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Sorghum Hybrid Performance Trials in Colorado, 2003

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

The 2003 Colorado grain sorghum crop was estimated at 5.7 million bushels, more than three times higher than 2002 drought year. For Colorado, the 5.7 million bushels is slightly above the 25-year average. The increase in sorghum production this year compared to last year was due mainly to a increase in harvested acres, and secondarily to an increase in average bushels per acre. There was a 2.3 fold increase in harvested acreage from 90,000 in 2002 to 210,000 in 2003. In 2003 the average yield was 27 Bu/A, whereas, in 2002 the average yield was 20 Bu/A. The yield of 27 Bu/A is 6 Bu/A less than the 5-year average. Sorghum silage production in 2002 was 135,000 tons, down 1.8 times from 2001. Sorghum silage production for 2002 was the lowest recorded over the past 25 years. The decrease in silage production was because of lower yields, 9 Tons/A from 15,000 acres in 2002, and 20 Tons/A from 12,000 in 2001 (Colorado Agricultural Statistic Service, 2003).

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 trials 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 contact Kevin Larson, Plainsman Research Center, Box 477, Walsh, Colorado 81090, or phone (719) 324-5643, or email Kevin.Larson@colostate.edu for further details. Names and addresses of firms submitting entries in 2003 are shown in Table 1. Each firm selected entries for testing and furnished seed for the tests. The Agricultural Experiment Station as a standard of comparison included selected open-pedigree hybrids. A closed-pedigree corn hybrid was also 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, 2003), 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 2003 Colorado Sorghum Performance Trials.

Brand	Entered by
AERC	AERC Inc., 34, Colonnade Road, Suite 200, Ottawa, ON K2E 7J6 Canada
ASGROW	Monsanto, RR 3, Box 119, Plainview, TX 79072
BUFFALO BRAND	Sharp Brothers Seed Co., P.O. Box 140, Healy, KS 67850
CAL/WEST SEEDS	CAL/WEST Seeds, Rt.1, Box 70, West Salem, WI 54669
DEKALB	Monsanto, RR 3, Box 119, Plainview, TX 79072
DRUSSEL SEED	Drussel Seed and Supply, 2197 West Parallel Road, Garden City, KS 67846
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
SORGHUM PARTNERS	Sorghum Partners, Inc., 403 S. Monroe, P.O. Box 189, New Deal, TX 79350
PIONEER BRAND	Pioneer Hi-Bred International, Inc., 390 Union Blvd., Suite 500A, Lakewood, CO 80228
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, DEKALB 642 and TRIUMPH 1866 Bt.

Growing Degree Days for sorghum were calculated from planting through first freeze using a maximum of 111^{o}F and a minimum of 50^{o}F for threshold temperatures (Peacock and Heinrich, 1984). They are calculated by averaging daily high and low temperatures and subtracting the base temperature of 50^{o}F from the average. When daily temperatures are less than 50^{o}F, 50^{o}F is used, when temperatures are above 111^{o}F a maximum temperature of 111^{o}F is used:

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

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 grain yield 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 yield in tons per acre was corrected to 70 % moisture content. A representative sample of fresh silage was oven-dried at 167^{o}F (75^{o}C) until there was no more weight loss, and 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 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 Wilson, Holly, Colorado for collecting the weather data utilized at Hartman.

References

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Early Maturing Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2003

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

PURPOSE: To identify high yielding hybrids, when planted late in the season (June 25), under drip-irrigated conditions with 2780 sorghum heat units in Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: June 25. HARVESTED: November 4.

EMERGENCE DATE: 5 days after planting. SOIL TEMP: 72 F.

IRRIGATION: Drip irrigated for 12 weeks with 10.1 A-in./A.

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	1.03	137	6	1	6
July	1.62	963	28	13	37
August	2.72	829	24	3	68
September	0.77	495	3	0	98
October	0.08	359	2	0	124
Total	6.22	2783	63	17	124

\1 Growing season from July 1 (planting) to October 26 (first freeze, 22 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides Clarity 4 Oz/A, Atrazine 1.0 Lb/A, COC 32 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

COMMENTS: Planted in good soil moisture. Weed control was very good. Near normal precipitation for the growing season with a wet June and dry July and September months. No greenbug infestation. None of the hybrids lodged. Late freeze date. Yields and test weights were very good considering the late date of planting.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.8	0.6	2.3	65	3.6	531	1.0	6.1
8"-24"								
Comment	Alka	VLo	VHi	Lo	Lo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	42	20	0	0
Applied	100	20	0.3	0

Yield Goal: 120 Bu/A.
Actual Yield: 117 Bu/A.

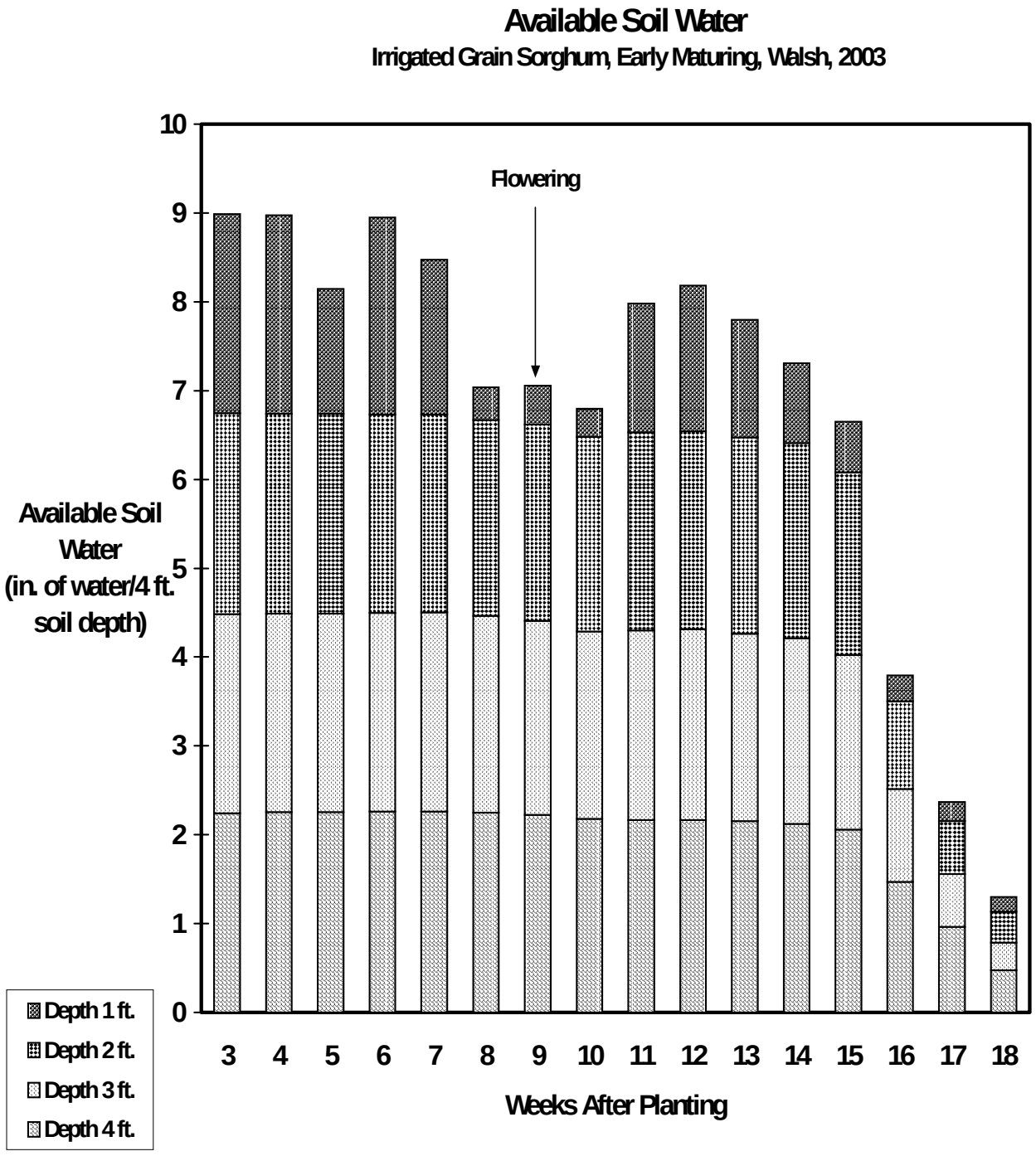

Fig. 1. Available soil water in drip irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 6.22 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 2.--Irrigated Grain Sorghum Early Maturing Hybrid Performance Test at Walsh, 2003. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
DEKALB	DKS 29-28	5	55	1624	77	E	42	56.1	0	57	134	114
SORGHUM PARTNERS	KS 310	5	58	1711	76	E/ME	48	48.4	0	56	128	109
ASGROW	Reward	5	56	1652	74	E	40	58.1	0	57	123	105
DEKALB	DK-28E	5	53	1567	72	E	43	50.7	0	57	122	104
TRIUMPH	TR X21725	5	52	1539	70	E	45	55.8	0	58	108	93
SORGHUM PARTNERS	251	5	51	1515	69	E	42	43.4	0	59	102	87
SORGHUM PARTNERS	K35-Y5	5	60	1766	85	ME	44	41.0	0	55	123	105
SORGHUM PARTNERS	1486	5	64	1878	HD	M	44	48.0	0	52	122	104
(Check)	399 X 2737	5	67	1929	SD	ML	47	42.6	0	48	88	75
Average		5	57	1687	78	E	44	49.3	0	55	117	
LSD 0.20											8.1	

\1 Planted: June 25; Harvested: November 4.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze (22 F, October 26).

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, 2001-2003.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2001	2002	2003	2-Year Avg	3-Year Avg	2001	2002	2003	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Reward	59	76	123	100	86	109	119	105	112	111
DEKALB	DK-28E	62	88	122	105	91	115	138	104	121	119
DEKALB	DKS 29-28	--	74	134	104	--	--	115	114	115	--
PIONEER	87G57	69	69	--	69	--	128	112	--	120	--
SORGHUM PARTNERS	KS 310	49	69	128	99	82	91	108	109	109	103
SORGHUM PARTNERS	K35-Y5	53	60	123	92	79	98	94	105	100	99
SORGHUM PARTNERS	251	--	77	102	90	--	--	120	87	104	--
(Check)	399 X 2737	39	21	88	55	49	72	33	75	54	60
Average		54	64	117	91	78					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland at Vilas for 2001; Irrigated at Walsh for 2002 and 2003.

Dryland Grain Sorghum Hybrid Performance Trial at Vilas, 2003

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 Clay soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 39,200 Seed/A. PLANTED: June 2. HARVESTED: November 5.

EMERGENCE DATE: 12 days after planting. SOIL TEMP: 68 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, Atrazine 0.63 Lb AI/A. Post Emergence Herbicides: Clarity 5 Oz/A, 2,4-D 0.28 Lb AI/A. CULTIVATION: Once. INSECTICIDE: 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	6.89	595	14	3	28
July	1.62	963	28	13	59
August	2.72	829	24	3	90
September	0.77	495	3	0	120
October	0.08	359	2	0	146
Total	12.08	3241	71	19	146

\1 Growing season from June 2 (planting) to October 26 (first freeze, 22 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Weed control was poor to fair. Below normal precipitation for the growing season, June was wet but the rest of the season was very dry. Seed set was poor because it was very hot and dry at flowering. No greenbug infestation. None of the hybrids lodged. Grain yields were poor.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.6	0.3	1.3	3	1.5	296	0.4	6.8
8"-24"				4				
Comment	Alka	Vlo	Mod	Lo	V Lo	VHi	V Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	17	40	0	0
Applied	60	20	0	0

Yield Goal: 60 Bu/A.
Actual Yield: 16 Bu/A.

