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Agricultural Experiment Station

College of Agricultural Sciences | Department of Soil and Crop Sciences | Arkansas Valley Research Center | Plainsman Research Center

Sorghum Hybrid Performance Trials in Colorado, 2004

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K.J. Larson, A. Berrada and D.L. Thompson \1

The 2004 Colorado grain sorghum crop was estimated at 7.0 million bushels, 62% above the 2003 sorghum crop. For Colorado, the 7.0 million bushels is 26% larger than the 25-year average. The increase in sorghum production this year was due to increases in both harvested acres and average yield per acre. There was a 25% increase in harvested acreage from 160,000 in 2003 to 200,000 in 2004. In 2004 the average yield was 35 Bu/A, 8 Bu/A more than in 2003. The 35 Bu/A yield is 7 Bu/A more than the 5-year average. Sorghum silage production in 2003 was 210,000 tons, up 56% compared to 2002 production. Sorghum silage production for 2003 was 11% higher than the 5-year average. The increase in sorghum silage production for 2003 compared to 2002 was because of higher per acre yield, 14 Tons/A from 15,000 acres in 2003, and 9 Tons/A from 15,000 acres in 2002 (Colorado Agricultural Statistic Service, 2004).

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 three sites in Southeastern Colorado: dryland grain sorghum trials were conducted at Vilas and Walsh; irrigated grain sorghum trials at 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 2004 are shown in Table 1. Each firm selected entries for testing and furnished seed for the tests. The Agricultural Experiment Station included selected open-pedigree hybrids as a standard of comparison. 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, 2004), 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;
Research Scientist, Arkansas Valley Research Center, Rock Ford;
Technician III, Plainsman Research Center, Walsh.

Table 1.--Entrants in the 2004 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, N. 4505 County Hwy M, 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
FRONTIER HYBRIDS	Frontier Hybrids, P.O. Box 177, Abernathy, TX 79311
MMR	MMR Genetics LLC, P.O. Box 60, Vega, TX 79092
PIONEER BRAND	Pioneer Hi-Bred International, Inc., 390 Union Blvd., Suite 500A, Lakewood, CO 80228
SORGHUM PARTNERS	Sorghum Partners, Inc., 403 S. Monroe, P.O. Box 189, New Deal, TX 79350
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 hybrid, GARST 8292 YG1.

Growing Degree Days for sorghum were calculated from planting through first freeze using a maximum of 111°F and a minimum of 50°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°F from the average. When daily temperatures are less than 50°F, 50°F is used, when temperatures are above 111°F a maximum temperature of 111°F is used:

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

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-cooperator, Terrill Swanson, for his assistance in the off-station trial at Vilas, Colorado.

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 Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2004

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 30), under drip-irrigated conditions with 2300 sorghum heat units in Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: June 30. HARVESTED: November 26.

EMERGENCE DATE: 6 days after planting. SOIL TEMP: 72 F.

IRRIGATION: Drip irrigated for 15 weeks with 11.7 A-in./A.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, Atrazine 1.0 Lb/A. Post Emergence Herbicides Banvel 4 Oz/A, Saber 10 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	0.05	21	0	0	1
July	3.49	780	13	1	32
August	3.10	639	6	0	63
September	2.45	573	9	0	93
October	0.55	249	0	0	118
Total	9.64	2262	28	1	118

\1 Growing season from June 30 (planting) to October 25 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Weed control was very good. Above normal precipitation for the growing season with very cool temperatures throughout the season. No greenbug infestation. Only a few hybrids lodged. Late freeze date. Yields and test weights were good considering the late date of planting and the cool season.

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	0.5	1.7	14	2.5	455	0.8	4.6
8"-24"				14				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	40	40	0	0
Applied	120	20	0.3	0

Yield Goal: 120 Bu/A.
Actual Yield: 86 Bu/A.

