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: 52,300 Seed/A. PLANTED: June 3. HARVESTED: September 10.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 66 F.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A. Post Emergence Herbicides: Atrazine 1.0 Lb/A, COC 1.0 Qt/A, Banvel 2 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	0.56	592	13	0	27
July	1.91	869	23	5	58
August	3.75	787	19	0	89
September	0.05	235	5	0	99
Total	6.27	2483	60	5	99

\1 Growing season from June 3 (planting) to September 10 (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 good soil moisture. Weed control was very good. Near normal precipitation for the growing season, with a dry June and a wet August. No greenbug infestation. Forage yields were very good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.9	0.6	1.8	11	0.5	596	0.9	9.7
8"-24"				6				
Comment	Alka	VLo	Hi	Mod	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	50/6	20	0	0

Yield Goal: 10 Ton/A.
Actual Yield: 14 Ton/A.

Available Soil Water
Dryland Forage Sorghum, Walsh, 1999

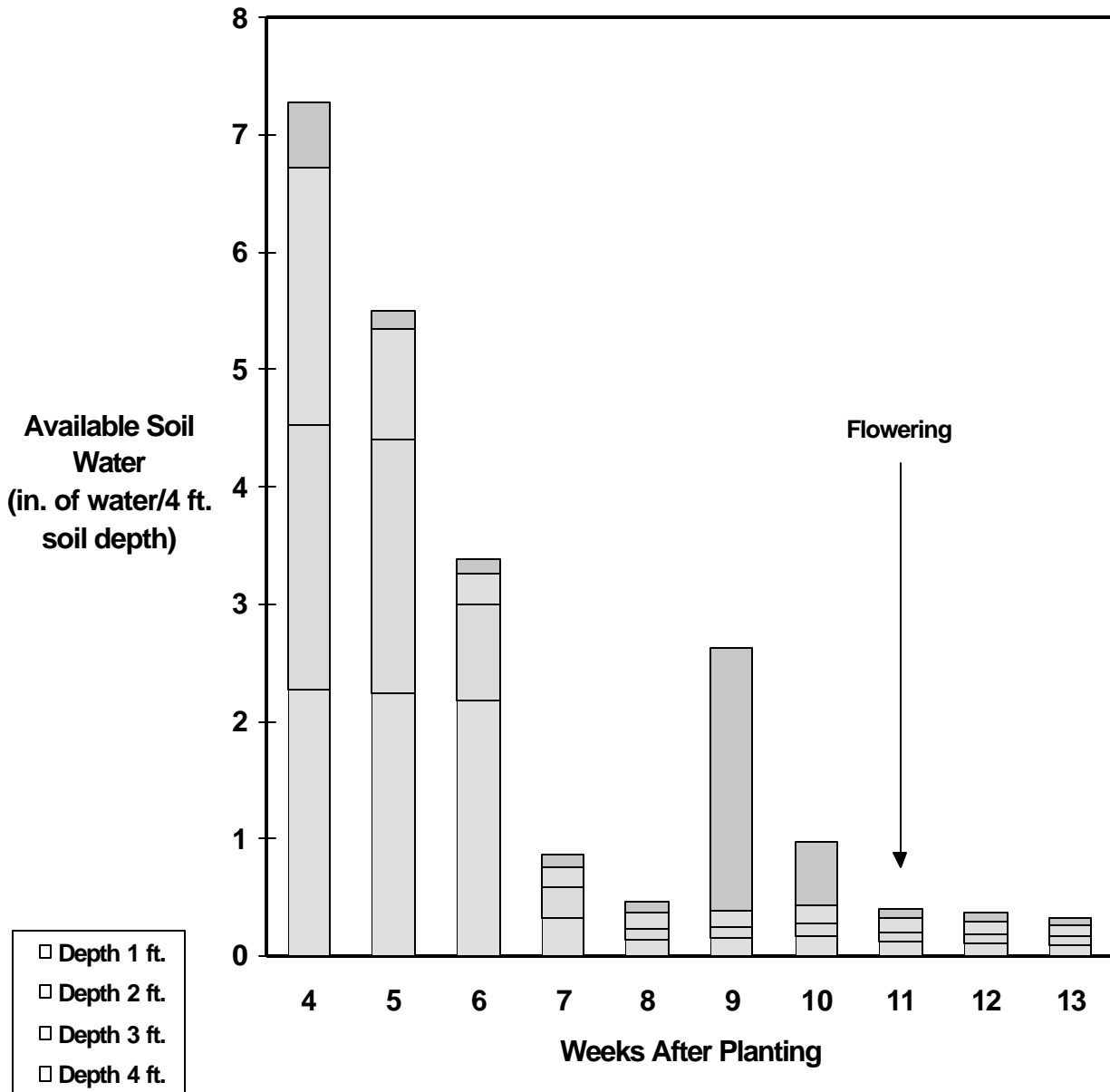


Fig. 6. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 6.27 in. Any increase in available soil water between weeks is from rain.

Table 12.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 1999. \1

Brand	Hybrid	Forage Type \2	Days			Harvest Density	Stage \3				Yield % of Test Average
			Days to Emerge	to 50% Bloom	Plant Ht.		at Harvest	Stem Sugar	Plants Lodged	Forage Yield	
				Plants/A (1000 X)	In.	%	%	Tons/A			
DEKALB	FS-25E	FS	8	96	35.0	76	PM	11	0	17.6	125
DEKALB	X-488	FS	7	82	32.5	65	LM	6	0	16.1	114
BUFFALO BRAND	Canex	FS	8	78	36.8	86	ED	15	0	15.7	111
(Check)	NB 305F	FS	8	82	42.2	88	LM	14	0	15.1	107
DEKALB	FS-5	FS	8	86	33.7	90	MM	12	0	15.1	107
ASGROW	XP BMR 1	FS	7	81	43.0	92	LM	7	35	12.9	91
BUFFALO BRAND	Canex II	FS	8	78	26.1	95	ED	14	1	10.9	77
BUFFALO BRAND	BMR-FS	FS	6	77	39.1	83	ED	9	3	10.3	73
CARGILL	Sweet Souix 5	SS	7	78	37.6	106	ED	10	15	17.1	121
BUFFALO BRAND	Buffalo Brand	SS	8	74	42.6	105	SD	9	1	15.7	111
BUFFALO BRAND	BMR-SS	SS	7	77	39.5	92	SD	8	8	15.6	111
DEKALB	SX-8	SS	7	85	41.8	100	MM	10	5	14.7	104
BUFFALO BRAND	Grazex II W	SS	8	71	34.1	106	HD	9	0	14.5	103
BUFFALO BRAND	Grazex II	SS	7	70	34.8	92	HD	9	0	13.4	95
DEKALB	ST-6E	SS	7	78	33.3	105	ED	11	4	13.0	92
CARGILL	X18347	SS	7	71	34.5	96	HD	13	1	11.1	79
CARGILL	7821 Bt	Corn	5	70	31.8	82	ED	12	0	10.2	72
Average		FS	7	78	36.4	92	SD	11	4	14.1	
LSD 0.20										2.24	

\1 Planted: June 3; Harvested: September 10.