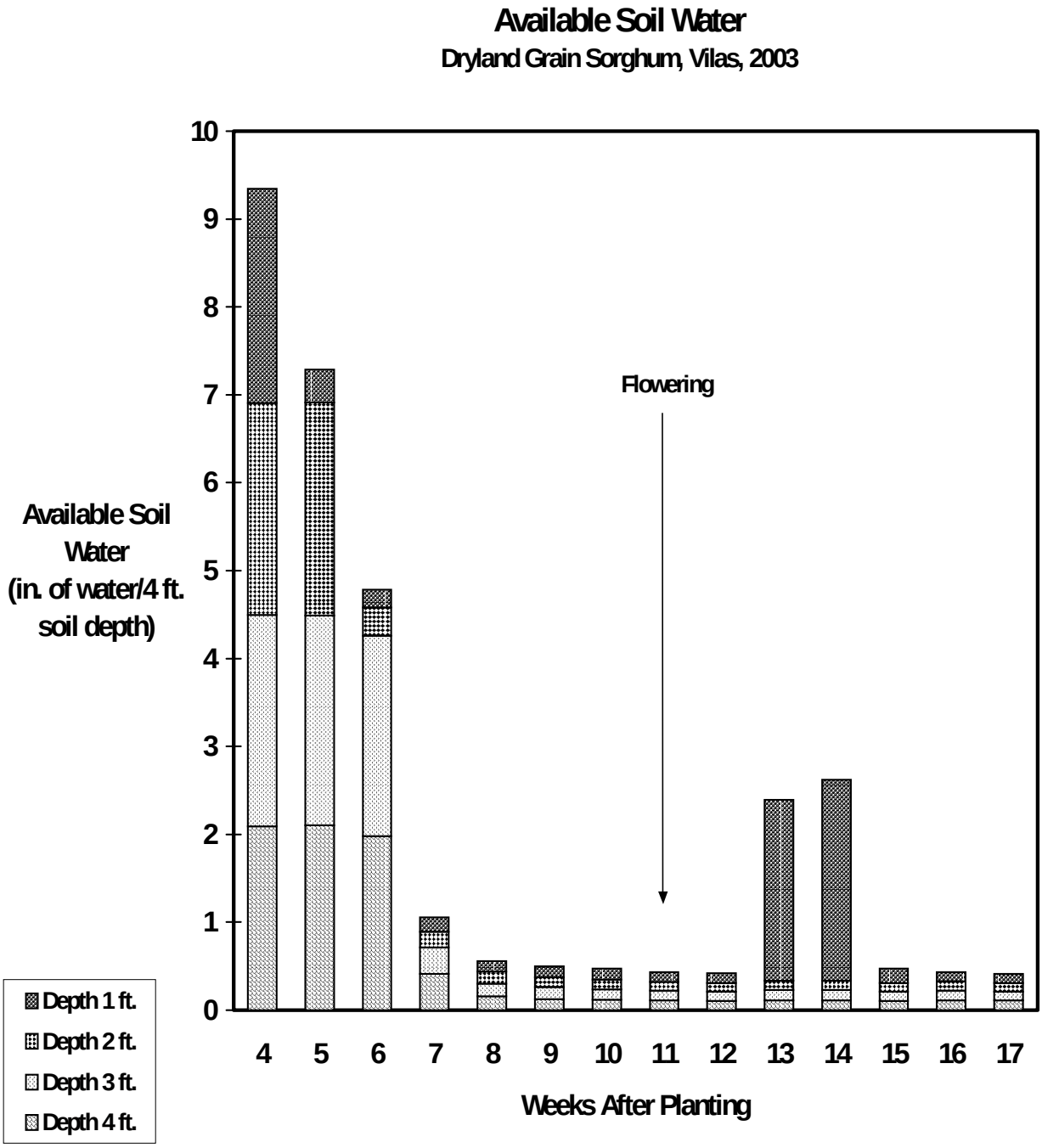

Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 12.08 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2003. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Plants Lodged	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
PIONEER	85G01	11	69	1859	116	ME/M	35	22.3	0	58	26	159
DEKALB	X210	12	68	1833	107	ME	32	20.3	0	58	23	144
ASGROW	Pulsar	13	68	1833	113	ME	31	23.6	0	55	21	129
DEKALB	DK-44	14	71	1910	121	ME/M	35	25.4	0	56	20	124
SORGHUM PARTNERS	NK 5418	11	69	1859	108	ME	33	21.1	0	56	19	116
ASGROW	Seneca	13	71	1910	121	ME/M	34	19.0	0	58	17	107
DEKALB	DK-40y	14	71	1910	122	ME/M	34	23.2	0	57	14	88
DEKALB	DKS 36-00	12	67	1805	107	ME	29	20.7	0	57	9	58
SORGHUM PARTNERS	NK 7633	14	72	1930	124	M	36	20.3	0	53	20	122
SORGHUM PARTNERS	K59-Y2	11	78	2082	126	M	36	19.0	0	52	19	116
SORGHUM PARTNERS	NK 7655	12	78	2082	127	M	36	24.2	0	54	17	107
PIONEER	84G50	11	78	2082	128	M	36	23.2	0	53	13	84
SORGHUM PARTNERS	KS 585	11	76	2025	122	M	31	19.8	0	56	11	66
SORGHUM PARTNERS	K73-J6	14	77	2054	124	M	35	22.5	0	56	11	66
SORGHUM PARTNERS	1486	15	73	1951	124	M	33	16.7	0	54	9	54
(Check)	399 X 2737	11	79	2111	130	ML	32	14.9	0	56	15	94
SORGHUM PARTNERS	NK 8828	13	79	2111	132	ML	35	14.9	0	54	11	70
Average		12	73	1962	121	ME/M	34	20.7	0	55	16	
LSD 0.20											7.3	

\1 Planted: June 2; Harvested: November 5.

Yields are corrected to 14.0% seed moisture content.

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

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

GDD: Growing Degree Days for sorghum.

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

Table 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 2001-2003.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2001	2002	2003	2-Year Avg	3-Year Avg	2001	2002	2003	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Seneca	87	7	17	12	37	105	93	107	100	102
ASGROW	Pulsar	--	6	21	14	--	--	74	129	102	--
DEKALB	DKS 36-00	--	5	9	7	--	--	64	58	61	--
DEKALB	DK-44	82	7	20	14	36	98	88	124	106	103
DEKALB	DK-40y	79	--	14	47	--	95	--	88	92	--
PIONEER	8505	85	8	--	47	--	103	109	--	106	--
PIONEER	85Y34	82	5	--	44	--	99	69	--	84	--
PIONEER	85G85	87	8	--	48	--	105	103	--	104	--
SORGHUM PARTNERS	KS 585	92	10	11	11	--	110	134	66	100	--
SORGHUM PARTNERS	K59-Y2	90	11	19	15	--	109	153	116	135	--
SORGHUM PARTNERS	NK 7633	--	10	20	15	--	--	128	122	125	--
SORGHUM PARTNERS	K73-J6	--	10	11	11	--	--	132	66	99	--
SORGHUM PARTNERS	NK 8828	--	7	11	9	--	--	95	70	83	--
TRIUMPH	TR 438	72	8	--	40	--	82	105	--	94	--
TRIUMPH	TR 465	87	6	--	47	--	104	78	--	91	--
(Check)	399 X 2737	82	9	15	12	35	99	119	94	107	104
Average		83	7	16	12	35					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2003

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 3450 sorghum heat units in a Silty Loam soil.

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

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 63 F.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Clarity 4.0 Oz/A, Buctril 16 Oz/A, Atrazine 1.0 Lb/A, COC 1 Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
May	0.55	175	2	2	9
June	6.89	626	14	3	39
July	1.62	963	28	13	70
August	2.72	829	24	3	101
September	0.77	495	3	0	131
October	0.08	359	2	0	157
Total	12.63	3447	73	21	157

\1 Growing season from May 22 (planting) to October 26 (first freeze, 22 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 soil moisture. Weed control was fair. Near normal precipitation for the growing season with a wet June and dry July and September months. No greenbug infestation. None of the hybrids lodged. Grain yields were fair.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.7	0.6	2.3	14	2.0	395	0.6	5.2
8"-24"				5				
Comment	Alka	Vlo	Hi	Mod	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

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

Yield Goal: 45 Bu/A.
Actual Yield: 26 Bu/A.

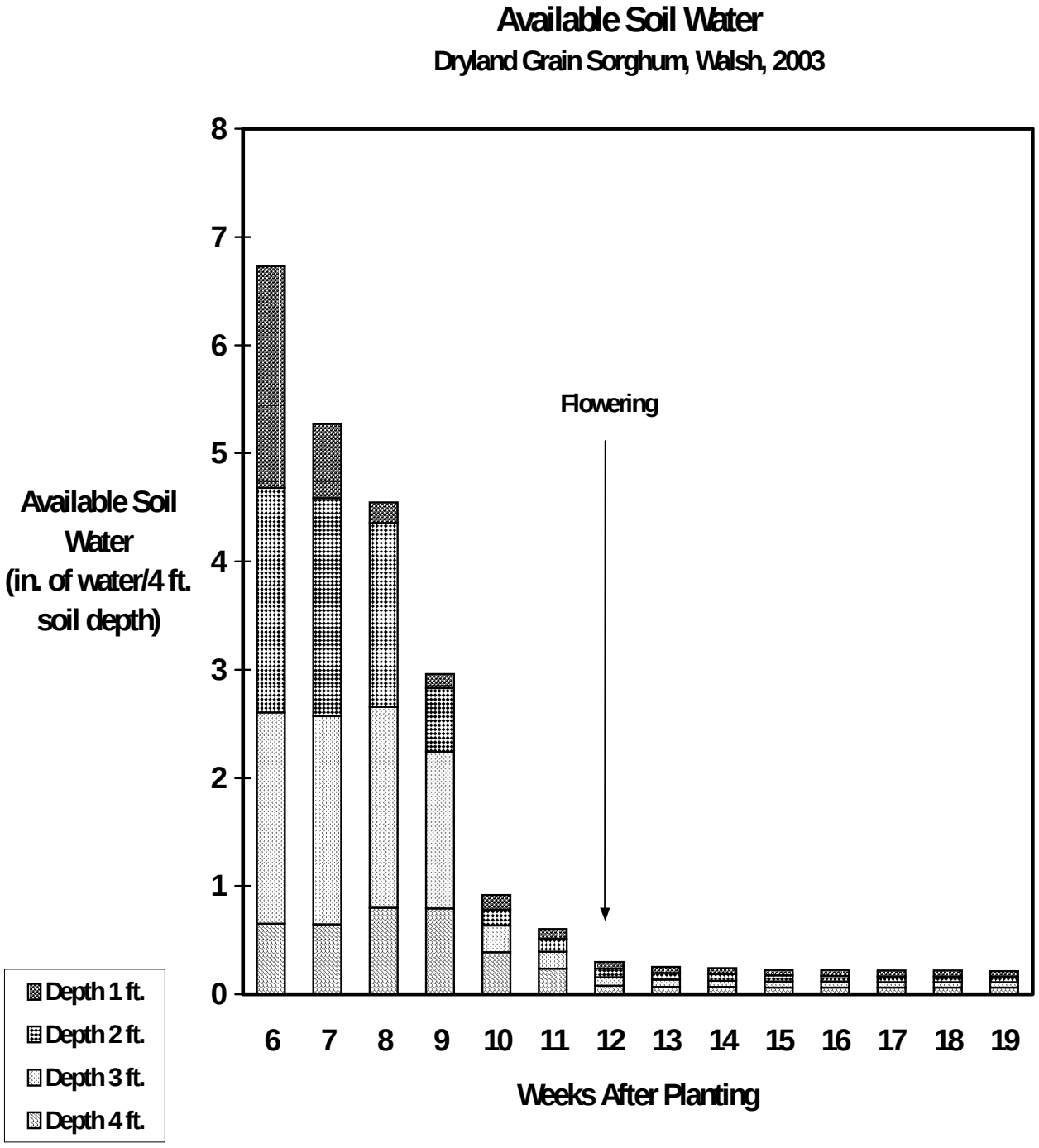

Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 12.63 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2003. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
TRIUMPH	TR 434	11	73	1847	119	E	41	13.6	0	61	28	113
SORGHUM PARTNERS	NK 5418	10	76	1949	120	ME	33	18.6	0	61	41	165
ASGROW	Seneca	10	79	2042	126	ME/M	39	19.8	0	63	36	144
ASGROW	Pulsar	10	75	1916	121	ME	33	16.3	0	60	34	135
NC+	NC+ 5B89	10	74	1882	120	ME/E	36	20.1	0	61	34	134
PIONEER	85G01	10	77	1980	127	ME/M	34	22.5	0	60	31	125
DEKALB	X210	10	77	1980	124	ME	39	13.6	0	62	29	117
DEKALB	DKS 36-00	11	74	1882	120	ME	32	17.4	0	61	29	116
TRIUMPH	TR 438	10	75	1916	120	ME	37	16.7	0	61	25	98
DEKALB	DK-40y	11	76	1949	125	ME/M	36	17.4	0	61	24	95
DEKALB	DK-44	10	77	1980	124	ME/M	39	16.7	0	61	23	94
SORGHUM PARTNERS	NK 7633	10	84	2193	137	M	43	13.9	0	62	36	146
NC+	NC+ 7C22	10	80	2068	131	M	37	14.7	0	61	27	107
SORGHUM PARTNERS	1486	10	80	2068	128	M	35	12.8	0	62	26	105
SORGHUM PARTNERS	K73-J6	10	85	2229	134	M/ML	34	19.4	0	60	18	72
SORGHUM PARTNERS	NK 7655	10	85	2229	135	M	38	19.0	0	62	15	60
SORGHUM PARTNERS	KS 585	10	84	2193	132	M	34	18.2	0	61	12	48
SORGHUM PARTNERS	NK 8828	12	86	2259	140	ML	44	15.5	0	60	25	100
PIONEER	84G50	10	87	2292	139	ML/M	37	21.7	0	59	18	72
SORGHUM PARTNERS	K59-Y2	10	87	2292	141	ML/M	34	16.7	0	59	17	66
(Check)	399 X 2737	10	90	2396	143	ML	34	18.2	0	60	15	58
Average		10	80	2073	129	M	37	17.3	0	61	26	
LSD 0.20											10.1	

\1 Planted: May 22; Harvested: October 30.

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, 2001-2003.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2001	2002	2003	2-Year Avg	3-Year Avg	2001	2002	2003	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Seneca	51	52	36	44	46	116	102	144	123	121
ASGROW	Pulsar	--	54	34	44	--	--	105	135	120	--
DEKALB	DK-40y	48	--	24	36	--	110	--	95	103	--
DEKALB	DK-44	35	56	23	40	38	80	109	94	102	94
DEKALB	DKS 36-00	--	57	29	43	--	--	112	116	114	--
NC+	NC+ 6B50	37	50	--	44	--	85	96	--	91	--
NC+	NC +5B74E	52	47	--	50	--	118	91	--	105	--
NC+	NC+ 5B89	--	67	34	51	--	--	131	134	133	--
PIONEER	85G85	55	61	--	58	--	125	119	--	122	--
PIONEER	8505	61	54	--	58	--	138	105	--	122	--
PIONEER	85Y34	54	57	--	56	--	122	110	--	116	--
SORGHUM PARTNERS	KS 585	31	60	12	36	34	70	117	48	83	78
SORGHUM PARTNERS	K59-Y2	37	55	17	36	36	83	107	66	87	85
SORGHUM PARTNERS	NK 7633	--	48	36	42	--	--	93	146	120	--
SORGHUM PARTNERS	K73-J6	--	34	18	26	--	--	66	72	69	--
SORGHUM PARTNERS	NK 8828	--	47	25	36	--	--	90	100	95	--
TRIUMPH	TR 438	48	59	25	42	44	109	115	98	107	107
(Check)	399 X 2737	31	41	15	28	29	71	79	58	69	69
Average		44	51	26	39	40					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Trial at Hartman, 2003

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2750 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 12. HARVESTED: November 18.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 68 F.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Avalanche 0.5 Oz/A. CULTIVATION: Once. INSECTICIDE: None.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
June	1.19	424	6	0	18
July	1.14	957	26	18	49
August	2.83	859	26	5	80
September	0.82	488	3	0	110
October	0.05	12	0	0	116
Total	6.03	2740	61	23	116

\1 Growing season from June 12 (planting) to October 6 (first freeze, 28 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in good soil moisture. Weed control was very good. Below normal precipitation for the growing season with all monthly averages except August below normal. No greenbug infestation. Some of the hybrids lodged. Grain yields were 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"	7.6	2.3	2.7	38	2.0	294	2.6	12.4
8"-24"				18				
Comment	Alka	Mod	VHi	VHi	VLo	VHi	Adeq	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

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

Yield Goal: 140 Bu/A.
Actual Yield: 109 Bu/A.