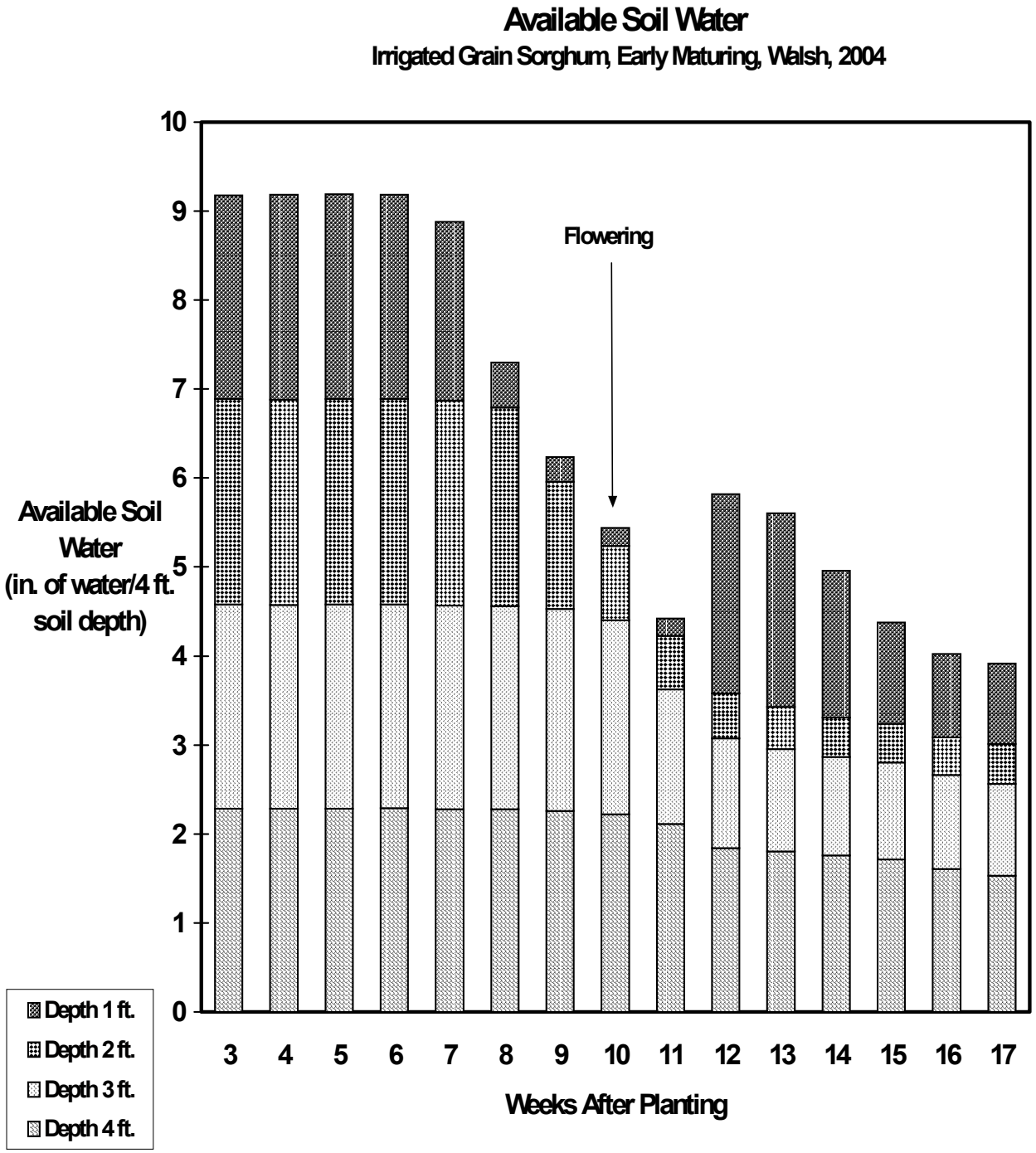

Fig. 1. Available soil water in drip irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 9.64 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 2.--Irrigated Grain Sorghum Early Maturing Hybrid Performance Test at Walsh, 2004. \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	%
ASGROW	Reward	6	63	1460	106	E	42	42.2	2	56	100	116
SORGHUM PARTNERS	251	6	61	1398	103	E	43	34.5	0	57	97	113
DEKALB	DKS 29-28	6	66	1531	112	E	42	48.8	0	56	97	113
DEKALB	DK-28E	7	62	1421	106	E	44	48.0	0	55	93	108
PIONEER	86G08	6	67	1555	113	E/ME	50	43.4	18	55	93	108
SORGHUM PARTNERS	KS 310	6	67	1555	111	E	46	51.9	0	55	93	108
TRIUMPH	TR 418	6	63	1460	105	E	43	45.3	1	57	91	106
FRONTIER HYBRIDS	F-222E	7	71	1624	HD	ME/E	51	37.6	5	54	80	93
SORGHUM PARTNERS	K35-Y5	7	69	1587	116	ME	42	50.0	0	55	77	89
(Check)	399 X 2737	5	76	1751	ED	ML	44	48.4	0	47	37	43
Average		6	67	1534	114	E	45	45	3	55	86	
LSD 0.20											5.3	

\1 Planted: June 30; Harvested: November 26.

Yields are corrected to 14.0% seed moisture content.

DAP: Days After Planting or maturation of seed at first freeze (29 F, October 25).

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

GDD: Growing Degree Days for sorghum.

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

Table 3.--Summary: Grain Sorghum Early Maturing Hybrid Performance Tests, 2002-2004.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Reward	76	123	100	112	100	119	105	116	111	113
DEKALB	DK-28E	88	122	93	108	101	138	104	108	106	117
DEKALB	DKS 29-28	74	134	97	116	102	115	114	113	114	114
SORGHUM PARTNERS	KS 310	69	128	93	111	97	108	109	108	109	108
SORGHUM PARTNERS	K35-Y5	60	123	77	100	87	94	105	89	97	96
SORGHUM PARTNERS	251	77	102	97	100	92	120	87	113	100	107
(Check)	399 X 2737	21	88	37	63	49	33	75	43	59	50
Average		64	117	86	102	89					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated at Walsh for 2002, 2003 and 2004.

Dryland Grain Sorghum Hybrid Performance Trial at Vilas, 2004

COOPERATORS: Terrill Swanson Farm, Vilas, 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 Sandy Clay soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 34,800 Seed/A. PLANTED: June 11. HARVESTED: November 16.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 71 F.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, Atrazine 0.63 Lb AI/A. Post Emergence Herbicides: Banvel 5 Oz/A, 2,4-D 0.28 Lb AI/A. CULTIVATION: Once. INSECTICIDE: None.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
June	6.82	624	6	0	19
July	3.49	780	13	1	50
August	3.10	639	6	0	81
September	2.45	573	9	0	111
October	0.55	249	0	0	136
Total	16.41	2865	34	1	136

\1 Growing season from June 11 (planting) to October 25 (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 but very dry around flowering (reflected in available soil water graph). Temperatures were quite cool throughout the season. Late freeze date. No greenbug infestation. Four hybrids lodged 18% or more. Grain yields were fair.

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"	7.3	0.3	1.0	6	1.8	203	0.6	6.0
8"-24"				6				
Comment	Alka	Vlo	Lo	Mod	V Lo	VHi	Lo	Adeq

Manganese and Copper levels were adequate.

Summary: Fertilization.

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

Yield Goal: 45 Bu/A.
Actual Yield: 28 Bu/A.