\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, 1997-99.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	XP BMR 1	--	17.1	12.9	15.0	--	--	96	91	94	--
BUFFALO BRAND	Canex	10.3	17.1	15.7	16.4	14.4	100	96	111	104	102
BUFFALO BRAND	Canex II	10.3	18.8	10.9	14.9	13.3	100	105	77	91	94
BUFFALO BRAND	Buffalo Brand	10.7	16.9	15.7	16.3	14.4	104	95	111	103	103
BUFFALO BRAND	Grazex II	10.0	18.8	13.4	16.1	14.1	97	106	95	101	99
BUFFALO BRAND	Grazex II W	9.4	18.1	14.5	16.3	14.0	91	101	103	102	98
BUFFALO BRAND	BMR-FS	--	17.1	10.3	13.7	--	--	97	73	85	--
BUFFALO BRAND	BMR-SS	--	18.1	15.6	16.9	--	--	102	111	107	--
CARGILL	X18347	--	20.2	11.1	15.7	--	--	114	79	97	--
DEKALB	FS-5	11.8	20.0	15.1	17.6	15.6	115	112	107	110	111
DEKALB	ST-6E	--	18.7	13.0	15.9	--	--	106	92	99	--
DEKALB	SX-8	--	18.9	14.7	16.8	--	--	107	104	106	--
(Check)	NB 305F	11.4	18.1	15.1	16.6	14.9	111	102	107	105	107
(Check)	Corn	8.3	12.4	10.2	11.3	10.3	81	70	72	71	74
Average		10.1	17.7	14.1	15.9	14.0					

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

Table 14.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1999.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	In -----%-----									
					CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
(Check)	NB 305F	FS	72	74	13.9	9.2	37.7	57.8	59.6	95.9	0.41	0.37	2.83	0.26
BUFFALO BRAND	Canex II	FS	70	79	12.4	8.2	38.2	54.5	59.0	100.9	0.37	0.51	2.60	0.28
ASGROW	XP BMR 1	FS	76	70	12.3	8.1	35.3	54.2	62.3	105.4	0.38	0.34	2.83	0.24
DEKALB	FS-25E	FS	89	77	12.2	8.1	36.1	52.9	61.4	106.8	0.36	0.53	2.53	0.26
DEKALB	X-488	FS	74	53	12.1	8.1	35.3	52.5	62.3	108.8	0.38	0.41	2.75	0.26
BUFFALO BRAND	BMR-FS	FS	70	71	11.9	8.0	37.5	58.0	59.8	95.6	0.40	0.23	2.75	0.25
BUFFALO BRAND	Canex	FS	70	80	11.1	7.5	38.7	57.7	58.5	94.7	0.37	0.38	2.50	0.25
DEKALB	FS-5	FS	78	80	10.5	7.0	38.7	53.1	58.5	103.0	0.31	0.63	2.26	0.26
BUFFALO BRAND	Buffalo Brand	SS	63	68	12.3	8.3	38.0	51.8	59.3	106.4	0.36	0.62	2.42	0.27
DEKALB	ST-6E	SS	70	82	11.8	8.0	36.3	51.7	61.1	109.1	0.35	0.54	2.48	0.26
BUFFALO BRAND	BMR-SS	SS	70	74	11.8	8.2	37.1	51.9	60.2	107.4	0.37	0.50	2.63	0.28
BUFFALO BRAND	Grazex II W	SS	63	74	11.1	7.5	38.6	51.1	58.6	107.1	0.34	0.61	2.23	0.27
CARGILL	Sweet Souix 5	SS	70	80	11.1	7.6	38.0	53.1	59.2	103.9	0.35	0.55	2.50	0.26
CARGILL	X18347	SS	63	65	10.8	7.5	34.3	50.5	63.4	114.6	0.34	0.43	2.57	0.24
DEKALB	SX-8	SS	75	88	10.0	7.0	37.0	51.6	60.4	108.3	0.32	0.57	2.27	0.25
BUFFALO BRAND	Grazex II	SS	62	67	9.8	6.8	37.5	53.9	59.8	103.1	0.32	0.51	2.29	0.23
CARGILL	7821 Bt	Com	66	72	12.9	8.8	35.8	48.8	61.7	116.3	0.37	0.63	2.64	0.27
Average		FS	71	74	11.6	7.9	37.1	53.2	60.3	105.1	0.36	0.49	2.53	0.26

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

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, Digestible Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; RFV, Relative Feed Value; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1999

COOPERATORS: Plainsman Agri-Search Foundation, 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 Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: June 3. HARVESTED: September 21.

EMERGENCE DATE: 7 days after planting. SOIL TEMP: 66 F.

IRRIGATION: Two furrow irrigations: July 16 and August 20, total applied 9.8 acre-in./A.

PEST CONTROL: Preemergence Herbicides: LandMaster 54 Oz/A, Atrazine 1.0 Lb AI/A. Post Emergence Herbicides: Buctril 16 Oz/A; Banvel 3 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	0.56	592	13	0	27
July	1.91	869	23	5	58
August	3.75	787	19	0	89
September	2.21	366	5	0	110
Total	8.43	2614	60	5	110

\1 Growing season from June 3 (planting) to September 21 (harvest).
 \2 GDD: Growing Degree Days for sorghum.
 \3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season, with a dry June and a wet August. No greenbug infestation. Forage yields were good.

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

Summary: Soil Analysis.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.8	0.6	1.8	26	0.5	612	0.9	7.7
8"-24"				6				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----Lb/A-----			
Recommended	0	40	2	0
Applied	125/6	20	0	0

Yield Goal: 18 Ton/A @ 70% M. C.
 Actual Yield: 19 Ton/A.