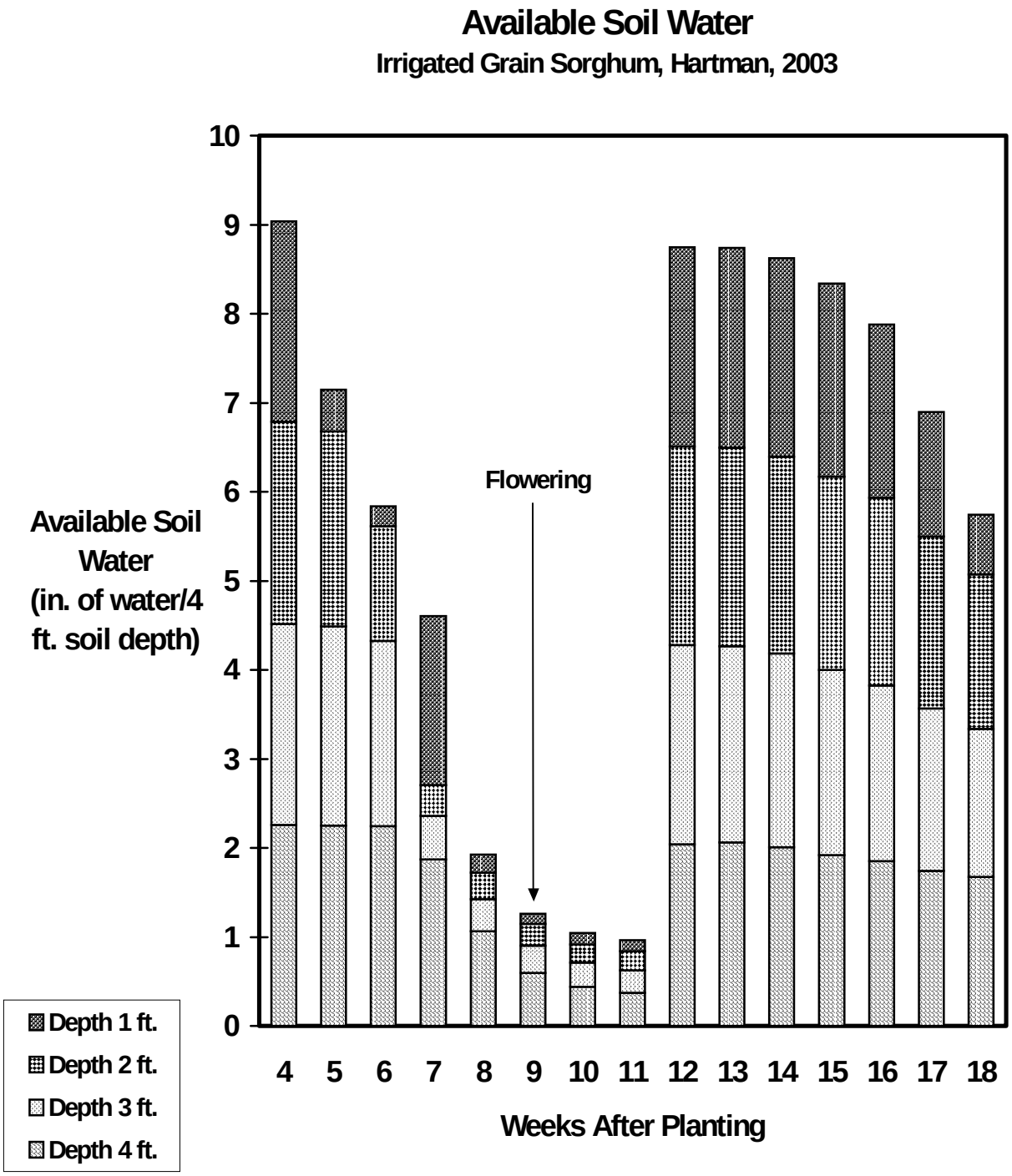

Fig. 4. Available soil water in irrigated grain sorghum at Hartman. Gypsum block measurements taken to 4 ft. with 1ft. increments. Total rainfall at Hartman from planting to first freeze was 6.03 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Hartman, 2003. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In.	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
SORGHUM PARTNERS	251	8	49	1413	85	E	33	53.4	0	59	89	81
SORGHUM PARTNERS	KS 560Y	8	58	1689	99	ME/M	36	33.3	0	60	111	102
SORGHUM PARTNERS	KS 310	8	53	1532	90	ME	43	42.6	0	59	105	97
SORGHUM PARTNERS	K35-Y5	10	54	1566	93	ME	38	36.8	0	59	94	86
SORGHUM PARTNERS	KS 585	8	60	1740	101	M	40	39.9	0	60	129	118
SORGHUM PARTNERS	NK X633	8	61	1758	103	M/ML	43	53.1	0	59	114	105
SORGHUM PARTNERS	K59-Y2	8	63	1801	108	M	48	61.6	0	56	111	102
SORGHUM PARTNERS	K73-J6	8	62	1778	103	M/ML	46	56.9	0	58	98	90
PIONEER	84G62	8	66	1885	113	ML	45	49.6	0	57	131	120
NC+	NC+ 7R83	8	69	1977	116	ML/M	47	42.6	0	58	119	109
DEKALB	DKS 54-00	9	68	1945	116	ML	46	47.6	0	58	117	108
SORGHUM PARTNERS	NK 8828	9	69	1977	116	ML	44	38.7	0	57	112	103
(Check)	399 X 2737	8	63	1801	112	ML	41	49.6	0	59	111	102
SORGHUM PARTNERS	NK X654	8	64	1826	110	ML	43	50.3	0	60	106	97
ASGROW	A459	8	66	1885	113	ML/M	48	39.1	0	60	104	96
TRIUMPH	TR 481	8	65	1855	112	ML	48	54.2	0	59	100	92
Average		8	62	1777	106	M	43	46.8	0	59	109	
LSD 0.20											8.0	

\1 Planted: June 12; Harvested: November 18.

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, 2000, 2001, 2003.

		Grain Yield					Yield as % of Test Average				
					2-Year	3-Year				2-Year	3-Year
Brand	Hybrid	2000	2001	2003	Avg	Avg	2000	2001	2003	Avg	Avg
		----------Bu/A----------					----------%----------				
ASGROW	A459	139	130	104	117	124	108	95	96	96	100
ASGROW	A571	124	137	--	131	--	96	100	--	98	--
DEKALB	DK-53	127	143	--	135	--	98	104	--	101	--
DEKALB	DKS 54-00	--	128	117	123	--	--	94	108	101	--
PIONEER	84G62	178	162	131	147	157	138	118	120	119	125
SORGHUM PARTNERS	K73-J6	--	143	98	121	--	--	104	90	97	--
SORGHUM PARTNERS	NK 8828	--	144	112	128	--	--	105	103	104	--
TRIUMPH	TR 481	130	122	100	111	117	101	89	92	91	94
(Check)	399 X 2737	138	128	111	120	126	107	93	102	98	101
Average		129	137	109	123	125					

Grain Yields were corrected to 14.0 % seed moisture content.

No yield data from 2002 because of drought.

Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2003

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 3400 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: May 23. HARVESTED: October 31.

EMERGENCE DATE: 8 days after planting. SOIL TEMP: 66 F.

IRRIGATION: Drip irrigated for 14 weeks with 11.8 A-in./A.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A. Post Emergence Herbicides: Clarity 4 0z/A, Atrazine 1.0 Lb/A, COC 1 Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
May	0.55	157	2	2	8
June	6.89	626	14	3	38
July	1.62	963	28	13	69
August	2.72	829	24	3	100
September	0.77	495	3	0	130
October	0.08	359	2	0	156
Total	12.63	3429	73	21	156

\1 Growing season from May 23 (planting) to October 26 (first freeze, 22 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

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 wet June and dry July and September months. No greenbug infestation. None of the hybrids lodged. Grain yields were very good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.8	0.6	2.3	6	3.6	531	1.0	6.1
8"-24"				5				
Comment	Alka	VLo	VHi	Lo	Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	42	20	0	0
Applied	100	20	0.3	0

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

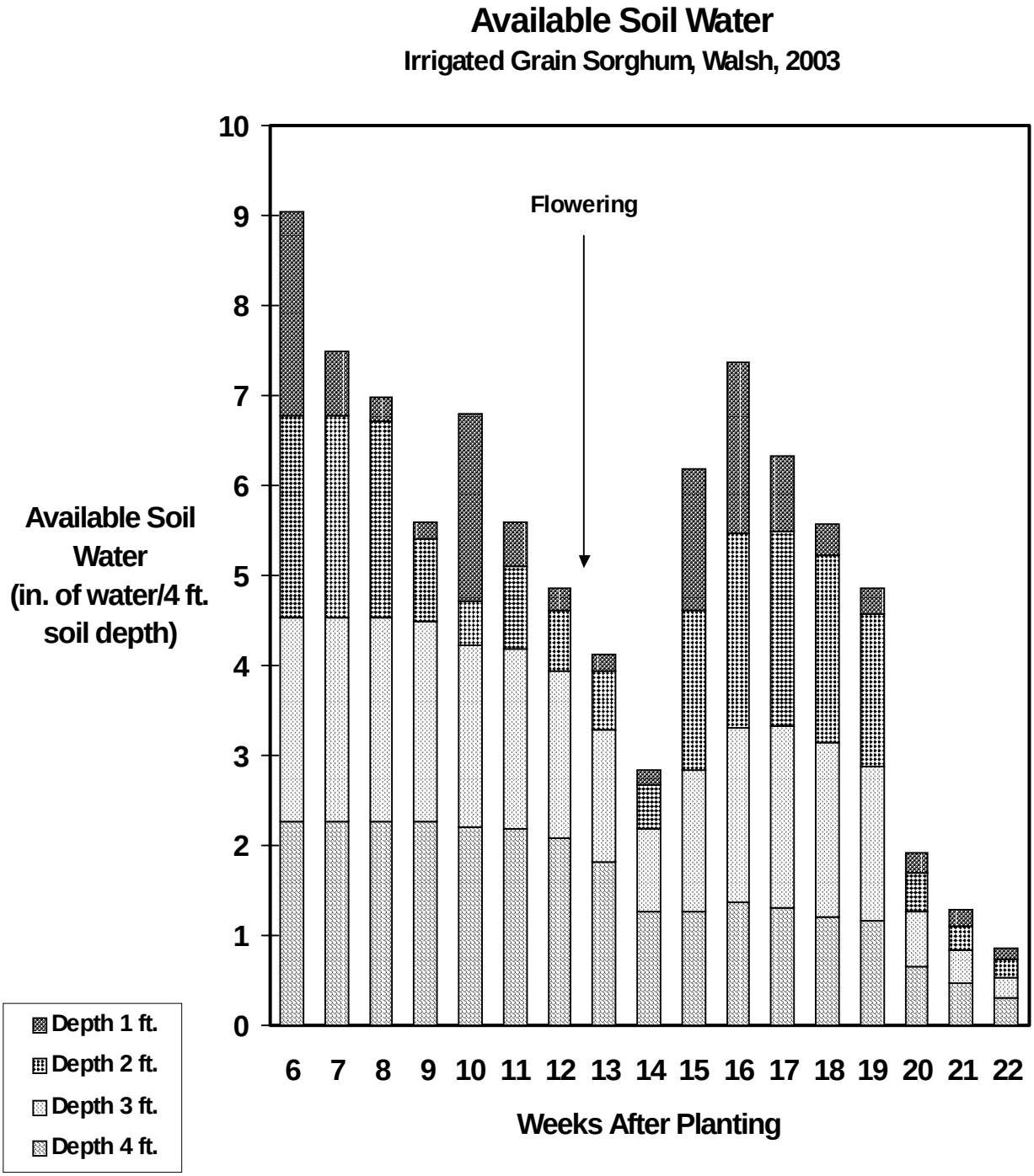

Fig. 4. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 12.63 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 10.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2003. \1

Brand	Hybrid	Days to Emerge	50% Bloom DAP	50% Bloom GDD	50% Mature DAP	50% Mature Group	Plant Ht.	Harvest Density	Lodged Plants	Test Wt.	Grain Yield	Yield % of Test Average
							In	Plants/A (1000 X)	%	Lb/Bu	Bu/A	%
SORGHUM PARTNERS	NK 5418	9	77	1993	124	ME	40	31.0	0	59	122	98
SORGHUM PARTNERS	K73-J6	8	84	2162	134	M/ML	50	32.9	0	58	136	109
SORGHUM PARTNERS	KS 585	8	83	2139	133	M	46	33.3	0	60	123	98
SORGHUM PARTNERS	1486	9	82	2118	131	M	43	25.2	0	59	111	89
PIONEER	84G62	8	89	2299	146	ML	49	27.9	0	58	139	111
DEKALB	DKS 54-00	9	90	2327	147	ML	52	30.2	0	55	135	108
ASGROW	A 571	8	93	2413	151	ML	47	32.5	0	55	132	106
NC+	NC+ 7R83	8	92	2387	152	ML/M	50	29.4	0	55	128	103
SORGHUM PARTNERS	K59-Y2	8	88	2270	145	ML/M	51	26.7	0	56	127	102
SORGHUM PARTNERS	NK 7633	8	85	2186	140	ML	48	30.2	0	58	127	102
(Check)	399 X 2737	8	88	2270	145	ML	46	32.5	0	57	125	100
SORGHUM PARTNERS	NK 7655	8	85	2186	138	ML	47	26.7	0	57	120	96
DEKALB	DKS 53-11	9	85	2186	138	ML	50	25.2	0	60	119	96
SORGHUM PARTNERS	NK 8828	10	90	2327	149	ML	47	28.3	0	57	115	92
Average		8	87	2233	141	ML	48	29.4	0	57	125	
LSD 0.20											8.4	

\1 Planted May 23; Harvested: October 31.

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, 2001-2003.