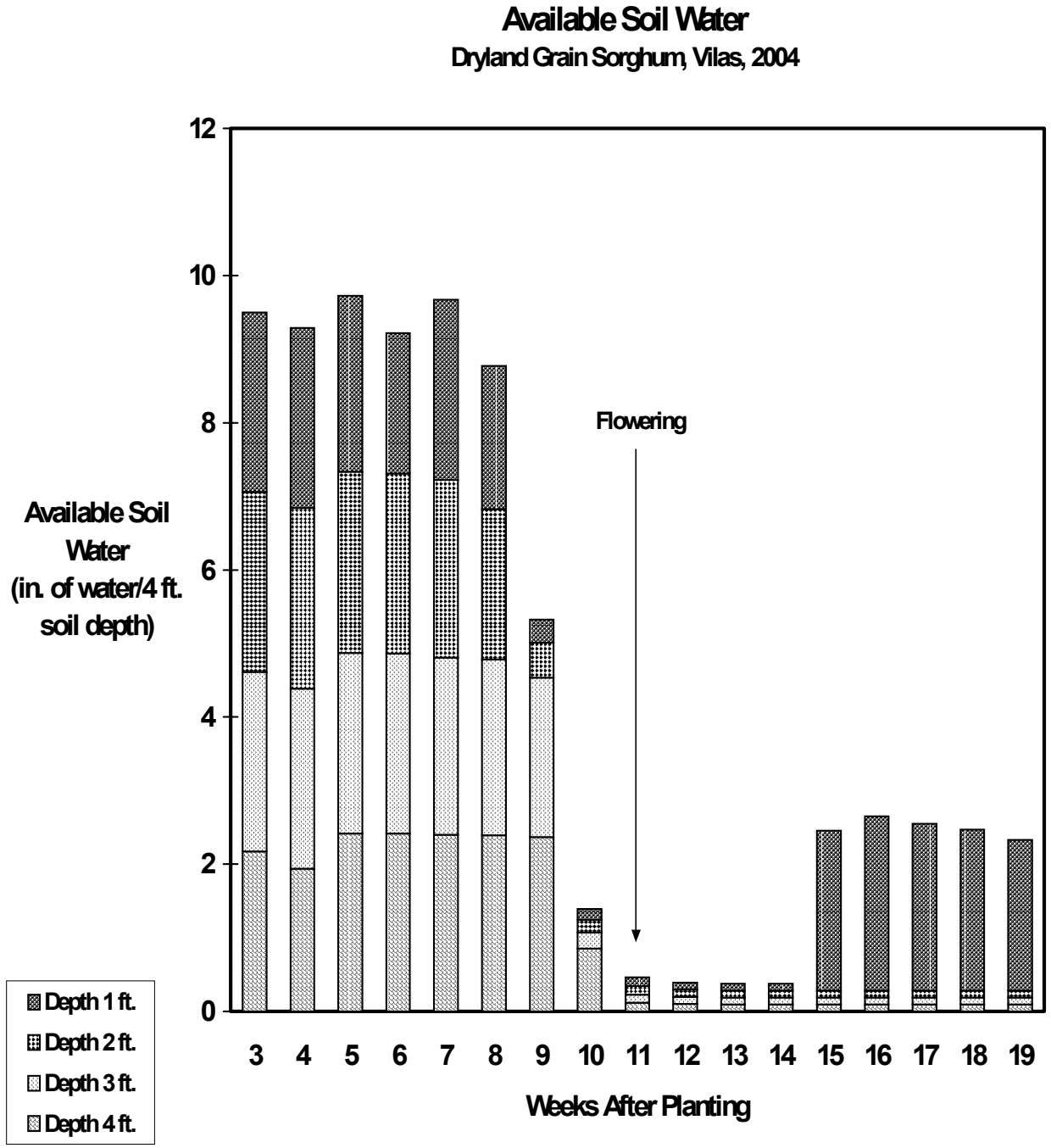

Fig. 2. Available soil water in dryland grain sorghum at Vilas. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 16.41 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Vilas, 2004. \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	%
SORGHUM PARTNERS	NK 5418	10	75	1657	119	ME/M	34	19.4	14	56	39	140
PIONEER	85G01	9	75	1657	121	ME/M	38	19.8	30	58	35	126
ASGROW	Seneca	10	80	1756	124	ME	35	15.1	3	60	33	116
DEKALB	DKS 37-07	10	72	1592	117	ME	35	15.8	18	56	28	99
ASGROW	Pulsar	10	71	1569	116	ME	35	15.6	18	58	24	85
SORGHUM PARTNERS	NK 6673	9	77	1701	122	ME/M	36	19.1	3	55	20	73
SORGHUM PARTNERS	NK 6641	9	72	1592	118	ME/M	35	18.6	36	58	19	68
SORGHUM PARTNERS	NK 7633	9	82	1795	128	M/ML	34	16.0	1	57	35	123
DEKALB	DK-44	11	80	1756	126	M	37	13.9	4	58	31	110
SORGHUM PARTNERS	NK 7655	10	84	1840	131	ML	38	18.5	2	54	22	80
(Check)	399 X 2737	9	83	1817	130	ML	36	16.7	2	55	20	73
Average		10	77	1703	123	ME	36	17.1	12	57	28	
LSD 0.20									8.0		7.1	

\1 Planted: June 11; Harvested: November 16.

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.

Table 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Vilas, 2002-2004.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Seneca	7	17	33	25	19	93	107	116	112	105
ASGROW	Pulsar	6	21	24	23	17	74	129	85	107	96
DEKALB	DKS 36-00	5	9	--	7	--	64	58	--	61	--
DEKALB	DK-44	7	20	31	26	19	88	124	110	117	107
PIONEER	85G01	--	26	35	31	--	--	159	126	143	--
SORGHUM PARTNERS	KS 585	10	11	--	11	--	134	66	--	100	--
SORGHUM PARTNERS	K59-Y2	11	19	--	15	--	153	116	--	135	--
SORGHUM PARTNERS	NK 7633	10	20	35	28	22	128	122	123	123	124
SORGHUM PARTNERS	K73-J6	10	11	--	11	--	132	66	--	99	--
SORGHUM PARTNERS	NK 8828	7	11	--	9	--	95	70	--	83	--
(Check)	399 X 2737	9	15	15	20	13	119	94	73	84	95
Average		7	16	28	22	17					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2004

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 2800 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 34,800 Seed/A. PLANTED: June 3; Replanted June 24. HARVESTED: November 6.

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

PEST CONTROL: Preemergence Herbicides: Roundup, 16 Oz/A; 2,4-D, 0.5 Lb/A. Post Emergence Herbicides: Banvel 4.0 Oz/A, Atrazine 1.0 Lb/A, COC 1 Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

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	7.62	571	12	1	27
July	3.49	780	13	1	58
August	3.10	639	6	0	89
September	2.45	573	9	0	119
October	0.55	249	0	0	144
Total	17.21	2812	29	2	144

\1 Growing season from June 3 (planting) to October 25 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

COMMENTS: Planted in poor soil moisture; replanted in good soil moisture. Weed control was good. The growing season was very wet and very cool. Late freeze date. No greenbug infestation. None of the hybrids lodged. Grain yields were very good considering the late replanting date and the cool season.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.6	0.8	1.2	36	1.8	341	0.5	5.3
8"-24"				14				
Comment	Alka	Vlo	Mod	VHi	VLo	VHi	Lo	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	0

Yield Goal: 45 Bu/A.
Actual Yield: 61 Bu/A.