Available Soil Water
Irrigated Forage Sorghum, Walsh, 1999

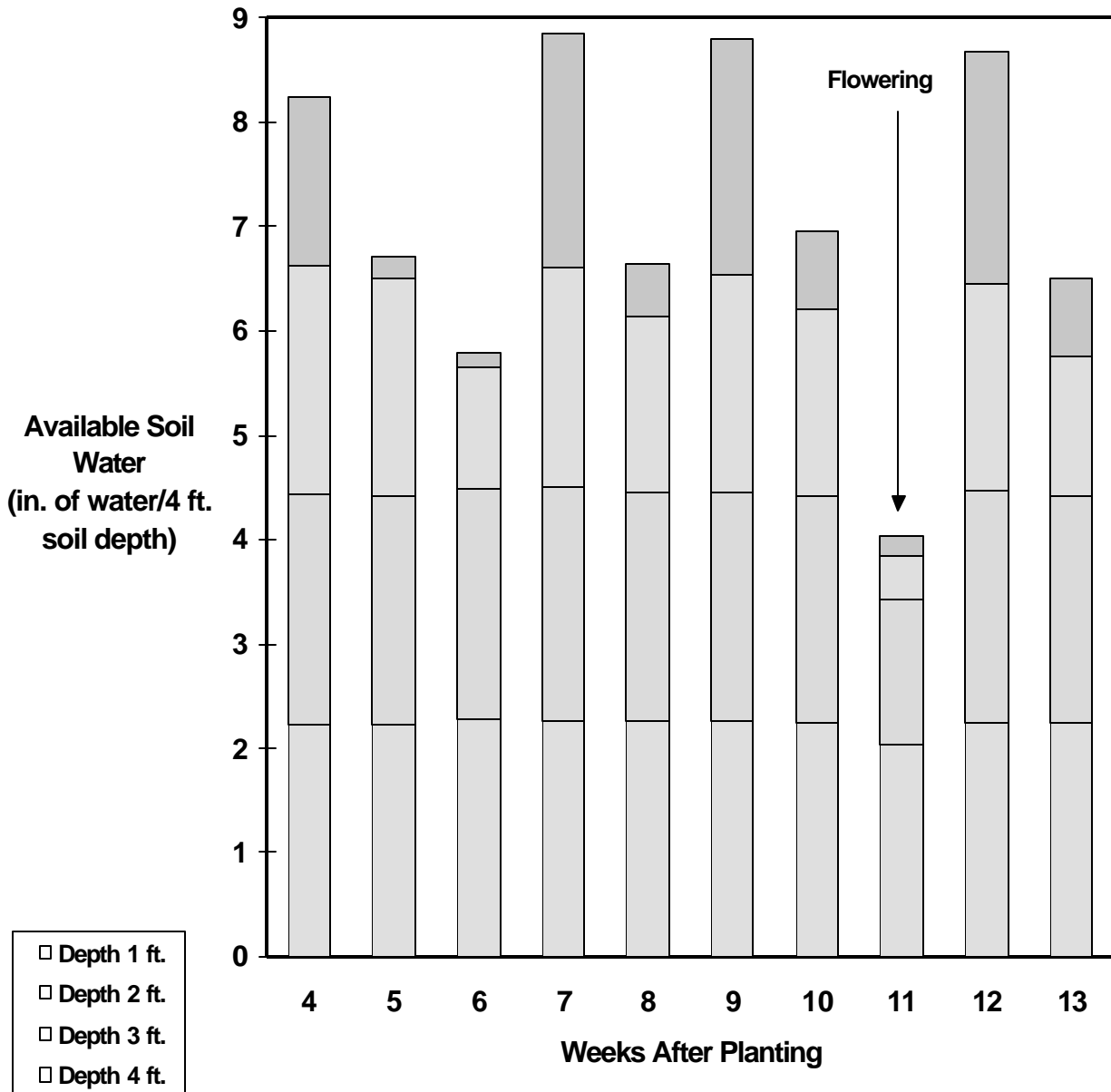


Fig. 7. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 8.43 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 1999. \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	%	
DEKALB	FS-25E	FS	7	97	44.1	113	PM	7	0	22.6	121
RICHARDSON	Pacesetter Plus	FS	6	Veg \4	42.2	114	Veg \4	5	0	19.6	105
DEKALB	FS-5	FS	8	85	43.4	104	MM	9	0	19.5	104
DEKALB	FS-22	FS	7	91	45.7	87	EM	9	0	19.4	104
BUFFALO BRAND	Canex	FS	9	77	40.3	97	ED	13	0	18.5	99
ASGROW	XP BMR 1	FS	7	78	47.6	100	ED	8	20	18.3	98
(Check)	NB 305F	FS	8	79	36.4	99	LM	8	0	17.9	96
RICHARDSON	Dairy Master BMR	FS	7	83	38.7	98	MM	7	6	17.6	94
DEKALB	X-488	FS	8	77	43.0	77	ED	4	0	17.3	93
BUFFALO BRAND	BMR-FS	FS	6	76	43.8	95	SD	8	40	16.1	86
BUFFALO BRAND	Canex II	FS	9	77	28.3	101	ED	11	0	15.3	82
DEKALB	SX-8	SS	7	79	46.9	126	LM	9	16	22.3	119
CARGILL	X18347	SS	7	71	41.4	117	HD	10	2	19.6	105
BUFFALO BRAND	Grazex II W	SS	7	71	43.4	110	HD	11	0	19.1	102
CARGILL	Sweet Souix 5	SS	7	77	35.6	114	ED	11	7	19.1	102
BUFFALO BRAND	Grazex II	SS	7	69	38.3	110	HD	9	0	18.9	101
DEKALB	ST-6E	SS	7	77	41.8	124	ED	7	3	18.6	99
BUFFALO BRAND	Buffalo Brand	SS	7	74	36.8	123	SD	9	0	18.3	98
RICHARDSON	Honey Graze BMR	SS	7	79	35.2	106	LM	11	3	17.7	95
BUFFALO BRAND	BMR-SS	SS	7	76	42.2	103	SD	9	10	17.3	93
CARGILL	7821 Bt	Corn	5	70	35.6	106	ED	9	0	20.1	107
Average		FS	7	78	40.5	106	ED	9	5	18.7	
LSD 0.20										1.62	

\1 Planted June 3; 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.

\4 ASGROW Pacesetter Plus remained vegetative.

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

Table 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 1997-99.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Bu/A-----					-----%-----				
ASGROW	XP BMR 1	--	22.5	18.3	20.4	--	--	107	98	103	--
BUFFALO BRAND	Canex	12.8	17.5	18.5	18.0	16.3	82	83	99	91	88
BUFFALO BRAND	Canex II	11.2	19.7	15.3	17.5	15.4	71	94	82	88	82
BUFFALO BRAND	Buffalo Brand	17.8	21.8	18.3	20.1	19.3	113	104	98	101	105
BUFFALO BRAND	Grazex II	18.5	20.7	18.9	19.8	19.4	118	99	101	100	106
BUFFALO BRAND	Grazex II W	19.0	21.6	19.1	20.4	19.9	121	103	102	103	109
BUFFALO BRAND	BMR-FS	--	21.2	16.1	18.7	--	--	101	86	94	--
BUFFALO BRAND	BMR-SS	--	19.9	17.3	18.6	--	--	95	93	94	--
CARGILL	Sweet Souix V	19.4	--	19.1	19.3	--	124	---	102	113	--
CARGILL	X18347	--	20.2	19.6	19.9	--	--	96	105	101	--
CARGILL	X25477	19.3	21.4	--	20.4	--	123	102	--	113	--
DEKALB	FS-5	13.9	21.7	19.5	20.6	18.4	89	103	104	104	99
DEKALB	FS-25E	--	25.0	22.6	23.8	--	--	119	121	120	--
DEKALB	FS-22	--	22.2	19.4	20.8	--	--	106	104	105	--
MYCOGEN	T-E Silomaker	15.9	22.2	--	19.1	--	101	105	--	103	--
MYCOGEN	Greenchopper	15.0	24.6	--	19.8	--	96	117	--	107	--
(Check)	NB 305F	14.3	18.7	17.9	18.3	17.0	91	89	96	93	92
(Check)	Corn	13.5	15.1	20.1	17.6	16.2	86	72	107	90	88
Average		15.7	21.0	18.7	19.9	18.5					