		Grain Yield					Yield as % of Test Average				
					2-Year	3-Year				2-Year	3-Year
Brand	Hybrid	2001	2002	2003	Avg	Avg	2001	2002	2003	Avg	Avg
		----------Bu/A----------					----------%----------				
ASGROW	A459	151	71	--	111	--	99	94	--	97	--
DEKALB	DKS 54-00	161	76	135	106	124	106	100	108	104	105
NC+	NC+ 7R83	171	78	128	103	126	113	103	103	103	106
PIONEER	84G62	171	99	139	119	136	113	130	111	121	118
SORGHUM PARTNERS	KS 585	--	90	123	107	--	--	118	98	108	--
SORGHUM PARTNERS	K59-Y2	--	78	127	103	--	--	102	102	102	--
SORGHUM PARTNERS	KS 73-J6	161	74	136	105	124	106	98	109	104	104
SORGHUM PARTNERS	NK 7633	--	87	127	107	--	--	115	102	109	--
SORGHUM PARTNERS	NK 8828	156	57	115	86	109	103	75	92	84	90
TRIUMPH	TR 465	163	66	--	115	--	107	86	--	97	--
(Check)	399 X 2737	147	76	125	101	116	97	100	100	100	99
Average		152	76	125	101	118					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Trial at Walsh, 2003

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 Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 69,700 Seed/A. PLANTED: May 23. HARVESTED: October 8.

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

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Clarity 4 Oz/A, Buctril 16 Oz/A, COC 1Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
May	0.55	175	2	2	9
June	6.89	626	14	3	39
July	1.62	963	28	13	70
August	2.72	829	24	3	101
September	0.77	495	3	0	131
October	0.08	91	0	0	139
Total	12.63	3179	71	21	139

\1 Growing season from May 22 (planting) to October 8 (harvest).
\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 soil moisture. Weed control was fair. Near normal precipitation for the growing season with a wet June and dry July and September. No greenbug infestation. Forage yields were fair.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.7	0.6	2.3	14	2.0	395	0.6	5.2
8"-24"				5				
Comment	Alka	VLo	VHi	Mod	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

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

Yield Goal: 10 Ton/A.
Actual Yield: 4.8 Ton/A @ 70% MC.

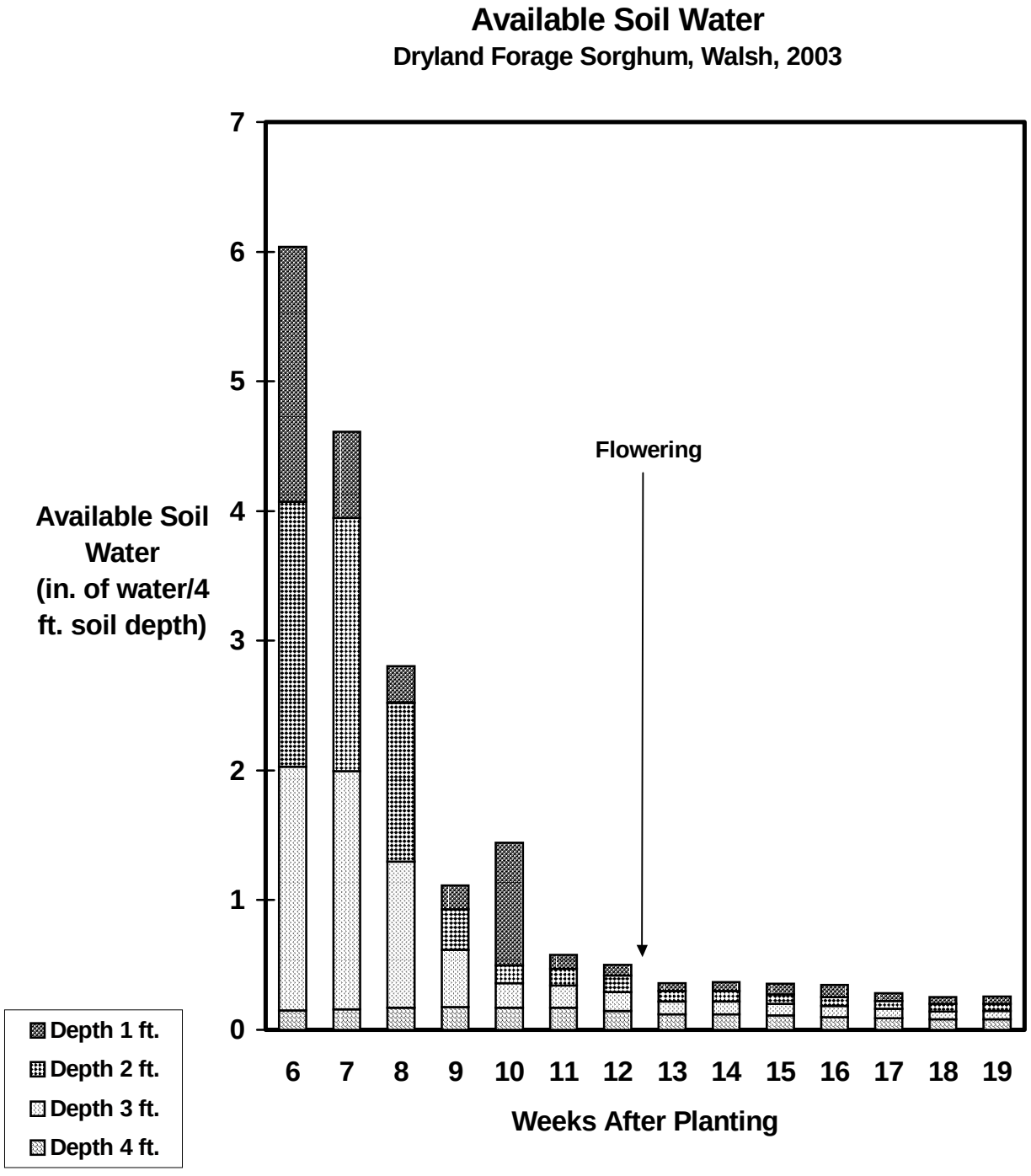

Fig. 5. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 12.63 in. Any increase in available soil water between weeks is from rain.

Table 12.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2003. \1

Brand	Hybrid	Forage Type \2	Days to Emerge	Days to 50% Bloom	Harvest Density	Plant Ht.	Stage \3 at Harvest	Stem Sugar	Plant Lodg.	Forage Yield	Yield % of Test Average
					Plants/A (1000 X)	In.		%	%	Tons/A	%
AERC	AERC SSH 51	FS	9	Veg	16.3	40	Veg	13	0	6.2	129
BUFFALO BRAND	Canex BMR 340	FS	9	83	24.4	44	MT	23	0	6.0	124
SORGHUM PARTNERS	SS 405	FS	10	Veg	20.9	48	Veg	15	0	6.0	124
BUFFALO BRAND	Canex BMR 310	FS	9	87	19.0	45	MT	15	0	5.5	115
BUFFALO BRAND	Canex	FS	11	88	23.2	51	MT	22	0	5.5	115
BUFFALO BRAND	Canex BMR 248	FS	9	86	20.9	53	MT	20	0	5.1	107
(Check)	NB 305F	FS	12	95	20.1	50	MT	20	1	5.0	104
AERC	AERC SSH 35	FS	9	109	20.1	43	SD	20	1	4.9	102
BUFFALO BRAND	Canex BMR 208	FS	9	89	17.4	47	MT	19	0	4.8	99
BUFFALO BRAND	Canex II	FS	10	89	24.4	37	MT	22	2	4.3	89
SORGHUM PARTNERS	NK 300	FS	9	89	28.3	32	MT	11	0	4.2	87
SORGHUM PARTNERS	1990	FS	9	Veg	24.8	38	Veg	15	0	3.3	68
BUFFALO BRAND	Buffalo Brand	SS	9	83	26.3	61	MT	22	1	5.6	116
BUFFALO BRAND	Grazex II W	SS	10	79	22.5	62	MT	15	0	4.6	95
SORGHUM PARTNERS	Sordan Headless	SS	10	Veg	25.6	42	Veg	14	0	4.3	89
SORGHUM PARTNERS	Trudan 8	SS	10	77	19.8	56	MT	15	0	4.2	87
BUFFALO BRAND	Grazex II	SS	10	79	26.7	51	MT	19	0	4.1	86
DRUSSEL SEED	DSS Bonus-R BMR	SS	9	Veg	21.3	44	Veg	11	0	4.1	84
SORGHUM PARTNERS	Sordan 79	SS	9	83	27.9	50	MT	20	1	3.9	81
BUFFALO BRAND	Grazex BMR 727	SS	9	80	21.7	55	MT	9	0	3.9	80
TRIUMPH	TR 1866 Bt	Corn	8	Veg	18.6	50	Veg	15	0	3.1	64
Sorghum Average		FS	10	86	22.6	47	MT	17	0	4.8	
LSD 0.20										1.37	

\1 Planted: May 23; Harvested: October 8.

\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, 2001-2003.

		Forage Yield					Yield as % of Test Average				
					2-Year	3-Year				2-Year	3-Year
Brand	Hybrid	2001	2002	2003	Avg	Avg	2001	2002	2003	Avg	Avg
		----------Tons/A----------					----------%----------				
BUFFALO BRAND	Canex	10.8	13.5	5.5	9.5	9.9	122	124	115	120	120
BUFFALO BRAND	Canex II	10.9	11.7	4.3	8.0	9.0	124	107	89	98	107
BUFFALO BRAND	Canex BMR 208	8.1	9.5	4.8	7.2	7.5	92	87	99	93	93
BUFFALO BRAND	Canex BMR 310	7.3	8.8	5.5	7.2	7.2	83	81	115	98	93
BUFFALO BRAND	Buffalo Brand	8.4	12.0	5.6	8.8	8.7	96	110	116	113	107
BUFFALO BRAND	Grazex II	8.6	10.5	4.1	7.3	7.7	97	96	86	91	93
BUFFALO BRAND	Grazex II W	6.0	9.7	4.6	7.2	6.8	69	89	95	92	84
BUFFALO BRAND	Grazex BMR 727	11.2	8.5	3.9	6.2	7.9	128	78	80	79	95
BUFFALO BRAND	Grazex BMR 720	8.4	7.4	--	7.9	--	95	68	--	82	--
GOLDEN HARVEST	Re-Gro H-22B	8.4	12.0	--	10.2	--	96	110	--	103	--
GOLDEN HARVEST	Re-Gro H-33	9.0	10.2	--	9.6	--	102	93	--	98	--
SORGHUM PARTNERS	NK 300	9.6	11.9	4.2	8.1	8.6	109	109	87	98	102
SORGHUM PARTNERS	HiKane II	9.7	11.5	--	10.6	--	111	105	--	108	--
SORGHUM PARTNERS	SS 405	--	16.0	6.0	11.0	--	--	147	124	136	--
SORGHUM PARTNERS	1990	--	12.9	3.3	11.0	--	--	118	48	83	--
SORGHUM PARTNERS	Sordan 79	--	12.2	3.9	11.0	--	--	112	81	97	--
SORGHUM PARTNERS	Sordan Headless	--	12.5	4.3	11.0	--	--	115	89	102	--
SORGHUM PARTNERS	Trudan 8	--	11.8	4.2	11.0	--	--	108	87	98	--
(Check)	NB 305F	10.2	12.8	5.0	11.0	9.3	116	117	104	111	112
(Check)	Corn	5.9	5.7	3.1	7.6	4.9	69	52	64	58	62
Average		8.8	10.9	4.8	7.9	8.2					

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

Table 14.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2003.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	ADF	NDF	IVTD	TDN	RFQ	Net Energy Main.	Net Energy Gain	Net Energy Lact.
				In	----------%----------						-----MCal/lb-----		
AERC	AERC SSH 51	FS	Veg	45	8.3	29.5	48.0	84.9	68.2	175	0.73	0.45	0.70
SORGHUM PARTNERS	1990	FS	Veg	40	7.6	30.5	46.8	84.6	67.3	174	0.71	0.44	0.69
(Check)	NB 305F	FS	86	47	10.8	29.8	51.8	83.9	69.0	167	0.72	0.45	0.71
BUFFALO BRAND	Canex BMR 340	FS	79	40	14.5	27.2	50.2	83.4	66.9	163	0.76	0.49	0.69
BUFFALO BRAND	Canex BMR 310	FS	80	40	12.8	28.8	52.9	82.2	66.5	155	0.74	0.46	0.69
SORGHUM PARTNERS	SS 405	FS	Veg	48	9.7	30.1	52.1	81.7	66.3	154	0.72	0.44	0.68
BUFFALO BRAND	Canex BMR 208	FS	82	42	13.4	28.7	53.0	82.3	65.9	153	0.74	0.46	0.68
BUFFALO BRAND	Canex BMR 248	FS	79	45	14.0	28.0	52.3	81.6	65.6	152	0.75	0.48	0.68
BUFFALO BRAND	Canex	FS	81	47	10.3	31.1	53.4	81.5	66.1	151	0.70	0.43	0.68
AERC	AERC SS 35	FS	101	37	11.6	28.4	52.0	80.7	65.5	149	0.75	0.47	0.67
BUFFALO BRAND	Canex II	FS	82	37	12.0	30.2	53.9	79.0	64.4	140	0.72	0.44	0.66
SORGHUM PARTNERS	NK 300	FS	83	26	12.6	29.1	53.4	79.3	64.0	140	0.73	0.46	0.66
SORGHUM PARTNERS	Trudan 8	SS	69	36	13.1	30.3	51.5	82.6	67.5	160	0.71	0.44	0.70
SORGHUM PARTNERS	Sordan Headless	SS	Veg	40	9.5	29.5	50.2	82.5	66.4	159	0.73	0.45	0.69
DRUSSEL SEED	DSS Bonus-R BMR	SS	Veg	47	10.4	31.0	51.9	81.2	65.9	152	0.70	0.43	0.68
BUFFALO BRAND	Grazex II W	SS	71	51	13.9	29.6	52.2	81.1	65.7	150	0.73	0.45	0.68
BUFFALO BRAND	Buffalo Brand	SS	77	45	11.8	30.8	53.6	80.0	66.0	147	0.71	0.43	0.68
BUFFALO BRAND	Grazex II	SS	71	46	11.7	32.2	54.6	80.8	65.7	147	0.68	0.41	0.68
SORGHUM PARTNERS	Sordan 79	SS	77	41	13.1	29.2	51.9	80.4	64.8	147	0.73	0.46	0.67
BUFFALO BRAND	Grazex BMR 727	SS	73	42	12.8	30.7	54.9	80.3	64.7	143	0.71	0.44	0.67
TRIUMPH	TR 1866 Bt	Corn	66	57	13.3	33.7	55.3	81.8	65.5	148	0.66	0.39	0.67
Sorghum Average		FS	79	42	11.7	29.7	52.0	81.7	66.1	154	0.72	0.45	0.68

\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;

IVTD, In Vitro True Digestibility; RFQ, Relative Forage Quality.