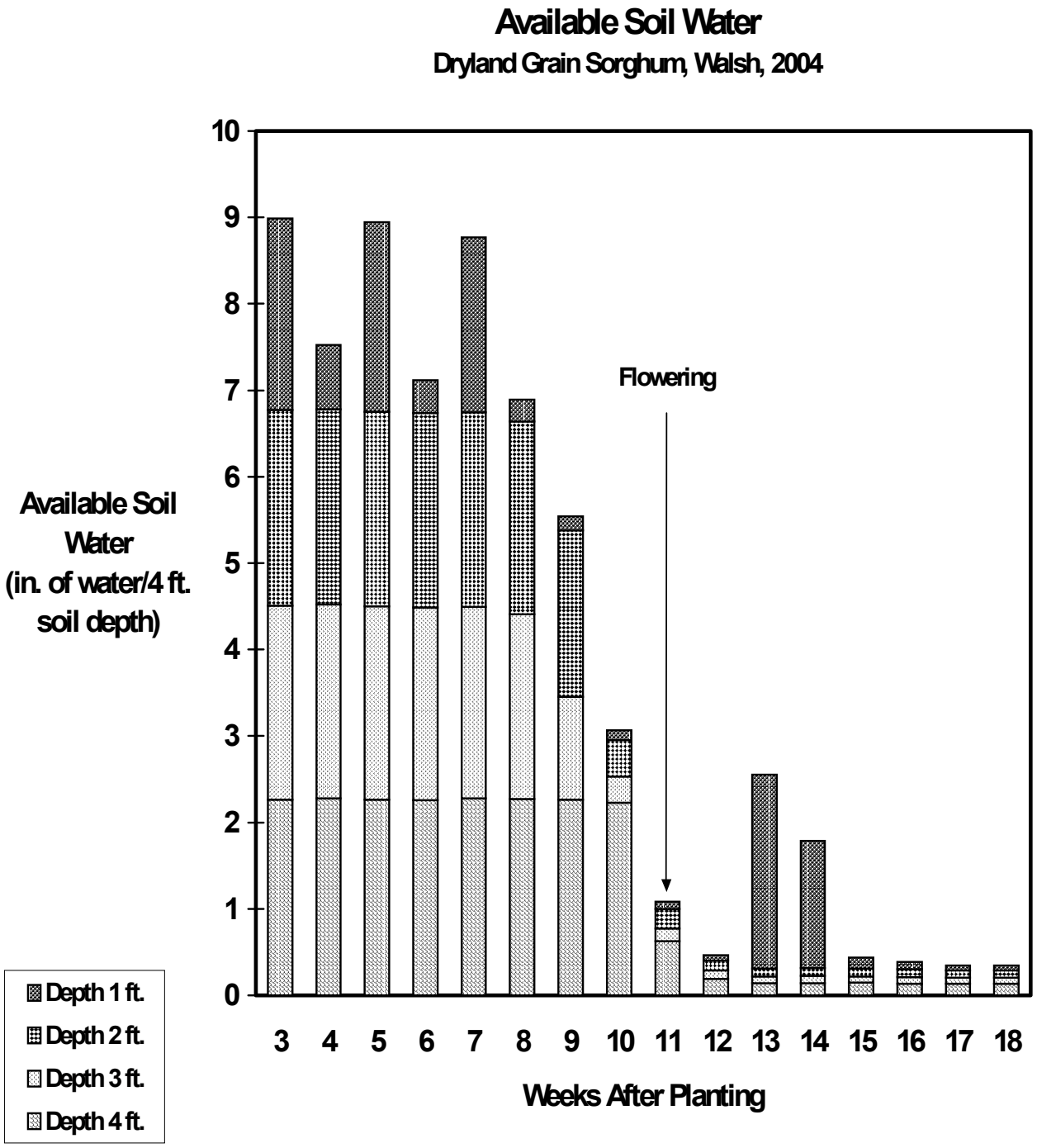

Fig. 3. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 17.21 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 6.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2004. \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	%
PIONEER	85G01	12	76	1691	HD	ME/M	42	30.0	0	55	81	131
TRIUMPH	TR 438	13	72	1616	115	ME	44	31.8	0	56	79	129
SORGHUM PARTNERS	NK 5418	12	72	1616	115	ME/M	38	26.3	0	55	75	122
DEKALB	DKS 37-07	11	74	1655	HD	ME	38	32.1	0	55	70	114
ASGROW	Seneca	12	77	1708	HD	ME	38	23.0	0	56	66	107
ASGROW	Pulsar	12	75	1671	HD	ME	38	25.7	0	54	64	105
FRONTIER HYBRIDS	F-222E	12	74	1655	121	ME/E	37	26.5	0	56	63	102
SORGHUM PARTNERS	NK 6641	13	75	1671	HD	ME/M	38	24.0	0	55	60	98
FRONTIER HYBRIDS	F-303C	13	75	1671	HD	ME	37	23.8	0	54	57	93
SORGHUM PARTNERS	NK 6673	12	76	1691	HD	ME/M	38	25.4	0	53	56	91
FRONTIER HYBRIDS	F-270E	13	77	1708	HD	ME	35	24.8	0	54	53	86
SORGHUM PARTNERS	NK 7633	13	79	1756	SD	M/ML	39	25.9	0	52	55	90
DEKALB	DK-44	13	79	1756	SD	M	39	25.9	0	52	52	85
(Check)	399 X 2737	12	81	1808	ED	ML	37	21.5	0	50	43	70
SORGHUM PARTNERS	NK 7655	12	82	1835	ED	ML	39	22.8	0	49	40	65
Average		12	76	1701	HD	ME	38	26.0	0	54	61	
LSD 0.20											5.1	

\1 Planted: June 3; Replanted June 24; Harvested: November 6.

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.

Table 7.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 2002-2004.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	Seneca	52	36	66	51	51	102	144	107	126	118
ASGROW	Pulsar	54	34	64	49	51	105	135	105	120	115
DEKALB	DK-44	56	23	52	38	44	109	94	85	90	96
DEKALB	DKS 36-00	57	29	--	43	--	112	116	--	114	--
NC+	NC+ 5B89	67	34	--	51	--	131	134	--	133	--
PIONEER	85G01	--	31	81	56	--	--	125	131	128	--
SORGHUM PARTNERS	KS 585	60	12	--	36	--	117	48	--	83	--
SORGHUM PARTNERS	K59-Y2	55	17	--	36	--	107	66	--	87	--
SORGHUM PARTNERS	NK 7633	48	36	55	46	46	93	146	90	118	110
SORGHUM PARTNERS	K73-J6	34	18	--	26	--	66	72	--	69	--
SORGHUM PARTNERS	NK 8828	47	25	--	36	--	90	100	--	95	--
TRIUMPH	TR 438	59	25	79	52	54	115	98	129	114	114
(Check)	399 X 2737	41	15	43	29	33	79	58	70	64	69
Average		51	26	61	44	46					

Grain Yields were corrected to 14.0 % seed moisture content.

Irrigated Grain Sorghum Hybrid Performance Trial at Walsh, 2004

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

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

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 87,100 Seed/A. PLANTED: May 26. HARVESTED: November 27.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 71 F.

IRRIGATION: Drip irrigated for 15 weeks with 11.7 A-in./A.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, Atrazine 1.0 Lb/A. Post Emergence Herbicides: Banvel 4 0z/A, Saber 10 Oz/A. CULTIVATION: Once. INSECTICIDES: None.

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		--------No. of Days--------		
May	0.01	102	3	0	5
June	7.65	624	12	1	35
July	3.49	780	13	1	66
August	3.10	639	6	0	97
September	2.45	573	9	0	127
October	0.55	249	0	0	152
Total	17.25	2967	43	2	152

\1 Growing season from May 26 (planting) to October 25 (first freeze, 29 F).
\2 GDD: Growing Degree Days for sorghum.
\3 DAP: Days After Planting.

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

COMMENTS: Planted in marginal soil moisture. Weed control was good. The growing season was very wet and very cool. Late freeze date. No greenbug infestation. Three hybrids had 14% or more lodging. None of the hybrids lodged. Grain yields were good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.8	0.5	1.7	14	2.5	455	0.8	4.6
8"-24"				14				
Comment	Alka	VLo	Hi	Hi	VLo	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P_2O_5	Zn	Fe
	----------Lb/A----------			
Recommended	49	20	0	0
Applied	120	20	0.3	0

Yield Goal: 140 Bu/A.
Actual Yield: 111 Bu/A.