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

Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 1999.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	-----%-----									
					CP	DP	ADF	NDF	TDN	RFV	P	Ca	K	Mg
ASGROW	XP BMR 1	FS	71	81	13.6	8.8	37.7	58.7	59.6	94.4	0.42	0.28	2.96	0.23
DEKALB	X-488	FS	70	60	13.5	8.8	37.6	54.8	59.7	101.1	0.42	0.40	2.87	0.27
(Check)	NB 305F	FS	70	80	13.0	8.4	37.4	56.0	59.9	99.3	0.40	0.38	2.85	0.27
RICHARDSON	Pacesetter Plus	FS	Veg \2	92	12.9	8.5	38.5	57.8	58.6	94.8	0.36	0.47	2.58	0.22
RICHARDSON	Dairy Master BMR	FS	72	79	12.3	8.2	39.8	58.2	57.1	92.6	0.39	0.39	2.75	0.27
BUFFALO BRAND	Canex	FS	69	85	12.2	8.1	39.6	58.7	57.3	91.9	0.36	0.44	2.67	0.25
BUFFALO BRAND	BMR-FS	FS	68	78	11.9	8.2	36.9	57.9	60.5	96.7	0.40	0.23	2.95	0.25
BUFFALO BRAND	Canex II	FS	69	83	11.0	7.4	38.5	55.5	58.7	98.8	0.36	0.45	2.58	0.26
DEKALB	FS-25E	FS	87	85	10.7	7.4	36.5	54.2	61.0	103.8	0.34	0.38	2.43	0.24
DEKALB	FS-22	FS	83	63	10.6	7.3	36.4	53.8	61.0	104.6	0.34	0.43	2.57	0.23
DEKALB	FS-5	FS	76	86	10.0	6.8	39.6	57.0	57.4	94.8	0.32	0.51	2.26	0.22
BUFFALO BRAND	Grazex II W	SS	63	90	13.2	8.7	36.9	52.8	60.5	106.0	0.35	0.64	2.55	0.26
BUFFALO BRAND	BMR-SS	SS	68	77	13.2	8.8	37.6	56.6	59.6	97.9	0.38	0.46	2.69	0.25
BUFFALO BRAND	Grazex II	SS	61	83	12.8	8.6	37.4	59.8	59.9	93.0	0.41	0.21	3.00	0.25
CARGILL	X18347	SS	63	70	12.7	8.4	37.0	53.4	60.4	104.7	0.35	0.57	2.55	0.25
DEKALB	SX-8	SS	71	94	11.8	7.8	38.9	61.4	58.1	88.7	0.35	0.32	2.66	0.21
BUFFALO BRAND	Buffalo Brand	SS	65	80	11.2	7.5	39.6	57.9	57.4	93.2	0.35	0.45	2.38	0.23
RICHARDSON	Honey Grazer BMR	SS	72	77	10.8	7.3	37.9	57.7	59.3	95.6	0.36	0.34	2.66	0.23
DEKALB	ST-6E	SS	66	85	10.5	7.1	38.4	55.7	58.8	98.5	0.33	0.47	2.44	0.23
CARGILL	Sweet Souix 5	SS	69	92	10.1	6.6	38.4	55.9	58.8	98.3	0.31	0.53	2.44	0.24
CARGILL	7821 Bt	Corn	66	84	12.0	8.2	36.3	54.3	61.2	103.8	0.33	0.52	2.75	0.23
Average		FS	67	81	11.9	7.9	37.9	56.6	59.3	97.7	0.36	0.42	2.65	0.24

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

\2 RICHARSON Pacesetter Plus remained vegetative.

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; DP, Digestible Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; RFV, Relative Feed Value; P, Phosphorus; Ca, Calcium; K, Potassium; Mg, Magnesium.

Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 1999

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:** May 20. **HARVESTED:** September 14.

EMERGENCE DATE: 12 days after planting. **SOIL TEMP:** 62 °F.

IRRIGATION: Three furrow irrigations: May 27, June 24, August 17, total applied 15 acre-in/A.

PEST CONTROL: Preemergence
Herbicides: Bifenox 2 lbs. AI/A. Post
Emergence Herbicides: None. Insecticide:
None.

CULTURAL PRACTICES: Previous crop: corn. Field Preparation: chisel, field cultivator, roller-pack, float. Cultivation: 2 times.

SOIL: Silty Clay Loam, 1 - 1.5 % O.M., pH-ca. 7.8. **FERTILIZER:** 50 lbs. P₂O₅ and 150 lbs. N/A.

COMMENTS: Excessive moisture (6.25") in April and early May resulted in wet, cloddy compacted soils. Germination was not as good as we expected. Greater than average precipitation in July and August. No lodging. Greenbugs were not a problem.

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-----		
May	0.42	155	1	0	11
June	0.96	577	18	0	41
July	6.79	767	25	5	72
August	2.79	686	23	0	103
September	T	245	6	0	117
Total	10.96	2430	73	5	117

\1 Growing season from May 20 (planting) to September 14 (harvest).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Table 18.-Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 1999. \1

Brand	Hybrid	Forage Type \2	Days		Plant Stand \3	Stage \4			Forage Yield	Yield % of Test Average
			to 50% Bloom			Plant Height	at Harvest	Stem Sugar		
				Plants/A (1000 X)	In.		%	%	Tons/A	%
DEKALB	SX-8	SS	88	74.0	129	ED	13	33	43.9	145
DEKALB	ST-6E	SS	78	72.4	127	SD	6	34	35.1	116
DEKALB	FS-5	FS	87	62.9	118	ED	7	32	34.8	115
DEKALB	FS-25E	FS	91	63.2	105	LM	9	29	34.4	113
BUFFALO BRAND	Buffalo Brand	SS	75	60.7	125	SD	8	36	33.5	110
BUFFALO BRAND	Canex	FS	79	68.6	104	SD	16	31	29.9	99
BUFFALO BRAND	Grazex II W	SS	72	63.7	116	SD	7	40	29.7	98
BUFFALO BRAND	BMR-FS	FS	82	67.2	102	SD	15	35	29.7	98
BUFFALO BRAND	Grazex II	SS	74	72.1	113	HD	6	36	29.3	97
BUFFALO BRAND	Canex II	FS	85	53.9	112	ED	14	31	29.1	96
ASGROW	XP BMR 1	FS	85	64.0	101	ED	5	28	27.8	91
BUFFALO BRAND	BMR-SS	SS	74	64.5	103	SD	11	35	26.1	86
(Check)	NB 305F	FS	87	76.5	104	SD	14	25	24.7	82
MYCOGEN	2725	Corn	70	37.6	77	HD	6	37	23.5	78
DEKALB	X-488	FS	82	76.0	87	HD	3	28	23.5	77
Average		FS	81	65.2	108	SD	9	33	30.3	
LSD 0.20									2.97	

\1 Planted May 20, 1999; Harvested: September 14, 1999.