Net Energy: Maintenance, Gain, Lactation.

Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2003

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 Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 113,250 Seed/A. PLANTED: May 22. HARVESTED: October 9 and 10.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 63 F.

IRRIGATION: Three furrow irrigations: July 2, July 23, and August 7, total applied 14 A-in./A.

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	0.55	175	2	2	9
June	6.89	626	14	3	39
July	1.62	963	28	13	70
August	2.72	829	24	3	101
September	0.77	495	3	0	131
October	0.08	126	0	0	141
Total	12.63	3214	71	23	141

\1 Growing season from May 22 (planting) to October 9 & 10 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

PEST CONTROL: Preemergence Herbicides: None. Post Emergence Herbicides: Clarity 4 Oz/A, Buctril 16 Oz/A, Atrazine 1.0 Lb/A, COC 1 Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

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

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.7	0.6	2.3	14	2.0	395	0.6	5.2
8"-24"				5				
Comment	Alka	VLo	VHi	Mod	VLo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	75	20	0	0
Applied	125	20	0.3	0

Yield Goal: 18 Ton/A.
Actual Yield: 19.4 Ton/A @ 70% MC.

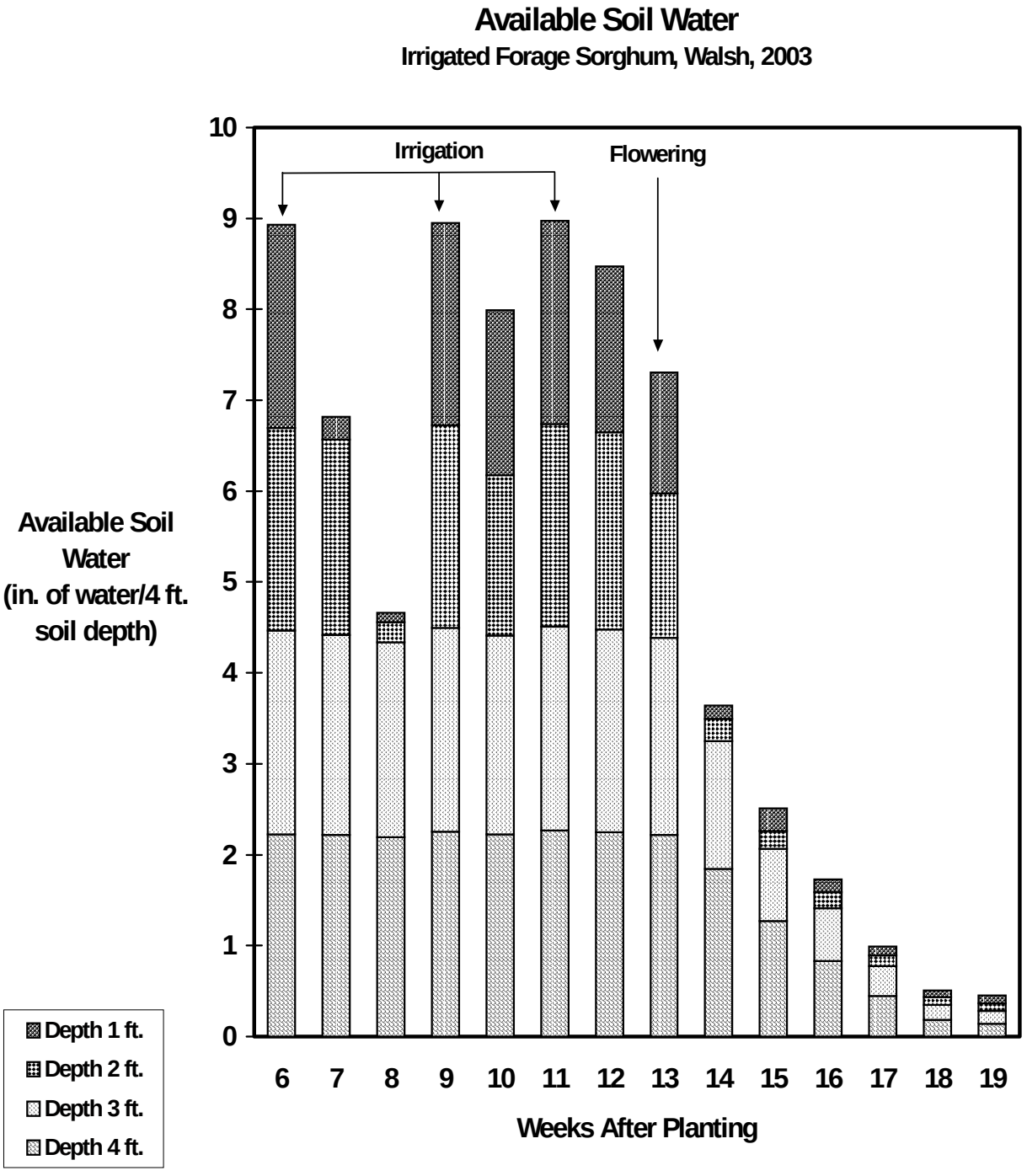

Fig. 6. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 12.63 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 15.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2003. \1

Brand	Hybrid	Forage Type \2	Days to Emerge	Days to 50% Bloom	Harvest Density	Plant Ht.	Stage \3 at Harvest	Stem Sugar	Plant Lodg	Forage Yield	Yield % of Test Average
					Plants/A (1000 X)	In.		%	%	Tons/A	%
NC+	NC+ Nutri-Ton II	FS	10	107	39.9	104	LM	11	12	25.6	132
DRUSSEL SEED	DSS Dividend BMR	FS	9	96	43.4	102	HD	10	18	24.1	124
DEKALB	FS-5	FS	11	95	36.8	106	HD	11	0	24.0	124
DEKALB	FS-25E	FS	10	115	45.7	112	EM	16	0	23.6	122
NC+	NC+ Nutri-Cane II	FS	11	91	35.6	102	HD	17	0	22.8	118
SORGHUM PARTNERS	NK 300	FS	9	86	32.1	80	MT	4	0	21.9	113
(Check)	NB 305F	FS	12	91	32.5	94	HD	11	0	21.8	113
SORGHUM PARTNERS	SS 405	FS	10	102	38.3	137	LM	15	0	20.6	106
SORGHUM PARTNERS	1990	FS	11	Veg	31.8	120	Veg	13	0	20.2	104
AERC	AERC SSH 35	FS	9	93	25.6	89	HD	14	1	19.8	102
BUFFALO BRAND	Canex	FS	11	85	31.4	99	MT	17	0	19.8	102
BUFFALO BRAND	Canex BMR 248	FS	9	85	34.9	94	MT	15	2	19.6	101
BUFFALO BRAND	Canex BMR 340	FS	9	85	36.8	92	MT	18	0	18.8	97
BUFFALO BRAND	Canex II	FS	10	86	31.0	106	MT	13	0	18.1	93
BUFFALO BRAND	Canex BMR 310	FS	9	83	30.2	96	MT	12	3	18.0	93
AERC	AERC SSH 51	FS	10	104	29.0	142	LM	14	0	17.9	92
DEKALB	DKS 59-09	FS	9	88	45.3	80	MT	6	37	17.4	90
BUFFALO BRAND	Canex BMR 208	FS	9	86	29.4	93	MT	16	0	16.6	86
BUFFALO BRAND	Grazex BMR 727	SS	9	75	38.7	106	MT	8	20	20.8	107
SORGHUM PARTNERS	Sordan Headless	SS	10	131	34.1	114	PM	12	0	19.9	103
SORGHUM PARTNERS	Trudan 8	SS	9	73	33.7	111	MT	11	20	19.0	98
CAL/WEST SEEDS	CW 1-61-9	SS	11	84	27.9	98	MT	13	1	18.3	94
BUFFALO BRAND	Buffalo Brand	SS	10	79	36.4	124	MT	12	0	18.2	94
BUFFALO BRAND	Grazex II W	SS	10	76	37.6	119	MT	13	3	17.8	92
BUFFALO BRAND	Grazex II	SS	10	74	35.2	114	MT	13	7	17.5	90
CAL/WEST SEEDS	CW 1-61-1	SS	10	85	38.3	98	MT	9	1	16.9	87
SORGHUM PARTNERS	Sordan 79	SS	9	77	46.9	120	MT	10	25	16.7	86
CAL/WEST SEEDS	CW 1-61-10	SS	10	83	28.3	111	MT	9	0	16.6	86
CAL/WEST SEEDS	CW 1-61-4	SS	10	85	27.1	99	MT	7	0	16.3	84
CAL/WEST SEEDS	CW 1-63-1	SS	10	83	36.8	94	MT	15	2	16.1	83
CAL/WEST SEEDS	CW 1-63-4	SS	9	85	29.0	103	MT	8	1	15.7	81
TRIUMPH	TR 1866 Bt	Corn	8	78	25.9	102	HD	7	0	19.3	99
Sorghum Average		FS	10	89	34.8	105	MT	12	5	19.4	
LSD 0.20										3.08	

\1 Planted May 22; Harvested: October 9 and 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 16.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 2001-2003.

		Forage Yield					Yield as % of Test Average				
					2-Year	3-Year				2-Year	3-Year
Brand	Hybrid	2001	2002	2003	Avg	Avg	2001	2002	2003	Avg	Avg
		----------Tons/A----------									
BUFFALO BRAND	Canex	22.5	19.9	19.8	19.9	20.7	114	112	102	107	109
BUFFALO BRAND	Canex II	22.1	19.0	18.1	18.6	19.7	112	107	93	100	104
BUFFALO BRAND	Canex BMR 208	21.5	19.8	16.6	18.2	19.3	109	111	86	99	102
BUFFALO BRAND	Canex BMR 310	20.5	17.9	18.0	18.0	18.8	104	101	93	97	99
BUFFALO BRAND	Buffalo Brand	16.5	17.8	18.2	18.0	17.5	84	100	94	97	93
BUFFALO BRAND	Grazex II	19.3	15.7	17.5	16.6	17.5	98	88	90	89	92
BUFFALO BRAND	Grazex II W	17.1	13.5	17.8	15.7	16.1	87	76	92	84	85
BUFFALO BRAND	Grazex BMR 727	18.1	17.9	20.8	19.4	18.9	92	101	107	104	100
BUFFALO BRAND	Grazex BMR 720	17.0	13.5	--	15.3	--	86	76	--	81	--
CAL/WEST SEEDS	CW 1-61-1	--	20.1	16.9	18.5	--	--	113	87	100	--
CAL/WEST SEEDS	CW 1-61-9	--	16.9	18.3	17.6	--	--	95	94	95	--
CAL/WEST SEEDS	CW 1-61-10	--	17.1	16.6	16.9	--	--	96	86	91	--
CAL/WEST SEEDS	CW 1-63-1	--	18.0	16.1	17.1	--	--	101	83	92	--
GOLDEN HARVEST	Si-Gro H-45	20.3	20.3	--	20.3	--	103	118	--	111	--
GOLDEN HARVEST	Si-Gro EX-47	19.1	19.0	--	19.1	--	97	107	--	102	--
NC+	NC+ Nutri-Cane II	--	20.7	22.8	21.8	--	--	118	118	118	--
NC+	NC+ Nutri-Ton II	--	19.3	25.6	22.5	--	--	108	132	120	--
SORGHUM PARTNERS	NK 300	24.0	20.5	21.9	21.2	22.1	122	115	113	114	117
SORGHUM PARTNERS	HIKane II	20.2	18.6	--	19.4	--	102	105	--	104	--
SORGHUM PARTNERS	SS 405	--	20.2	20.6	20.4	--	--	113	106	110	--
SORGHUM PARTNERS	1990	--	18.6	20.2	19.4	--	--	104	104	104	--
SORGHUM PARTNERS	Sordan 79	--	16.6	16.7	16.7	--	--	93	86	90	--
SORGHUM PARTNERS	Sordan Headless	--	20.6	19.9	20.3	--	--	116	103	110	--
SORGHUM PARTNERS	Trudan 8	--	14.5	19.0	16.8	--	--	81	98	90	--
RICHARDSON SEED	Honey Graze BMR	19.5	15.9	--	17.7	--	99	89	--	94	--
RICHARDSON SEED	Sweeter N Honey BMR	20.8	20.0	--	20.4	--	105	112	--	109	--
(Check)	NB 305F	17.8	20.0	20.0	21.8	19.3	90	112	113	113	105
(Check)	Corn	22.4	13.9	19.3	16.6	18.5	114	78	99	89	97
Average		19.7	17.8	19.4	18.6	19.0					

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

Table 17.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2003.