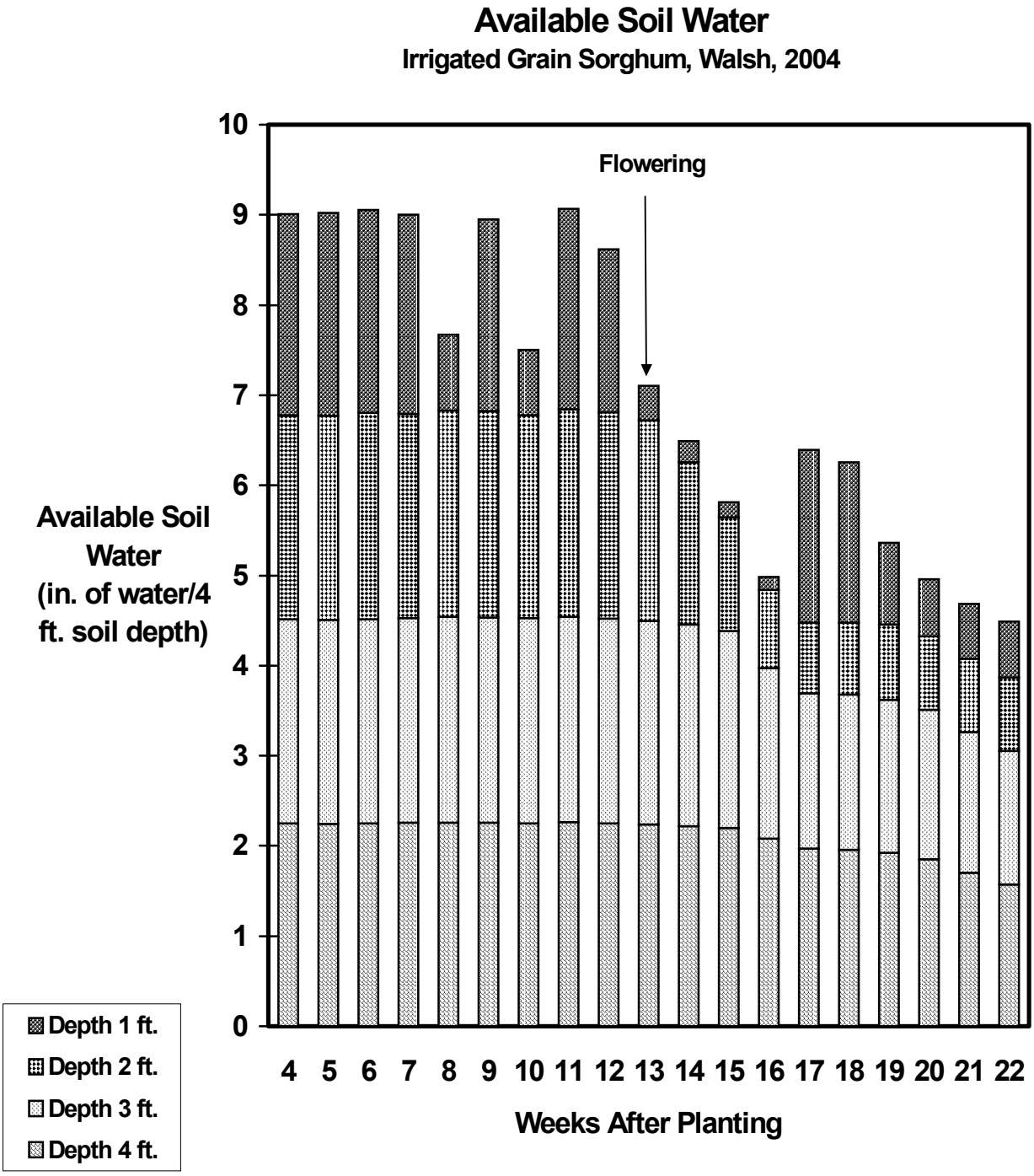

Fig. 4. Available soil water in irrigated grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 17.25 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 8.--Irrigated Grain Sorghum Hybrid Performance Test at Walsh, 2004. \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	%
PIONEER	85G01	10	89	1995	140	ME/M	53	32.9	19	58	121	109
SORGHUM PARTNERS	NK 5418	9	85	1929	134	ME/M	48	26.9	1	58	115	103
SORGHUM PARTNERS	NK 6641	10	90	2020	139	ME/M	48	27.7	4	57	110	99
SORGHUM PARTNERS	NK 6673	10	89	1995	140	ME/M	48	28.9	1	57	107	96
ASGROW	A 567	10	90	2020	142	M/ML	55	27.3	8	58	117	105
FRONTIER HYBRIDS	F-303C	11	95	2115	148	M/ME	49	28.5	0	58	110	99
PIONEER	84G62	9	98	2178	152	ML	53	36.4	2	57	131	118
DEKALB	DKS 53-11	11	98	2178	153	ML	54	25.3	6	58	119	107
SORGHUM PARTNERS	NK 7655	11	101	2249	HD	ML	53	29.3	4	54	117	105
(Check)	399 X 2737	9	98	2178	154	ML	48	31.3	0	56	109	98
ASGROW	A 571	10	104	2304	HD	ML	53	23.0	5	55	107	96
DEKALB	DKS 54-00	10	97	2138	156	ML	53	25.7	6	55	107	96
FRONTIER HYBRIDS	F-457E	9	97	2157	151	ML/M	49	33.3	15	55	104	94
TRIUMPH	TR 465	10	99	2200	156	ML/M	51	26.5	14	56	99	89
SORGHUM PARTNERS	NK 7633	9	97	2157	156	ML	51	26.5	1	55	99	89
FRONTIER HYBRIDS	F-700E	9	102	2272	HD	ML	52	29.3	8	54	98	88
Average		10	96	2130	149	M	51	28.7	6	56	111	
LSD 0.20											5.8	

\1 Planted May 26; Harvested: November 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 Walsh, 2002-2004.

		Grain Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Bu/A----------					----------%----------				
ASGROW	A 571	--	132	107	120	--	--	106	96	101	--
DEKALB	DKS 54-00	76	135	107	121	106	100	108	96	102	101
DEKALB	DKS 53-11	--	119	119	119	--	--	96	107	102	--
NC+	NC+ 7R83	78	128	--	103	--	103	103	--	103	--
PIONEER	84G62	99	139	131	135	123	130	111	118	115	120
SORGHUM PARTNERS	NK 5418	--	122	115	119	--	--	98	103	101	--
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	74	136	--	105	--	98	109	--	104	--
SORGHUM PARTNERS	NK 7633	87	127	99	113	104	115	102	89	96	102
SORGHUM PARTNERS	NK 7655	--	120	117	119	--	--	96	105	101	--
SORGHUM PARTNERS	NK 8828	57	115	--	86	--	75	92	--	84	--
TRIUMPH	TR 465	66	--	99	83	--	86	--	89	88	--
(Check)	399 X 2737	76	125	109	117	103	100	100	98	99	99
Average		76	125	111	118	104					

Grain Yields were corrected to 14.0 % seed moisture content.

Dryland Forage Sorghum Hybrid Performance Trial at Walsh, 2004

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 2800 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 69,700 Seed/A. PLANTED: June 3. HARVESTED: October 19.

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

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides: Atrazine 1.0 Lb/A, Banvel 4 Oz/A, COC 1Qt/A. CULTIVATION: Once. INSECTICIDES: None.

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

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	7.62	571	12	1	27
July	3.49	780	13	1	58
August	3.10	639	6	0	89
September	2.45	573	9	0	119
October	0.55	185	0	0	138
Total	17.21	2748	40	2	138

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

COMMENTS: Planted in marginal soil moisture. Weed control was good. The growing season was very wet and very cool. No greenbug infestation. Three hybrids had more than 10% lodging. Forage yields were good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.6	0.8	1.2	36	1.8	341	0.5	5.3
8"-24"				14				
Comment	Alka	VLo	Mod	VHi	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	0	20	0	0

Yield Goal: 10 Ton/A.
Actual Yield: 9.7 Ton/A @ 70% MC.