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

\3 Plant Population per acre on June 21, 1999.

\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, 1997-99.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		1997	1998	1999	2-Year Avg	3-Year Avg	1997	1998	1999	2-Year Avg	3-Year Avg
		-----Tons/A-----					-----%-----				
ASGROW	XP BMR 1	---	30.4	27.8	29.1	---	---	96	91	94	---
BUFFALO BRAND	Buffalo Brand	29.5	38.0	33.5	35.8	33.7	119	120	110	115	116
BUFFALO BRAND	Canex	22.6	29.9	29.9	29.9	27.5	91	95	99	97	95
BUFFALO BRAND	Canex II	20.9	24.7	29.1	26.9	24.9	85	78	96	87	86
BUFFALO BRAND	Grazex II	25.7	32.9	29.3	31.1	29.3	104	104	97	101	102
BUFFALO BRAND	Grazex II W	26.2	35.0	29.7	32.4	30.3	107	111	98	105	105
BUFFALO BRAND	BMR-FS	---	24.0	29.7	26.8	---	---	76	98	87	---
BUFFALO BRAND	BMR-SS	---	28.6	26.1	27.4	---	---	90	86	88	---
DEKALB	SX-8	---	40.3	43.9	42.1	---	---	128	145	137	---
DEKALB	ST-6E	---	35.7	35.1	35.4	---	---	113	116	115	---
DEKALB	FS-5	---	34.4	34.8	34.6	---	---	109	115	112	---
DEKALB	FS-25E	27.0	34.0	34.4	34.2	31.8	109	108	113	111	110
MYCOGEN	Greenchopper	28.2	33.2	---	30.7	---	114	105	---	110	---
MYCOGEN	T-E Silomaker	25.6	36.3	---	30.9	---	103	115	---	109	---
(Check)	NB 305F	22.3	28.7	24.7	26.7	25.2	90	91	82	87	88
(Check)	Corn	18.4	23.9	23.5	23.7	21.9	74	76	78	77	76
Average		24.8	31.6	30.3	31.0	28.9					

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 sow grain sorghum on same row spacing as their wheat drill, typically on 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 study, the second 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 we tested were, 1, 2, 3, 4, 5 ft. We used a six row cone planter with 12 in. row spacing. We plugged the seed spouts as needed to provide each row spacing. The grain sorghum hybrid used was CARGILL 627 and the seeding rate for all row spacings was 40,000 Seeds/A. Weed control was via a broad spectrum pre-emergence herbicide (LandMaster 54 Oz/A) and a post emergence broadleaf weed herbicide mixture (Atrazine 1.0 Lb/A, COC 1 Qt/A, Banvel 2 Oz/A). The treatments were not cultivated. The plots were 12 ft. by 450 ft, with two replications. The plots were harvested with a self-propelled combine equipped with a straight head and wide plastic sorghum fingers. Only treatment rows adjacent to identically treated rows were recorded for harvest.

Results and Discussion

The wide row spacing (48 in.) used in Kiowa County was adopted during the severe drought of the 1930's and 1950's. To reach the soil moisture, they had to list very deep, "as deep as a man's leg". This wide row spacing continues today as supposed insurance against dry weather.

We found that the highest yield was with the narrowest row spacing, 1 ft. (Fig. 9). One of the reasons narrow row spacings produced higher yield than the wide row spacings was weed suppression. The narrowest row spacings (1 and 2 ft.) provided canopy closure and grass weed suppression; the wider row spacings did not. However, wider row spacing would allow weed cultivation between the rows, but with narrow row spacing weed suppression occurred with canopy closure, making supplemental weed control less critical.

This past year was an above average precipitation year (23.02 in. with 8.47 in. of rain during the sorghum growing season). With adequate rainfall, we found that increasing row spacing from 1 ft. to 5 ft. reduced grain yield by 6.6 Bu/A for each foot increase in row width. Our results from the last two years of this study showed that we produced 4 to 7 Bu/A more for each one foot decrease in row spacing width. Precipitation was well above average for the two years that this study was conducted. Our findings suggest that narrow row spacing is a viable method for grain sorghum production for higher moisture years.

In order for growers to implement a change in row spacing, this study needs to be conducted over multiple years and various weather conditions; thus far, narrow row technology appears profitable for wet years.