Brand	Hybrid	Forage Type \1	Days to Boot	Plant Height at Boot	CP	ADF	NDF	IVTD	TDN	RFQ	Net Energy Main.	Net Energy Gain	Net Energy Lact.
				In	----------%----------						-----MCal/lb-----		
BUFFALO BRAND	Canex BMR 208	FS	79	75	12.0	34.8	58.1	81.7	63.4	140	0.64	0.37	0.65
BUFFALO BRAND	Canex BMR 248	FS	78	78	13.5	34.2	56.2	80.4	62.9	138	0.65	0.38	0.65
BUFFALO BRAND	Canex BMR 340	FS	78	75	10.4	35.4	60.5	80.1	64.8	137	0.63	0.37	0.67
BUFFALO BRAND	Canex II	FS	79	81	11.7	36.5	59.0	79.9	63.4	135	0.61	0.35	0.65
AERC	AERC SSH 35	FS	85	78	13.8	35.5	57.8	80.7	61.0	133	0.63	0.36	0.62
BUFFALO BRAND	Canex	FS	78	77	10.2	36.8	59.4	79.0	62.9	131	0.60	0.34	0.65
NC+	NC+ Nutri-Ton II	FS	103	82	10.4	37.5	59.3	78.9	62.3	130	0.59	0.33	0.64
(Check)	NB 305F	FS	82	69	12.8	35.8	58.9	79.4	61.4	129	0.62	0.36	0.63
SORGHUM PARTNERS	SS 405	FS	93	115	13.0	35.6	57.9	79.2	61.1	129	0.63	0.36	0.63
DEKALB	FS-25E	FS	104	97	10.2	37.3	61.2	77.3	62.3	125	0.60	0.34	0.64
BUFFALO BRAND	Canex BMR 310	FS	76	74	11.5	34.8	61.2	77.9	61.8	125	0.64	0.38	0.63
DEKALB	DKS 59-09	FS	80	59	9.8	39.0	62.1	78.9	61.2	125	0.57	0.31	0.63
DRUSSEL SEED	DSS Dividend BMR	FS	86	86	12.2	37.4	60.5	77.8	59.9	121	0.59	0.33	0.61
SORGHUM PARTNERS	1990	FS	Veg	119	9.0	39.8	62.1	77.9	60.5	121	0.55	0.30	0.62
NC+	NC+ Nutr-Cane II	FS	81	79	9.8	39.5	64.0	75.8	60.0	115	0.56	0.30	0.61
SORGHUM PARTNERS	NK 300	FS	78	46	10.1	10.9	64.3	76.0	59.2	113	0.53	0.28	0.60
DEKALB	FS-5	FS	88	82	11.9	37.9	61.8	74.3	57.1	107	0.59	0.33	0.58
AERC	AERC SSH 51	FS	95	99	10.7	36.8	62.1	74.3	57.2	107	0.60	0.34	0.58
BUFFALO BRAND	Grazex BMR 727	SS	64	42	12.8	32.2	53.8	83.6	67.9	161	0.68	0.41	0.70
SORGHUM PARTNERS	Trudan 8	SS	62	45	11.7	34.6	56.4	82.6	67.2	153	0.64	0.38	0.69
SORGHUM PARTNERS	Sordan 79	SS	65	46	12.5	34.2	54.4	82.5	66.0	152	0.65	0.38	0.68
BUFFALO BRAND	Grazex II W	SS	65	44	12.8	35.0	56.5	81.2	64.9	144	0.64	0.37	0.67
BUFFALO BRAND	Grazex II	SS	63	47	11.5	35.7	58.3	80.3	65.5	141	0.63	0.36	0.67
BUFFALO BRAND	Buffalo Brand	SS	66	46	13.6	33.5	55.9	79.0	62.9	135	0.66	0.39	0.65
CAL/WEST SEEDS	CW 1-61-9	SS	75	74	11.1	39.2	61.1	80.7	62.9	134	0.56	0.31	0.65
CAL/WEST SEEDS	CW 1-63-1	SS	74	73	11.2	39.1	62.5	79.9	61.9	129	0.56	0.31	0.63
SORGHUM PARTNERS	Sordan Headless	SS	120	118	9.9	37.1	57.9	77.5	62.1	127	0.60	0.34	0.64
CAL/WEST SEEDS	CW 1-61-10	SS	75	78	10.7	39.3	63.8	78.0	62.1	124	0.56	0.30	0.64
CAL/WEST SEEDS	CW 1-61-4	SS	76	73	10.6	40.1	63.7	77.9	60.3	120	0.55	0.29	0.62
CAL/WEST SEEDS	CW 1-61-1	SS	76	77	10.3	38.8	63.7	76.4	60.4	117	0.57	0.31	0.62
CAL/WEST SEEDS	CW 1-63-4	SS	76	80	11.9	39.6	63.9	75.9	59.7	114	0.56	0.30	0.61
TRIUMPH	TR 1866 Bt	Corn	73	92	13.6	37.1	56.4	81.3	64.0	142	0.60	0.34	0.66
Sorghum Average		FS	80	75	11.4	35.9	59.9	78.9	62.1	129	0.60	0.34	0.64

\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; IVTD, In Vitro True Digestibility; RFQ, Relative Forage Quality; Net Energy: Maintenance, Gain, Lactation..

Irrigated Forage Sorghum Hybrid Performance Trial at Rocky Ford, 2003

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

PURPOSE: To identify high yielding hybrids under irrigated conditions in a Silty Clay Loam soil.

PLOT: Two rows with 30" row spacing, 32' long. SEEDING DENSITY: 96,800 Seed/A. PLANTED: June 12. HARVESTED: September 17.

EMERGENCE DATE: ca. 10 to 14 days after planting. SOIL TEMP: 61°F.

IRRIGATION: Five furrow irrigations: June 14, July 1, July 26, August 8, August 25, total applied ca. 18 acre-in/A.

PEST CONTROL: Preemergence Herbicides: Glyphosate 1 lb.AI/A. Postemergence Herbicide: Dicamba 0.25 lb 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	2.28	374	12	2	18
July	0.51	829	29	22	49
August	0.54	770	28	6	80
September	0.44	256	4	0	97
Total	3.77	2229	73	30	97

\1 Growing season from June 12 (planting) to September 17 (harvest).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

CULTURAL PRACTICES: Previous crop: corn. Field Preparation: chisel, disc, roller-pack, level, furrow, rodweed. Cultivation: 2X.

SOIL: Silty Clay Loam, 1 - 1.5 % O.M., pH-ca. 7.8. FERTILIZER: 52 lbs. P_2O_5 and 111 lbs. N/A.

COMMENTS: Irrigation water adequate, very hot July, stand-fair, weed control-fair, forage yields below average.

.

Table 18.-Irrigated Forage Sorghum Hybrid Performance Test at Rocky Ford, 2003. \1

Brand	Hybrid	Forage Type \2	Days to 50% Bloom	Plant Density	Plant Height	Stage \3 at Harvest	Stem Sugar	Dry Matter	Forage Yield	Yield % of Test Average
				Plants/A (1000 X)	In.		%	%	Tons/A	%
SORGHUM PARTNERS	SS 405	FS	96	62.9	108	EM	7	21	24.1	117
SORGHUM PARTNERS	1990	FS	Veg	68.3	103	Veg	7	20	21.9	106
(Check)	NB 305F	FS	79	62.1	97	MM	15	25	21.7	105
SORGHUM PARTNERS	NK 300	FS	82	55.5	70	LM	12	24	21.0	102
SORGHUM PARTNERS	Sordan 79	SS	74	78.1	105	ED	2	26	24.5	119
SORGHUM PARTNERS	Sordan Headless	SS	Veg	70.2	102	Veg	8	20	21.7	105
CAL/WEST SEEDS	CW 1-63-1	SS	76	66.2	91	LM	11	26	20.7	100
CAL/WEST SEEDS	CW 1-63-4	SS	77	68.9	88	MM	11	27	20.7	100
CAL/WEST SEEDS	CW 1-61-4	SS	76	55.5	92	LM	12	26	20.6	100
CAL/WEST SEEDS	CW 1-61-1	SS	76	55.5	88	LM	11	26	20.3	100
CAL/WEST SEEDS	CW 1-61-10	SS	76	67.2	88	LM	11	26	18.9	92
SORGHUM PARTNERS	Trudan 8	SS	74	59.9	99	ED	8	31	18.8	91
CAL/WEST SEEDS	CW 1-61-9	SS	78	52.8	88	MM	11	26	17.9	87
DEKALB	DK 642	Corn	67	34.0	72	MM	12	27	15.4	75
Average		SS	78	61.2	92		10	25	20.6	
LSD 0.20									1.81	
CV%									9.52	

\1 Planted June 12, 2003; Harvested: September 17, 2003.

\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;

Table 19.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Rocky Ford, 2001-2003.

		Forage Yield					Yield as % of Test Average				
					2-Year	3-Year				2-Year	3-Year
Brand	Hybrid	2001	2002	2003	Avg	Avg	2001	2002	2003	Avg	Avg
		----------Tons/A----------					----------%----------				
SORGHUM PARTNERS	NK 300	24.5	23.0	21.0	22.0	22.8	102	101	102	102	102
SORGHUM PARTNERS	HiKane II	26.2	21.8	--	24.0	--	109	95	--	102	--
SORGHUM PARTNERS	SS 405	--	27.5	24.1	25.8	--	--	121	117	119	--
SORGHUM PARTNERS	1990	--	23.3	21.9	22.6	--	--	102	106	104	--
SORGHUM PARTNERS	Sordan Headless	--	25.4	21.7	23.6	--	--	111	105	108	--
SORGHUM PARTNERS	Sordan 79	--	27.5	24.5	26.0	--	--	121	119	120	--
SORGHUM PARTNERS	Trudan 8	--	21.8	18.8	20.3	--	--	95	91	93	--
(Check)	NB 305F	24.4	20.8	5.0	12.9	16.7	101	91	106	99	99
(Check)	Corn	21.7	19.6	3.1	11.4	14.8	90	86	65	76	80
Average		24.1	22.8	20.6	21.7	22.5					

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

Tillage System Comparisons for Dryland Grain Sorghum Production

Kevin Larson, Dennis Thompson, Deborah Harn, and Calvin Thompson

The majority of grain sorghum produced in Southeastern Colorado is grown using conventional tillage (disc, sweep plow, or chisel) in a continuous grain sorghum rotation. There are problems with conventional tillage: it leaves little soil-protecting residue and removes precious soil water. No-till solves conventional-till shortcomings by leaving residue that conserves both soil and soil water. However, long-term, continuous no-till grain sorghum is reported to be unprofitable (Peterson, et al., 1993). Continuous no-till yields tend to drop with each subsequent grain sorghum crop because of increasing grassy weed competition, and treatment costs are very high. Ridge-till has some of the moisture saving benefits of no-till, and grassy weeds are controlled with cultivation. In dry years, the moisture conserving ridge-till system would produce higher yields than conventional-till. In this study, we compared yield and economics of ridge-till, no-till and conventional-till for dryland continuous grain sorghum production.

Materials and Methods

We imposed three tillage systems, no-till, ridge-till and conventional-till, on large 20 ft. by 1300 ft. strips in a Silty Clay Loam soil with three replications. In order to set up the tillage systems, we planted continuous sorghum crops. After harvesting the first sorghum crop, we ripped the entire study site to a depth of 15 in. with an inline, straight shank subsoiler on 30 in. spacing. On the subsequent sorghum crops, we implemented the tillage systems to the same plots for five years from 1998 to 2003 (there was no crop sown in 2002 because of drought). We planted MYCOGEN 627 at 40,000 Seeds/A in early June to mid-June. At planting we seedrow applied 5 Gal 10-34-0/A (20 Lb P_2O_5/A, 6 Lb N/A). All treatments received a preplant application of Atrazine 1.0 Lb/A. To control early season weeds, we sprayed the no-till and ridge-till systems with LandMaster 54 Oz/A; the minimum-till system was swept. To control the weeds prior to planting, we sprayed the no-till and ridge-till systems with Roundup 16 Oz/A; and again, the minimum-till system was swept. When possible, we applied Roundup 16 Oz/A to the no-till system to control volunteer grain sorghum and weeds before crop emergence. Early in the season, both the ridge-till and minimum-till were cultivated. Later, we cultivated the ridge-till system a second time to build up the ridges. Beginning in 2001, we eliminated one of the two ridge-till cultivations, and combined cultivating and ridge building in one cultivation operation. We harvested the plots in November with a self-propelled combine and weighed them in a digital grain cart. Grain yields were corrected to 14% seed moisture content.

Results

There was no yield difference between no-till and ridge-till, until 2003, when ridge-till yielded more than no-till ($P > 0.20$) (Table 20). For two out of five years, no-till produced more than conventional-till, and three years ridge-till produced more than conventional-till ($P > 0.20$). The no-till and ridge-till systems frequently produced higher yields than conventional-till; however, because the production costs of no-till and ridge-till are higher than conventional-till, in three out of five years, conventional-till provided higher variable net income than one or both of the no-till and ridge-till systems. The

linear trends of yield and income for no-till and conventional-till significantly decrease with time compared to ridge-till (Fig. 7).

Discussion

The advantages of ridge-till compared to conventional-till are reported to be higher soil moisture (less moisture loss from tillage), higher soil conservation (the stocks are left standing until planting), better weed control (weeds are moved into the furrow and are cultivated out), reduced soil compaction in the crop zone (the ridge where the crop is grown does not have wheel traffic and is not tilled) and higher yield (from the moisture savings) (Pfost, 1993). The first two years of this study were much wetter than average: 29 in. for 1998, and 23 in. for 1999 of annual precipitation. The last three crop years of this study were drier than the first two years with above to average annual precipitation: 16 in. for 2000, 19 in. for 2001, and 20 in. for 2003. Presumably because of soil moisture savings, ridge-till yields were higher than conventional-till yields in the drier years of this study. Variable net income levels of conventional-till compared to ridge-till have likewise declined.

The advantages of ridge-till compared to no-till are reported to be earlier plant date due to higher soil temperature in the planting ridge, and less weed pressure because of ridge building cultivation (Pfost, 1993). There has been an obvious increase in grassy weeds in the no-till system compared to the ridge-till system. The increase in sandbur, shattercane, and volunteer in the no-till system have steadily decrease yields and income compared to ridge-till.

The longer the system is held in dryland continuous grain sorghum, the greater the advantages of ridge-till are compared to no-till and conventional-till (especially in drier years). It takes a few years of no-till continuous grain sorghum before grassy weeds proliferate and reduce yields and income compared to ridge-till. In drier years, the moisture savings from herbicide weed control compared to tillage weed control helped ridge-till produce higher yields than conventional-till. We recommend that grain sorghum producers in continuous grain sorghum production convert from conventional-till to ridge-till.

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Table 20.-Summary: Tillage Comparisons for Dryland Grain Sorghum at Walsh, 1998-2003.