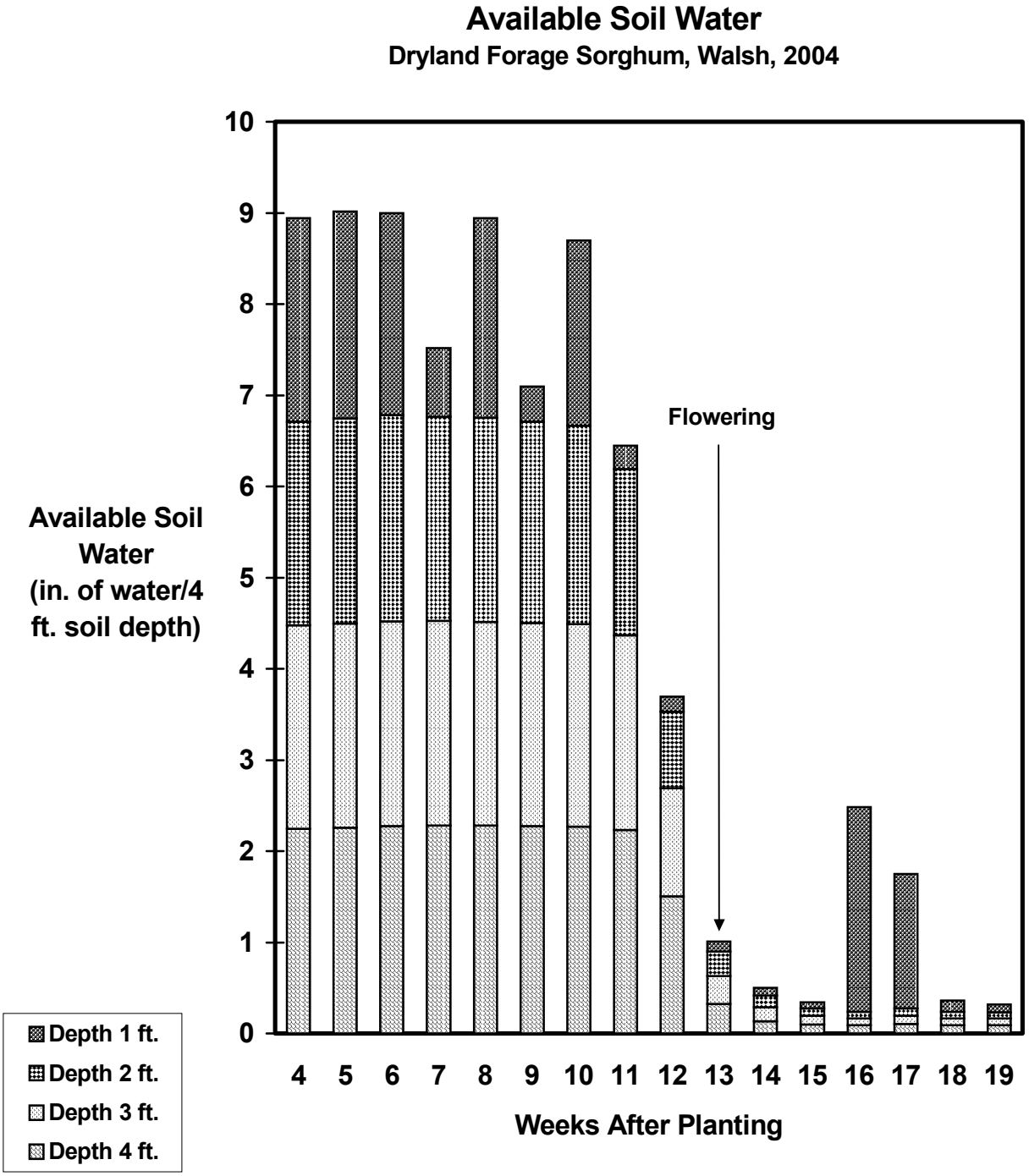

Fig. 5. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 17.21 in. Any increase in available soil water between weeks is from rain.

Table 10.--Dryland Forage Sorghum Hybrid Performance Test at Walsh, 2004. \1

Brand	Hybrid	Forage Type \2	Days to Emerge	Days to 50% Bloom	Harvest Density	Plant Ht.	Stage \3 at Harvest	Stem Sugar	Plants Lodged	Forage Yield	Yield % of Test Average
					Plants/A (1000 X)	In.		%	%	Tons/A	%
SORGHUM PARTNERS	1990	FS	11	Veg	26.5	75	Veg	12	0	12.4	128
SORGHUM PARTNERS	NK 300	FS	11	96	27.3	53	SD	9	0	12.1	125
FONTIER HYBRIDS	Sil Maker 6000	FS	13	92	18.8	51	SD	9	0	11.6	120
(Check)	NB 305F	FS	13	101	19.9	65	LM	16	0	9.5	98
BUFFALO BRAND	Canex BMR 248	FS	12	97	17.4	70	ED	17	0	9.2	95
SORGHUM PARTNERS	SS 405	FS	11	103	25.6	81	MM	13	30	8.9	92
BUFFALO BRAND	Canex BMR 208	FS	12	96	18.0	66	SD	9	0	8.7	90
BUFFALO BRAND	Canex	FS	12	94	24.6	76	SD	16	18	8.5	88
BUFFALO BRAND	Canex BMR 328	FS	12	93	23.0	62	SD	5	0	7.5	77
BUFFALO BRAND	Canex BMR 310	FS	12	96	17.4	64	SD	5	0	6.3	65
AERC	AERC SSH 35	FS	14	95	10.7	72	SD	3	3	3.1	32
SORGHUM PARTNERS	Sordan Headless	SS	11	113	26.9	69	PM	15	0	13.4	138
SORGHUM PARTNERS	Trudan Headless	SS	12	109	26.3	80	PM	17	0	12.3	127
SORGHUM PARTNERS	Trudan 8	SS	12	90	21.7	86	HD	6	12	11.7	120
BUFFALO BRAND	Grazex BMR 727	SS	11	92	26.5	84	HD	5	0	10.1	104
BUFFALO BRAND	Grazex BMR 771	SS	12	88	27.7	80	MT	11	1	10.0	104
SORGHUM PARTNERS	Sordan 79	SS	12	91	27.3	89	HD	14	5	9.6	99
BUFFALO BRAND	Grazex BMR 782	SS	11	90	26.7	80	HD	13	0	9.4	97
GARST	8292 YG1	Corn	10	81	17.8	86	SD	12	0	8.5	87
Sorghum Average		FS	12	91	22.9	72	HD	11	4	9.7	
LSD 0.20										1.40	

\1 Planted: June 3; Harvested: October 19.

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

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

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

Table 11.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 2002-2004.

		Forage Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Tons/A----------					----------%----------				
AERC	AERC SSH 35	--	4.9	3.1	4.0	--	--	102	32	67	--
BUFFALO BRAND	Canex	13.5	5.5	8.5	7.0	9.2	124	115	88	102	109
BUFFALO BRAND	Canex II	11.7	4.3	--	8.0	--	107	89	--	98	--
BUFFALO BRAND	Canex BMR 208	9.5	4.8	8.7	6.8	7.7	87	99	90	95	92
BUFFALO BRAND	Canex BMR 310	8.8	5.5	6.3	5.9	6.9	81	115	65	90	87
BUFFALO BRAND	Canex BMR 248	--	5.1	9.2	7.2	--	--	107	95	101	--
BUFFALO BRAND	Buffalo Brand	12.0	5.6	--	8.8	--	110	116	--	113	--
BUFFALO BRAND	Grazex II	10.5	4.1	--	7.3	--	96	86	--	91	--
BUFFALO BRAND	Grazex II W	9.7	4.6	--	7.2	--	89	95	--	92	--
BUFFALO BRAND	Grazex BMR 727	8.5	3.9	10.1	7.0	7.5	78	80	104	92	87
SORGHUM PARTNERS	NK 300	11.9	4.2	12.1	8.2	9.4	109	87	125	106	107
SORGHUM PARTNERS	SS 405	16.0	6.0	8.9	7.5	10.3	147	124	92	108	121
SORGHUM PARTNERS	1990	12.9	3.3	12.4	7.9	9.5	118	48	128	88	98
SORGHUM PARTNERS	Sordan 79	12.2	3.9	9.6	6.8	8.6	112	81	99	90	97
SORGHUM PARTNERS	Sordan Headless	12.5	4.3	13.4	8.9	10.1	115	89	138	114	114
SORGHUM PARTNERS	Trudan 8	11.8	4.2	11.7	8.0	9.2	108	87	120	104	105
SORGHUM PARTNERS	Trudan Headless	9.6	--	12.3	11.0	--	88	--	127	108	--
(Check)	NB 305F	12.8	5.0	9.5	7.3	9.1	117	104	98	101	106
(Check)	Corn	5.7	3.1	8.5	5.8	5.8	52	64	87	76	68
Average		10.9	4.8	9.7	7.3	8.5					

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

Table 12.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2004.