**Dryland Grain Sorghum Row Spacing Study
Walsh, 1999**

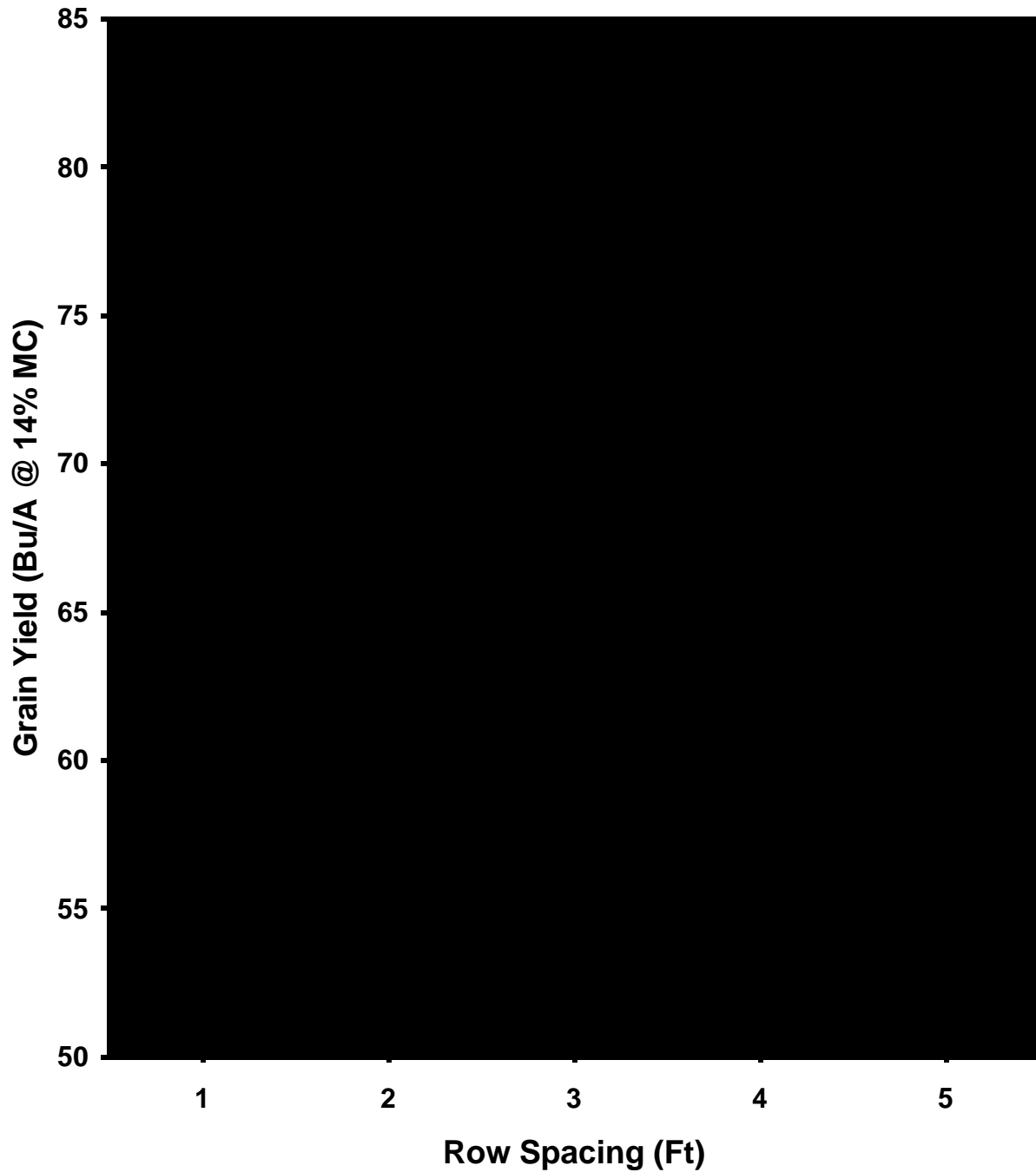


Fig. 8. Row spacing on dryland grain sorghum at Walsh. The five row spacings tested are: 1ft., 2 ft., 3 ft., 4 ft. and 5 ft. CARGILL 627 was sown at 40,000 Seeds/A.

Dryland Grain Sorghum Seeding Rate Study, Seedrow Applied Hydrogel Comparison, 1999

Kevin Larson and Dennis Thompson

In the dryland grain sorghum seeding rate study we conducted last year we observed a peculiar phenomenon, as the seeding rate increased the number of seeds developing into plants decreased (Larson, Schweissing, Thompson, 1999). One of the explanation for this phenomenon was insufficient water for germination from increasing seed competition for the limited germination water surrounding the seeds. The Area Irrigation Specialist, Jim Valliant, told us that he had had some success increasing soil water retention with a cross-linked polyacrylamide called Hydrogel. To keep the study simple and inexpensive, we simply added the Hydrogel with the seed.

Materials and Methods

The eight seeding rates we 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. For the Hydrogel treatment, we added 1.1 Lb of Hydrogel to 50 Lb seed. 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 32-0-0 and seedrow applied 5 Gal 10-34-0/A. Weed control was achieved with pre and post emergence herbicides (pre, LandMaster 54 Oz/A; post, atrazine 1.0 Lb/A, COC 1Qt/A, Banvel 2 Oz/A) and cultivation. The study was harvested with a self-propelled combine equipped with a digital scale.

Results and Discussion

The highest yielding seeding rate was 8 Lb/A, the highest rate we tested, which corresponds to 112,000 Seeds/A and 58,000 Plants/A (Fig. 10). There was no significant difference in plant density or grain yield between the hydrogel treated seed and the untreated seed (Orthogonal Comparison). The 95% confidence interval surrounding the regression coefficient easily encompassed the linear slopes of both the hydrogel and the untreated check, indicating that there was no difference in the linear yield response between the hydrogel and the untreated check.

Last year we reported that the dryland seeding rate study produced a puzzling phenomenon: as seeding rate increased fewer of the seeds developed into plants. One of the explanation for this decay curve was lack of water to germinate all the seeds. By introducing hydrogel with the seeds, we hoped to attract more water around the seeds and increase germination and yield. We did not increase plant density nor yield with the addition of hydrogel. This suggests that germination water is not the limiting factor behind the phenomenon of less germination with higher seeding rates.

Literature Cited

Larson, K.J., F.C. Schweissing, D. L. Thompson. 1999. Sorghum hybrid performance tests in Colorado, 1998. Technical Report TR99-4. AES, Dept. of Soil and Crop Sciences, CSU. 51p.