Tillage Treatment	Tillage Passes	Cultivations	Chemical Sprayings	Variable Tillage Cost	Variable Chemical Cost	Variable Treatment Cost	Grain Yield	Variable Net Income
				$/A	$/A	$/A	Bu/A	$/A
			----------1998----------					
No-Till	0	0	4	0.00	31.50	31.50	70	93.80
Ridge-Till	0	2	3	10.00	24.00	34.00	65	82.35
Conventional-Till	2	1	1	13.00	6.50	19.50	55	78.95
1998 Average	1	1	3	7.67	20.67	28.33	63	85.03
LSD 0.20							13.3	
			----------1999----------					
No-Till	0	0	4	0.00	31.50	31.50	66	86.64
Ridge-Till	0	2	3	10.00	24.00	34.00	63	78.77
Conventional-Till	2	1	1	13.00	6.50	19.50	64	95.06
1999 Average	1	1	3	7.67	20.67	28.33	64	86.82
LSD 0.20							7.0	
			----------2000----------					
No-Till	0	0	3	0.00	24.00	24.00	17	6.43
Ridge-Till	0	2	3	10.00	24.00	34.00	17	-3.57
Conventional-Till	2	1	1	13.00	6.50	19.50	16	9.14
2000 Average	1	1	2	7.67	18.17	25.83	17	4.00
LSD 0.20							2.4	
			----------2001----------					
No-Till	0	0	3	0.00	24.00	24.00	25	20.75
Ridge-Till	0	1	3	5.00	24.00	29.00	24	13.96
Conventional-Till	2	1	1	13.00	6.50	19.50	20	16.30
2001 Average	1	1	2	6.00	18.17	24.17	23	17.00
LSD 0.20							3.8	
			----------2003----------					
No-Till	0	0	3	0.00	24.00	24.00	49	88.70
Ridge-Till	0	1	3	5.00	24.00	29.00	52	90.60
Conventional-Till	2	1	1	13.00	6.50	19.50	47	88.60
2003 Average	1	1	2	6.00	18.17	24.17	49	89.30
LSD 0.20							2.5	

Tillage Cost: Sweep plow, $4/A; Cultivation, $5/A. Chemical Cost: Application $3.50/A; LandMaster, $7.50/A; Roundup, $4/A; Atrazine, $3./A.
Grain Price: $1.79/Bu for 1998, 1999, 2000, and 2001; $2.30/Bu for 2003
Variable Net Income: Grain Yield @ Grain Price minus Variable Treatment Cost.

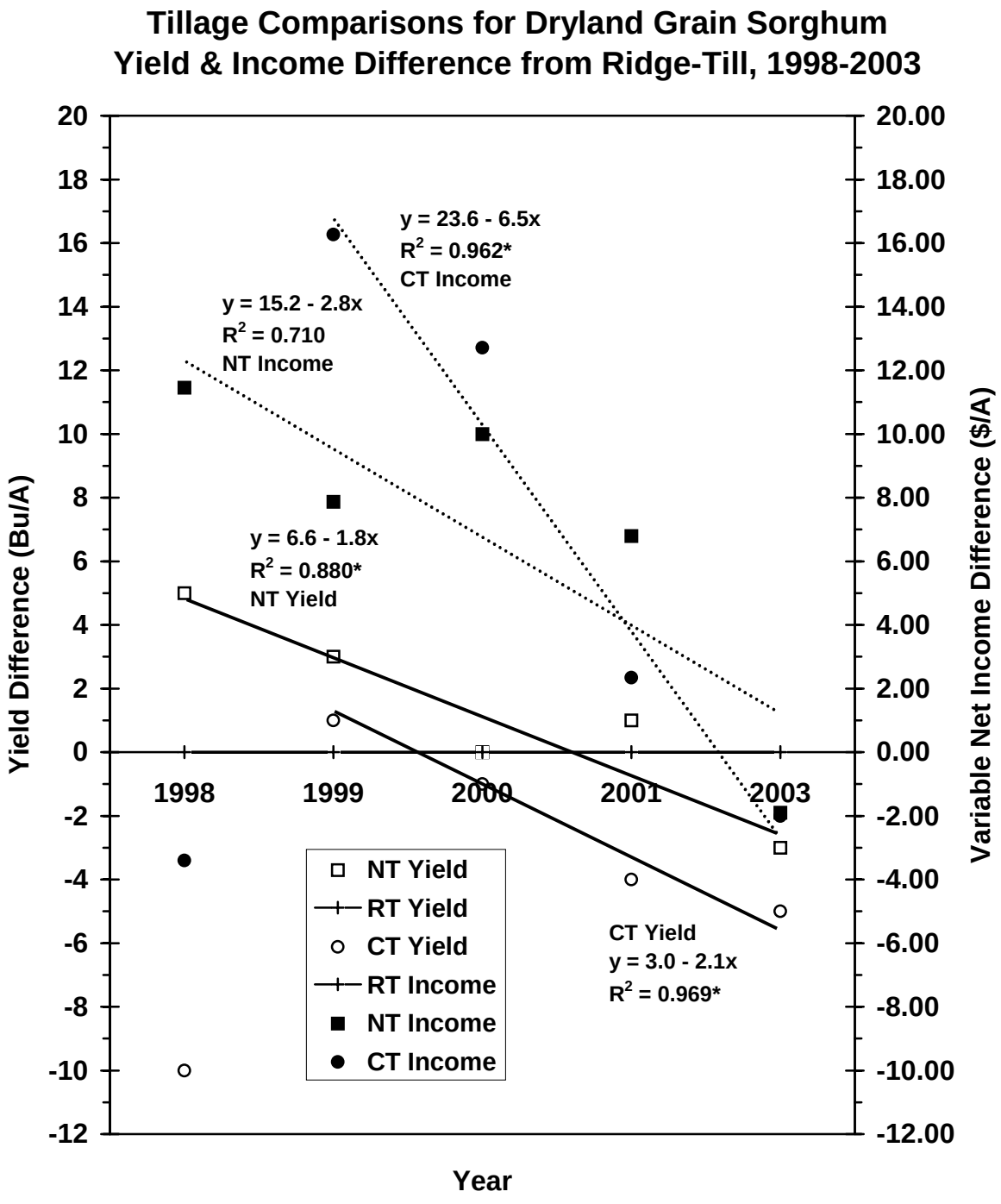

Fig. 7. Tillage comparison of yield and variable net income for dryland continuous grain sorghum at Walsh for 1998-2003 (no data from 2002 drought year). No-till (NT) and conventional-till (CT) yield and income difference from ridge-till (RT) base.

Zn Fertilization of Irrigated Grain Sorghum in Southeastern Colorado

Kevin Larson, Dennis Thompson, and Bill Brooks

Soil test recommendations for Southeastern Colorado typically recommend banding 2 Lb Zn/A to both dryland and irrigated grain sorghum. From our previous studies, we reported yield increases with Zn fertilization for dryland corn, but only once did dryland grain sorghum respond positively to applied Zn (Larson, Schweissing, Thompson, 2001). The one time dryland grain sorghum yields did increase with Zn fertilization was an exceptionally high rainfall, high yielding year. This is the second year of our continuing study to determine the optimum Zn rate for irrigated grain sorghum under high yielding conditions.

Materials and Methods

We used five seedrow applied Zn rates at Vilas: 0, 0.25, 0.5, 0.75 and 1.0 Lb Zn/A as Zn chelate. At Walsh we used six seedrow applied Zn rates: 0, 0.2, 0.4, 0.6, 0.8, and 1.0 Lb Zn/A as Zn chelate. At both sites, we mixed the Zn with 5 Gal 10-34-0/A. The Vilas site was sprinkler irrigated with 14 A-in./A of water. The Walsh site was subsurface drip irrigated with 11.8 A-in./A. The grain sorghum hybrid used at Walsh was MYCOGEN 627 planted on June 16 at 87,100 Seeds/A. The grain sorghum hybrid used at Vilas was PIONEER 84G62 planted on May 30 at 70,000 Seeds/A. The grower applied 80 Lb N/A and 24 Lb P_2O_5/A to the Vilas site. We applied 100 Lb N/A and 20 Lb P_2O_5/A to the Walsh site. An herbicide mixture of Guardsman 2.2 Pt/A and Outlook 5 Oz/A was banded on to control weeds at Vilas. We used a post emergence broad-spectrum weed herbicide mixture of Atrazine 1.0 Lb/A, Clarity 4 Oz/A and COC 1Qt/A for weed control at Walsh. Both sites were cultivated once. The 10 ft. X 650 ft. plots at Walsh and the 22.5 ft. X 2500 ft. plots at Vilas were harvested with self-propelled combines and weighed in a digital weigh cart.

Results and Discussion

This year there was no response to applied Zn on irrigated grain sorghum at either the Vilas or the Walsh sites and yields were very high (152 Bu/A at Vilas and 116 Bu/A at Walsh) (Fig. 8 and Fig. 9). Last year the Vilas site responded to applied Zn with an optimum rate around 0.6 Lb Zn/A and a yield of 98 Bu/A (Larson, Schweissing, Thompson, 2003). With the high yields we achieved this year, we anticipated a response to applied Zn; however, we recorded no response to Zn.

Bill Brooks, the farmer-cooperator at the Vilas site, observed plant maturity acceleration with increasing Zn rates at the Vilas site. These maturation differences became undistinguishable with the later than average freeze date (June 26, 22 F). Bill Brooks suggested that the Zn maturation response he observed might have produced yield responses if this season's first freeze date would have been closer to average (June 12). Brook's plausible explanation for the lack of Zn response suggests that one of the roles of Zn for our area is maturity acceleration.

This is the second year of our multi-year irrigated grain sorghum Zn study. The lack of Zn response we obtained this year suggests that Zn fertilizer may not be required for high grain sorghum production if the growing season is long enough for full maturation. This year's lack of yield response to Zn does not change our original

recommendation of seedrow applying 0.5 Lb/A of Zn to high production grain sorghum because we do not typically have extended grain fill periods from very late freeze dates.

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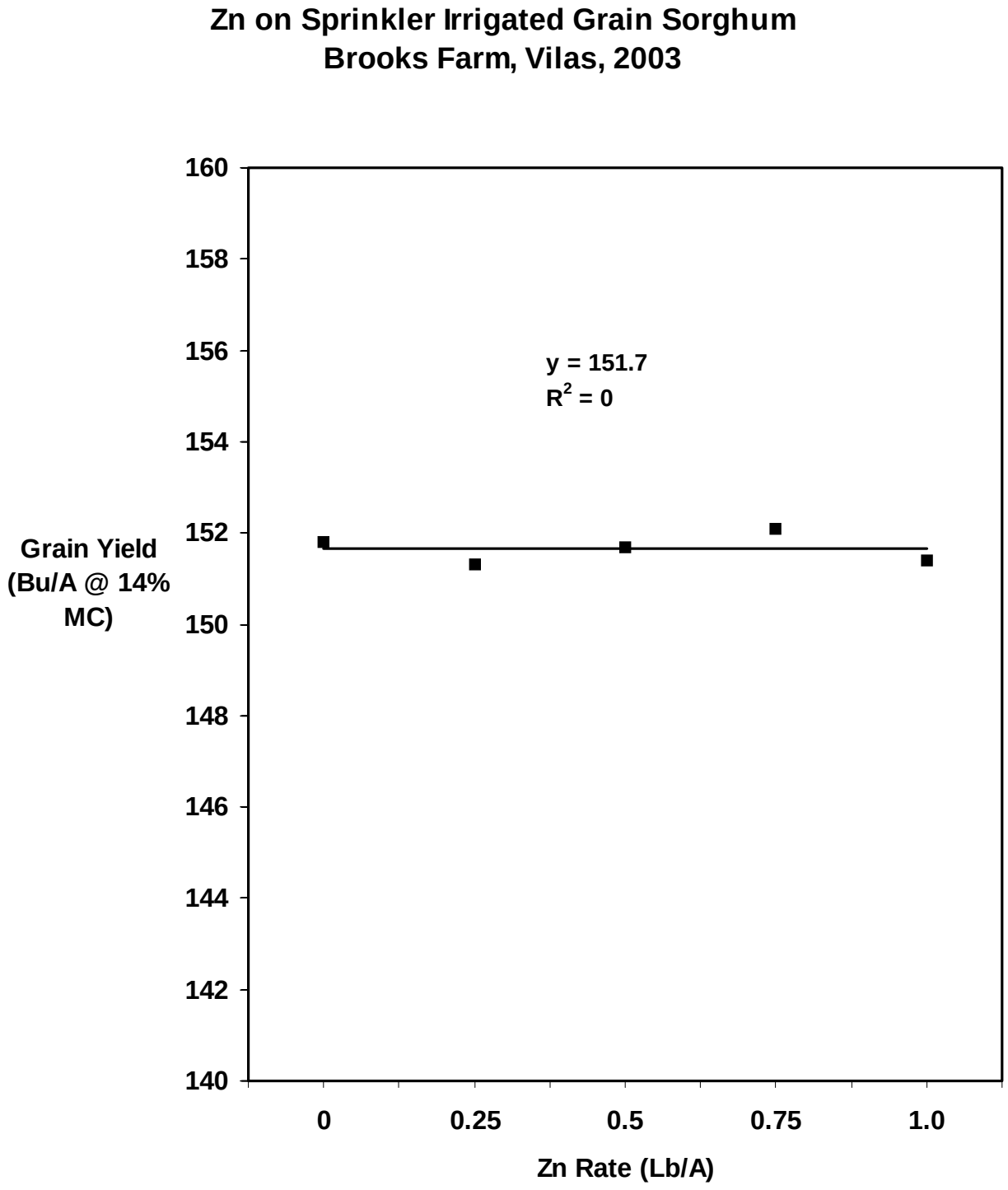

Fig. 8. Seedrow Zn on sprinkler irrigated grain sorghum at Vilas. The Zn rates were 0, 0.25, 0.5, 0.75 and 1.0 Lb Zn/A as Zn chelate. The grain sorghum hybrid was PIONEER 84G62.planted at 70,000 Seeds/A.