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-----		
SORGHUM PARTNERS	1990	FS	Veg	45	8.3	29.5	48.0	84.9	68.2	175	0.73	0.45	0.70
SORGHUM PARTNERS	NK 300	FS	Veg	40	7.6	30.5	46.8	84.6	67.3	174	0.71	0.44	0.69
FONTIER HYBRIDS	Sil Maker 6000	FS	86	47	10.8	29.8	51.8	83.9	69.0	167	0.72	0.45	0.71
(Check)	NB 305F	FS	79	40	14.5	27.2	50.2	83.4	66.9	163	0.76	0.49	0.69
BUFFALO BRAND	Canex BMR 248	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	FS	79	45	14.0	28.0	52.3	81.6	65.6	152	0.75	0.48	0.68
BUFFALO BRAND	Canex BMR 328	FS	81	47	10.3	31.1	53.4	81.5	66.1	151	0.70	0.43	0.68
BUFFALO BRAND	Canex BMR 310	FS	101	37	11.6	28.4	52.0	80.7	65.5	149	0.75	0.47	0.67
AERC	AERC SSH 35	FS	82	37	12.0	30.2	53.9	79.0	64.4	140	0.72	0.44	0.66
SORGHUM PARTNERS	Sordan Headless	SS	69	36	13.1	30.3	51.5	82.6	67.5	160	0.71	0.44	0.70
SORGHUM PARTNERS	Trudan Headless	SS	Veg	40	9.5	29.5	50.2	82.5	66.4	159	0.73	0.45	0.69
SORGHUM PARTNERS	Trudan 8	SS	Veg	47	10.4	31.0	51.9	81.2	65.9	152	0.70	0.43	0.68
BUFFALO BRAND	Grazex BMR 727	SS	71	51	13.9	29.6	52.2	81.1	65.7	150	0.73	0.45	0.68
BUFFALO BRAND	Grazex BMR 771	SS	77	45	11.8	30.8	53.6	80.0	66.0	147	0.71	0.43	0.68
SORGHUM PARTNERS	Sordan 79	SS	71	46	11.7	32.2	54.6	80.8	65.7	147	0.68	0.41	0.68
BUFFALO BRAND	Grazex BMR 782	SS	77	41	13.1	29.2	51.9	80.4	64.8	147	0.73	0.46	0.67
GARST	8292 YG1	Corn	66	57	13.3	33.7	55.3	81.8	65.5	148	0.66	0.39	0.67
Sorghum Average		FS	69	39	10.4	26.7	46.6	73.7	59.7	140	0.65	0.40	0.62

\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, 2004

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

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

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 113,250 Seed/A. PLANTED: June 3. HARVESTED: October 15 and 16.

EMERGENCE DATE: 11 days after planting. SOIL TEMP: 72 F.

IRRIGATION: Three furrow irrigations: June 22, August 25, and September 8, total applied 14 A-in./A.

PEST CONTROL: Preemergence Herbicides: Roundup 16 Oz/A, 2,4-D 0.5 Lb/A. Post Emergence Herbicides: Banvel 4 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--------		
June	7.62	571	12	1	27
July	3.49	780	13	1	58
August	3.10	639	6	0	89
September	2.45	573	9	0	119
October	0.55	147	0	0	135
Total	17.21	2710	40	2	135

\1 Growing season from June 3 (planting) to October 16 (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 marginal soil moisture. Weed control was good. The growing season was very wet and very cool. No greenbug infestation. Four hybrids had 25% or more lodging. Forage yields were good.

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

Summary: Soil Analysis.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	----------ppm----------				
0-8"	7.6	0.8	1.2	36	1.8	341	0.5	5.3
8"-24"				14				
Comment	Alka	VLo	Mod	VHi	VLo	VHi	Lo	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	0

Yield Goal: 18 Ton/A.
Actual Yield: 15.3 Ton/A @ 70% MC.