**Dryland Grain Sorghum Seeding Rate Study, 1999
With and Without Seedrow Applied Hydrogel**

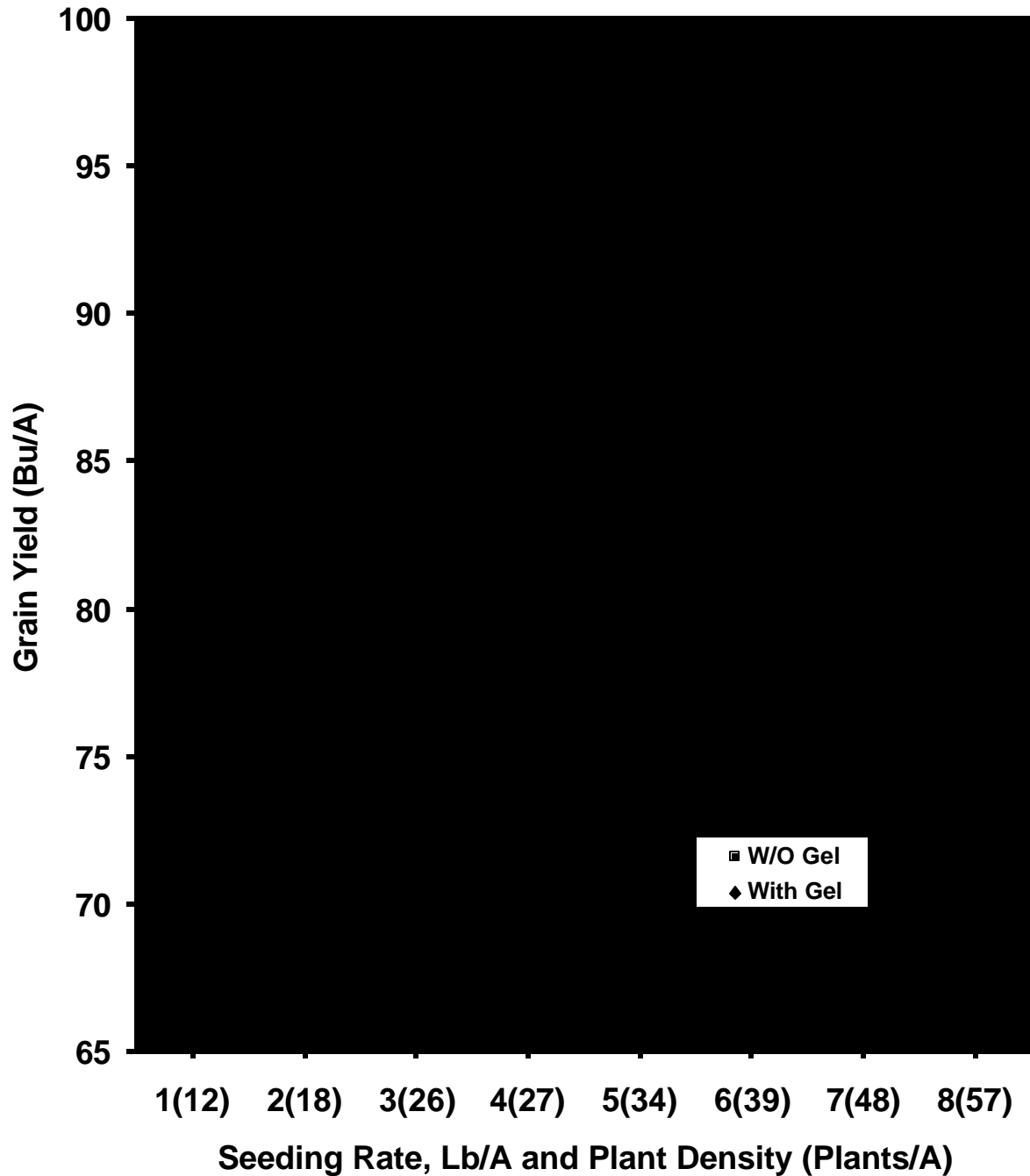


Fig. 9. Dryland grain sorghum seeding rate at Walsh. The eight seeding rates tested are 1 to 8 Lb/A at 1 Lb/A increments (14,000 Seeds/A to 112,000 Seeds/A at 14,000 Seeds/A increments) using CARGILL 627. The Hydrogel treatment received 1.1 Lb Hydrogel per 50 Lb Seed.

**Plant Density to Seeding Rate Ratio
Dryland Grain Sorghum, Walsh, 1999**

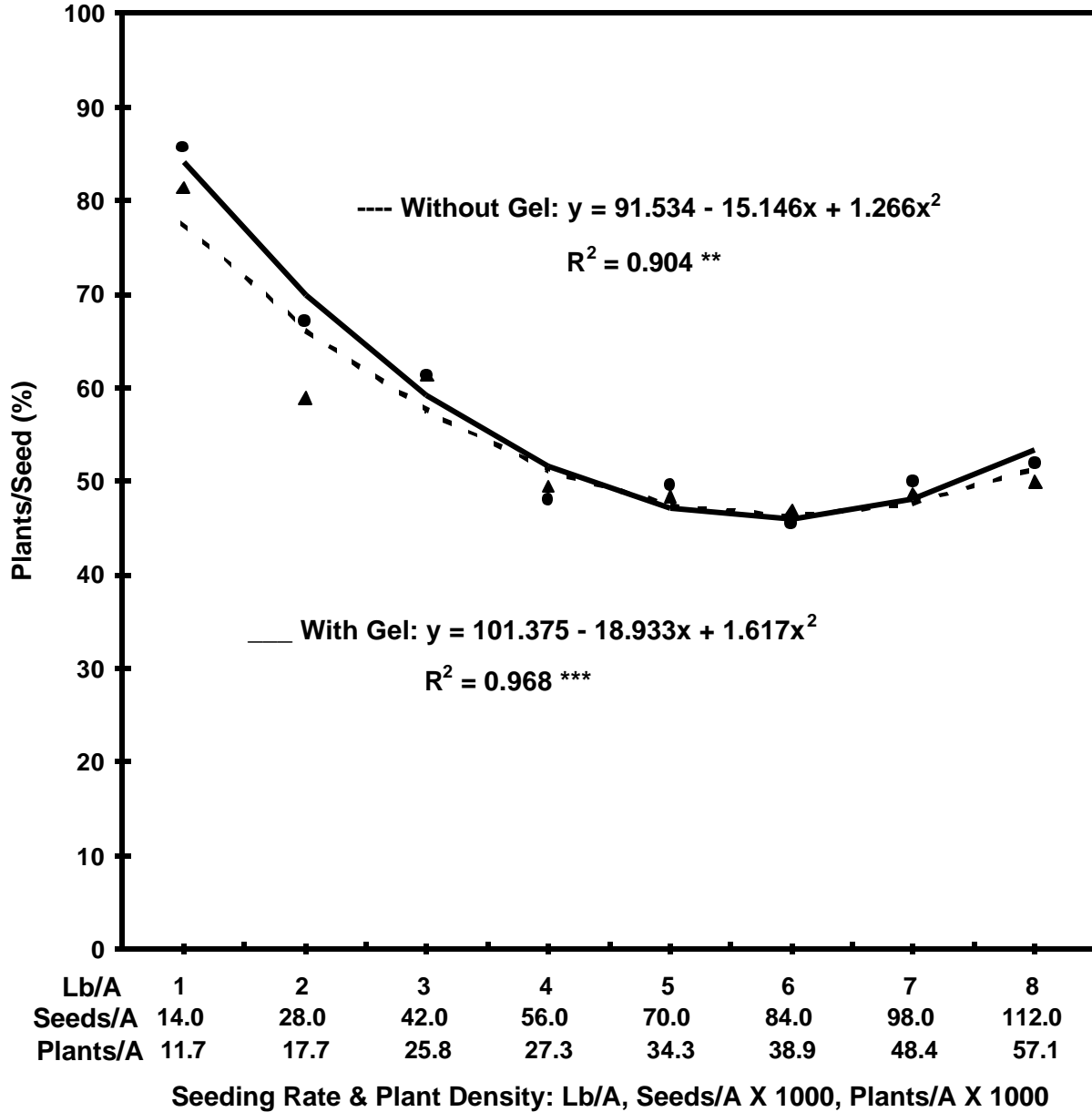


Fig. 10. Plant density to seeding rate ratio in dryland grain sorghum at Walsh. The eight seeding rates tested are 1, 2, 3, 4, 5, 6, 7 and 8 lb./A, corresponding to 14,000 to 112,000 seeds/A at 12,700 seeds/A increments. The Hydrogel treatment received 1.1 Lb Hydrogel per 50 Lb Seed.

Seedrow P and N on Dryland Grain Sorghum Kevin Larson, Dennis Thompson and Calvin Thompson

Banding P fertilizer with the seed at planting (seedrow placement) has proven to be a very effective P fertilizing method for dryland grain sorghum in the high lime, high alkaline soils of Southeastern Colorado. For these alkaline soils, the P fertilizer of choice for seedrow placement is liquid 10-34-0. The most common seedrow P rate for dryland grain sorghum is 5 Gal/A of 10-34-0 which contains 20 Lb P_2O_5 and 6 Lb N/A. High rates of seedrow N is reported to cause N salt toxicity which lowers germination (Mortvedt, 1976). Nonetheless, a moderate, nontoxic level of seedrow N may increase yields. We tested low seedrow P rates with added N to determine if the additional N would maintain high grain sorghum yields.