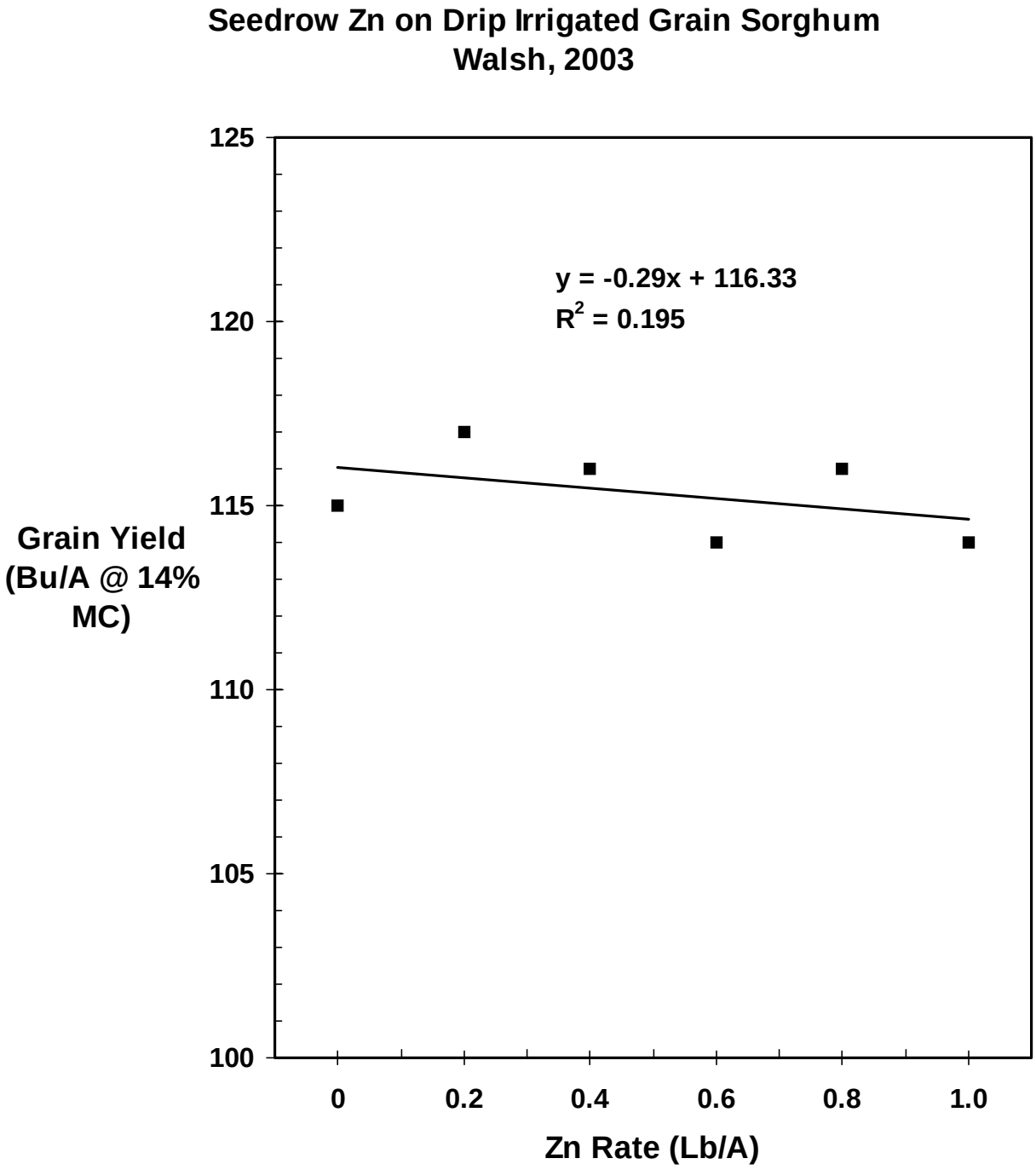

Fig. 9. Seedrow Zn rate on subsurface drip irrigated grain sorghum at Walsh. The Zn rates were 0, 0.2, 0.4, 0.6, 0.8 and 1.0 Lb Zn/A as Zn chelate. The grain sorghum hybrid was MYCOGEN 627 planted at 87,100 Seeds/A.

Broadleaf Weed 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 consider chemical costs and grain yields. We tested commonly used herbicide mixtures as well as some newer registered herbicides for broadleaf weed control in grain sorghum. Pigweed and kochia are the most prevalent broadleaf weeds in grain sorghum in Southeastern Colorado.

Materials and Methods

We applied ten post emergent herbicide treatments on 12 in. tall pigweed and kochia in 12 in. high grain sorghum. The herbicide treatments were applied on July 15 at 10 Gal/A with 110^{o} flat fan nozzles spaced 18 in. apart. The site was planted June 12 with MYCOGEN 627 at 38,000 Seeds/A. A late-season cultivation was performed on all treatments to control grassy weeds.

Results and Discussion

All herbicide treatments produced higher yields than the cultivated check (Table 21). All but four herbicide treatments provided positive net incomes compared to the cultivation check. Three of the four herbicide treatments with net incomes less than the cultivation check had the highest herbicide costs, $8 to $19/A higher than the check. The herbicide treatment that produced the highest variable net income was the Atrazine, Clarity, 2,4-D and Crop Oil Concentrate (COC) mixture at $8.98/A. Along with the highest variable net income, the Atrazine, Clarity, 2,4-D and COC treatment also had significantly higher yield than three of the four treatments with negative net incomes ($P > 0.20$). The Paramount, Clarity, 2,4-D, and COC treatment and the Buctril, Atrazine, and Penetrant II treatment had the two lowest net incomes, but surprisingly, they also had some of the highest weed control ratings. We have no explanation for their lower than expected yields.

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 higher net returns.

Two of the most widely used herbicide mixes for broadleaf weed control in grain sorghum are Atrazine, COC, and 2,4-D, or Atrazine, COC, and dicamba (Clarity or Banvel). Since the herbicide treatment of Atrazine, COC, Clarity, and 2,4-D provided the highest pigweed and kochia control, highest grain yield, and highest variable net income of the herbicide treatments tested, we recommend that both 2,4-D and dicamba be applied with Atrazine and COC. Grain sorghum growers with tight cash flow should consider the least cost herbicide treatment, 2,4-D and Penetrant II. It provided good weed control and a moderate variable income at a very low cost.

Table 21.-Broadleaf Weed Control in Dryland Grain Sorghum at Walsh, 2003.

Herbicide Treatment	Rate	Pigweed Control	Kochia Control	Crop Injury	Test Weight	Grain Yield	Chem. Cost	Var. Net Income
	*/A	%	%	%	Lb/Bu	Bu/A	$/A	$/A
1 Atrazine	0.75 lb	90	85	10	57	48	5.92	8.98
1 Clarity	3 oz							
1 2,4-D	0.28 lb							
1 COC	1 qt							
2 Atrazine	0.75 lb	90	75	10	56	47	4.21	8.39
2 2,4-D	0.38 lb							
2 COC	1 qt							
3 Peak	0.5 oz	83	70	0	58	45	8.25	-0.25
3 Atrazine	0.75 lb							
3 COC	1 qt							
4 Atrazine	0.75 lb	85	85	10	56	45	5.76	2.24
4 Clarity	4 oz							
4 COC	1 qt							
5 Ally	0.0625 oz	80	80	6	56	44	3.50	2.20
5 2,4-D	0.38 lb							
5 Penetrant II	1 qt/100 gal							
6 2,4-D	0.47 lb	80	55	11	57	44	2.44	3.26
6 Penetrant II	1 qt/100 gal							
7 Buctril	20 oz	88	88	0	57	43	12.03	-8.63
7 Atrazine	0.75 lb							
7 Penetrant II	1 qt/100 gal							
8 Clarity	5 oz	83	83	15	55	43	5.22	-1.82
8 2,4-D	0.38 lb							
8 Penetrant II	1 qt/100 gal							
9 Paramount	5.33 oz	88	85	14	56	43	19.38	-15.98
9 Clarity	3 oz							
9 2,4-D	0.28 lb							
9 COC	1qt							
10 Cultivation Check	None	0	0	0	56	40	0.00	0.00
Average		77	71	8	56	44	6.67	-0.16
LSD 0.20		3.1	4.0	1.1		3.8		

Planted: June 12, Cargill 627 at 38,000 Seeds/A; Harvested: November 20.
Variable Net Income: Treatment Yield - Control Yield x $2.30/Bu - Chemical Cost - Application Cost ($3.50/A). All treatments were cultivated

Long-Term, Low-Rate, 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 are reported to cause N salt toxicity, which lowers germination (Mortvedt, 1976). Nonetheless, a low to moderate, nontoxic level of seedrow N is reported to increase yields (Larson, Schweissing, Thompson, 2000). This is the second year of our long-term study testing low seedrow P and N rates to determine if low rates applied on the same site for multiple years will maintain high grain sorghum yields.

Materials and Methods

We tested four 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 four rates were 0, 1.25, 2.5, and 5.0 gallons of 10-34-0/A, corresponding to 0, 5, 10, and 20 Lb P_2O_5/A. In addition we added N (32-0-0) to the 6 Lb/N level to the two lowest P rates, making a total of 6 treatments. The fertilizer was applied with a squeeze pump at 5 Gal/A and all fertilizer rates were diluted with water to their appropriate levels. Prior to planting, the soil was sampled at six 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 20 Lb P_2O_5/A; and no N was recommend. The grain sorghum hybrid was MYCOGEN 1482 sown at 40,000 Seed/A on June 17. We harvested the 10 ft. by 500 ft. plots on November 3 with a self-propelled combine with a four-row crop header. Grain yields were corrected to 14% seed moisture content.

Results and Discussion

All seedrow P and N treatments produced higher yields than the no P check (Fig. 10). There was a significant trend toward an optimum seedrow P rate of around 10 Lb P_2O_5/A ($P > 0.10$). This is the second year of our long-term, low-rate seedrow P and N study and thus far the rates less than one-half the recommended rate are producing the highest yields. The first year of this long-term study there was no significant yield difference from any of the fertilizer treatments. Subsequent study results from applying the same rates to the same plots should reveal the long-term affects of low-rate P and N fertilizer treatments.

The efficacy of low P seedrow rates with added N to the 6 Lb/A level obtained from two previous studies indicates that low P rates are effective, at least in the short term (Larson, Schweissing, Thompson, 2000). Our results from these studies found that low seedrow P (10-34-0) rates, as low as one-sixteenth (2.5 Lb P_2O_5/A) the recommended banded P rate (40 Lb P_2O_5/A), 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.

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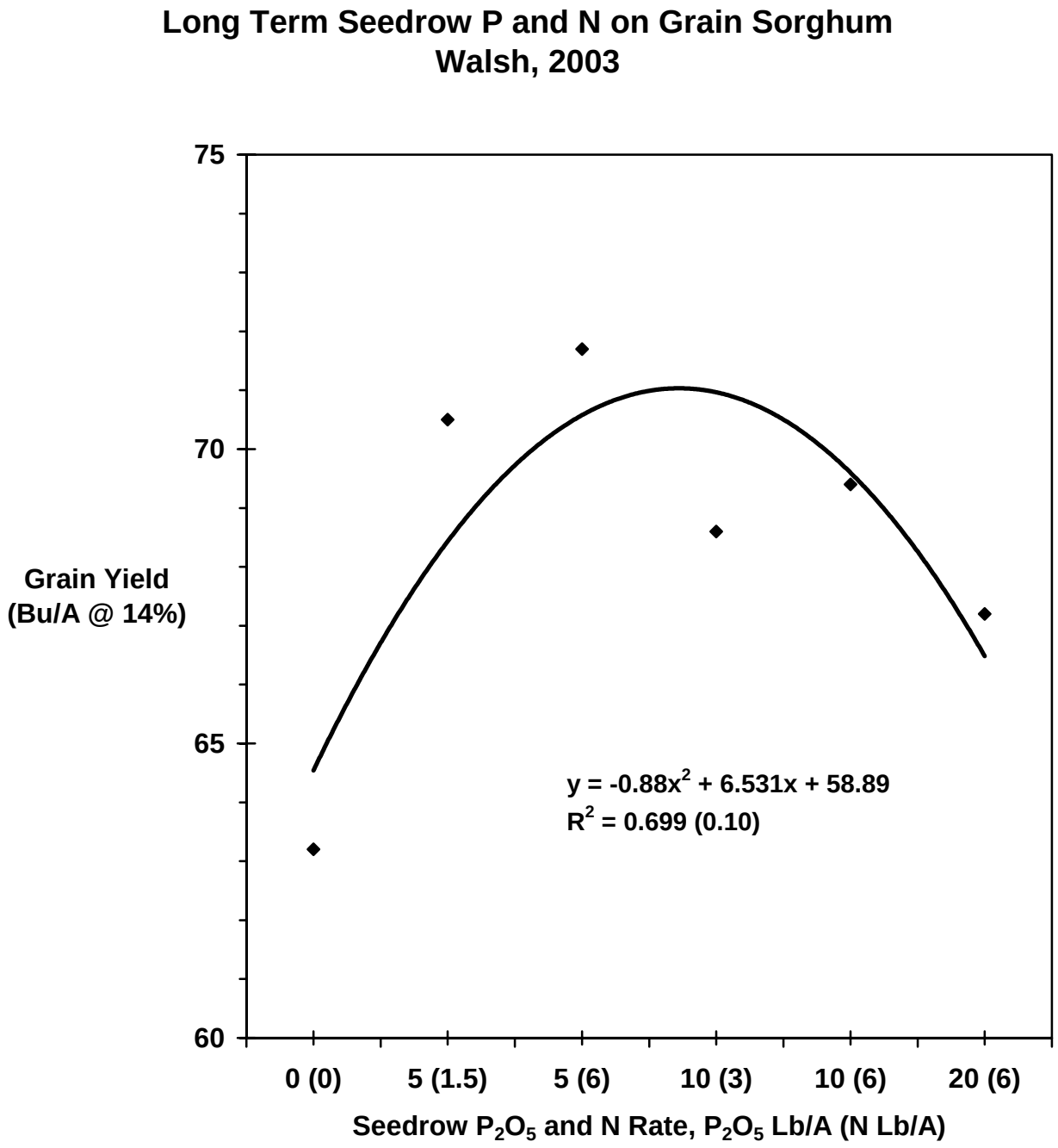

Fig. 10. Second year of long-term seedrow N and P on dryland grain sorghum at Walsh. MYCOGEN 1482 was planted at 40,000 Seeds/A. The N fertilizer was 32-0-0 and the P fertilizer was 10-34-0. All fertilizer treatments applied seedrow at 5 Gal/A.