Materials and Methods

We tested eight rates of poly ammoniated phosphate (10-34-0) fertilizer banded with the grain sorghum seed on 30 in. row spacing in an alkaline Silty Clay Loam soil. The eight rates were 0, 0.75, 1.25, 2.5, 5.0, 7.5, 10.0 and 12.5 gallons of 10-34-0/A, corresponding to 0, 2.5, 5, 10, 20, 30, 40, 50 Lb P_2O_5 /A. In addition we added 6 Lb/N (28-0-0) to the four lowest P rates, making a total of 12 treatments. The fertilizer was applied with a squeeze pump at 13.7 Gal/A and all fertilizer rates were diluted with water to their appropriate levels. 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 was sent to Colorado State University Soil Testing Lab for analysis. Their soil test recommendation for a 50 Bu/A yield goal was banding 40 Lb P_2O_5 /A; and no N was recommend. The grain sorghum hybrid was CARGILL 627 sown at 43,500 Seed/A on June 4. We harvested the 10 ft. by 50 ft. plots on November 1 with a self-propelled combine with a four row crop header. Grain yields were corrected to 14% seed moisture content.

Results and Discussion

The seedrow applied 10 Lb P_2O_5 , 6 Lb N/A rate produced the highest dryland grain sorghum yield, 96 Bu/A (Fig. 12). This seedrow 10 Lb P_2O_5 /A rate was one-fourth the recommended banded rate. All treatments which received added N to the 6 Lb/A level produced more yield than their non-N-added counterparts. The 95% confidence interval for the optimum seedrow rate ranged from 10 to 30 Lb P_2O_5 /A as 10-34-0; it also included 2.5, 5, 10 Lb P_2O_5 /A when N was added to the 6 Lb/A level. The low P rates of 2.5 and 5 Lb P_2O_5 /A yielded as much as the 10 to 30 Lb P_2O_5 /A rates when N was added to the 6 Lb/A level to these low P rates.

The efficacy of low P seedrow rate with added N to the 6 Lb/A level obtained this year is quite similar to the results from last year's study. Apparently low P rate are effective, at least in the short term. Our results from the last two years of this study found that low seedrow P (10-34-0) rates, as low as one-sixteenth the recommended banded P rate, can be used to produce grain yields as high as those from soil test recommend banded P rates when N is added to the 6 Lb N/A level. However, more P is removed with grain than is added from rates below 20 Lb P_2O_5 /A level: a 40 Bu/A sorghum grain crop removes about 18 Lb P_2O_5 /A (extrapolated from Leonard and Martin, 1963). Since more P

is removed with grain than is added with these low P rates, continuous use of these low P rates may eventually reduce yield levels because the available soil P pool in these low P soils will be depleted. Therefore, this low seedrow P and N technology may only provide a short term benefit, used, perhaps, in cash flow crises.

Literature Cited

Leonard, W. H. and J. H. Martin. 1963. Cereal Crops. MacMillan Publishing Co., New York, New York. pp. 789-791.

Mortvedt, J. J. 1976. Band fertilizer placement - how much and how close? Fert. Solns. 20(6): 90-96.

**Seedrow P and N on Grain Sorghum
Dryland, Walsh 1999**

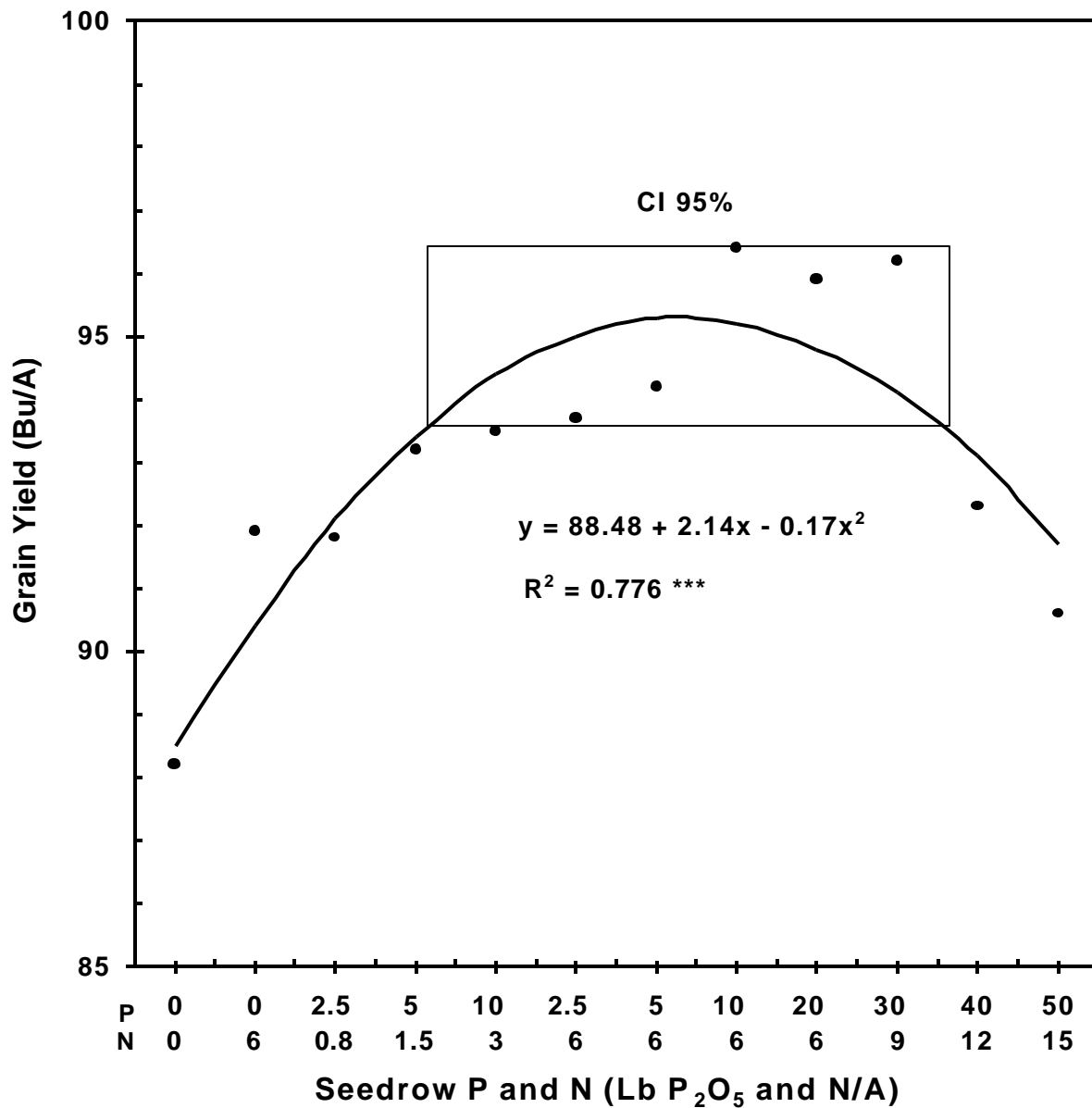


Fig. 11. Seedrow P and N on dryland grain sorghum at Walsh. The P fertilizer was liquid 10-34-0. All treatments with 6 Lb N/A, except 20 Lb P₂O₅, 6 N/A, had liquid 28-0-0 added. The grain sorghum hybrid was CARGILL 627 sown at 40,000 Seeds/A.