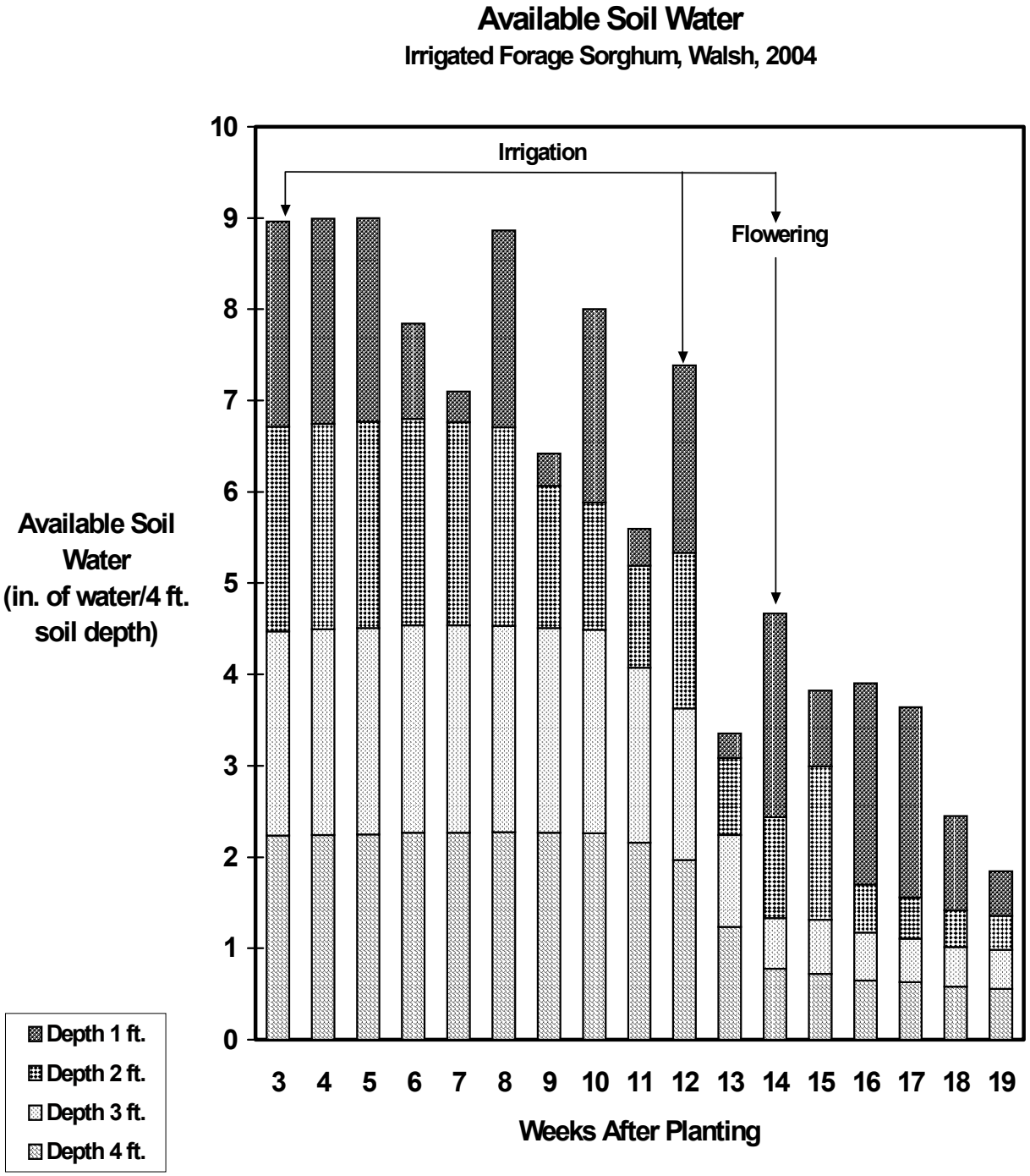

Fig. 6. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 17.21 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 13.--Irrigated Forage Sorghum Hybrid Performance Test at Walsh, 2004. \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	%
DEKALB	FS-5	FS	10	96	44.1	95	ED	4	0	21.0	137
DEKALB	DKS 59-09	FS	11	95	40.3	70	ED	4	0	20.7	136
FRONTIER HYBRIDS	Sil Maker 5700	FS	10	93	46.1	48	SD	3	0	18.5	121
FRONTIER HYBRIDS	Sil Maker 6500	FS	10	92	43.4	58	SD	4	0	17.9	117
DRUSSEL SEED	DSS Dividend BMR	FS	10	89	38.7	92	SD	4	35	17.8	116
BUFFALO BRAND	Canex BMR 328	FS	11	90	46.9	92	SD	8	0	17.6	115
FRONTIER HYBRIDS	Sil Maker 5500	FS	10	83	39.5	65	HD	6	0	17.4	113
(Check)	NB 305F	FS	13	97	42.6	90	ED	13	2	17.2	112
PIONEER	84B52	FS	10	89	39.1	87	SD	3	40	17.1	112
BUFFALO BRAND	Canex	FS	11	91	39.5	97	SD	13	0	16.4	107
SORGHUM PARTNERS	NK 300	FS	10	86	44.5	68	HD	7	0	16.2	106
MMR	MMR 327/70	FS	11	Veg	33.3	102	Veg	8	4	15.3	100
BUFFALO BRAND	Canex BMR 208	FS	11	91	36.4	90	SD	9	2	15.3	100
BUFFALO BRAND	Canex BMR 248	FS	11	90	30.2	93	SD	12	2	14.4	94
BUFFALO BRAND	Canex BMR 310	FS	12	91	32.9	91	SD	10	0	14.2	93
DEKALB	FS-25E	FS	11	102	42.6	89	MM	9	2	13.3	87
SORGHUM PARTNERS	SS 405	FS	10	101	46.5	107	MM	5	25	13.1	86
MMR	MMR 327/23	FS	11	96	31.4	97	ED	9	45	11.9	77
BUFFALO BRAND	Silex BMR 501	FS	12	101	28.7	87	LM	15	1	9.4	62
AERC	AERC SSH 35	FS	13	93	22.8	84	SD	8	18	7.3	48
SORGHUM PARTNERS	Sordan Headless	SS	11	110	38.3	111	PM	13	0	19.7	129
BUFFALO BRAND	Grazex BMR 782	SS	12	88	36.4	96	HD	9	0	17.4	114
MMR	MMR 352/40	SS	12	102	32.9	106	LM	14	0	17.2	112
MMR	MMR 327/52	SS	11	90	34.5	98	SD	11	2	17.1	112
BUFFALO BRAND	Grazex BMR 771	SS	11	89	37.6	101	HD	11	0	16.4	107
MMR	MMR 327/40	SS	11	101	32.5	103	MM	13	0	16.2	106
SORGHUM PARTNERS	Trudan Headless	SS	11	108	40.7	108	PM	12	0	15.2	99
CAL/WEST SEEDS	CW 1-61-14	SS	13	88	24.4	104	HD	6	1	14.3	93
BUFFALO BRAND	Grazex BMR 727	SS	12	89	31.8	93	HD	9	0	13.4	88
CAL/WEST SEEDS	CW 1-63-14	SS	12	87	27.1	96	HD	7	3	12.8	84
MMR	MMR 327/38	SS	13	97	27.5	91	ED	8	0	12.6	82
CAL/WEST SEEDS	CW 3-65-10	SS	13	97	27.9	93	ED	8	0	11.2	73
CAL/WEST SEEDS	CW 3-65-11	SS	13	97	24.4	98	ED	10	0	9.6	63
GARST	8292 YG1	Corn	9	78	21.7	93	SD	11	0	18.7	122
Sorghum Average		FS	11	94	35.9	91	SD	9	6	15.3	
LSD 0.20										2.05	

\1 Planted: June 3; Harvested: October 15 and 16.

\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 14.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 2002-2004.

		Forage Yield					Yield as % of Test Average				
Brand	Hybrid	2002	2003	2004	2-Year Avg	3-Year Avg	2002	2003	2004	2-Year Avg	3-Year Avg
		----------Tons/A----------									
AERC	AERC SSH 35	--	19.8	7.3	13.6	--	--	102	48	75	--
BUFFALO BRAND	Canex	19.9	19.8	16.4	18.1	18.7	112	102	107	105	107
BUFFALO BRAND	Canex II	19.0	18.1	--	18.6	--	107	93	--	100	--
BUFFALO BRAND	Canex BMR 208	19.8	16.6	15.3	16.0	17.2	111	86	100	93	99
BUFFALO BRAND	Canex BMR 310	17.9	18.0	14.2	16.1	16.7	101	93	93	93	96
BUFFALO BRAND	Canex BMR 248	--	19.6	14.4	17.0	--	--	101	94	98	--
BUFFALO BRAND	Buffalo Brand	17.8	18.2	--	18.0	12.0	100	94	--	97	65
BUFFALO BRAND	Grazex II	15.7	17.5	--	16.6	11.1	88	90	--	89	59
BUFFALO BRAND	Grazex II W	13.5	17.8	--	15.7	10.4	76	92	--	84	56
BUFFALO BRAND	Grazex BMR 727	17.9	20.8	13.4	17.1	17.4	101	107	88	98	99
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	--
DEKALB	FS-5	--	24.0	21.0	22.5	--	--	124	137	131	--
DEKALB	FS-25E	--	23.6	13.3	18.5	--	--	122	87	105	--
DEKALB	DKS 59-09	--	17.4	20.7	19.1	--	--	90	136	113	--
DRUSSEL SEED	DSS Dividend BMR	--	24.1	17.8	21.0	--	--	124	116	120	--
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	20.5	21.9	16.2	19.1	19.5	115	113	106	110	111
SORGHUM PARTNERS	SS 405	20.2	20.6	13.1	16.9	18.0	113	106	86	96	102
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	19.7	19.8	20.1	116	103	129	116	116
SORGHUM PARTNERS	Trudan 8	14.5	19.0	--	16.8	--	81	98	--	90	--
SORGHUM PARTNERS	Trudan Headless	15.9	--	15.2	15.6	--	89	--	99	94	--
(Check)	NB 305F	20.0	20.0	17.2	21.8	19.1	112	113	112	113	112
(Check)	Corn	13.9	19.3	18.7	19.0	17.3	78	99	122	111	100
Average		17.8	19.4	15.3	17.4	17.5					

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

Table 15.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2004.

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-----		
DEKALB	FS-5	FS	87	79	11.7	39.3	61.8	77.2	60.5	120	0.56	0.30	0.62
DEKALB	DKS 59-09	FS	85	56	12.5	37.4	56.9	79.0	60.5	129	0.59	0.33	0.62
FRONTIER HYBRIDS	Sil Maker 5700	FS	84	33	14.4	38.5	58.1	80.3	63.3	136	0.57	0.32	0.65
FRONTIER HYBRIDS	Sil Maker 6500	FS	82	46	14.6	32.7	52.1	82.6	65.1	154	0.67	0.41	0.67
DRUSSEL SEED	DSS Dividend BMR	FS	77	64	13.5	37.7	56.8	81.5	63.2	140	0.59	0.33	0.65
BUFFALO BRAND	Canex BMR 328	FS	78	60	13.6	33.6	55.2	83.8	66.4	156	0.66	0.39	0.68
FRONTIER HYBRIDS	Sil Maker 5500	FS	75	39	10.2	39.3	62.0	77.1	61.0	121	0.56	0.30	0.62
(Check)	NB 305F	FS	83	68	13.7	36.7	57.1	82.6	64.6	146	0.61	0.35	0.67
PIONEER	84B52	FS	77	66	13.3	37.8	57.2	82.8	64.7	147	0.59	0.33	0.67
BUFFALO BRAND	Canex	FS	77	72	12.3	35.8	56.0	82.6	66.3	151	0.62	0.36	0.68
SORGHUM PARTNERS	NK 300	FS	78	45	12.2	37.8	58.8	78.1	60.4	124	0.59	0.33	0.62
MMR	MMR 327/70	FS	127	94	10.1	35.5	56.7	80.2	65.2	142	0.63	0.36	0.67
BUFFALO BRAND	Canex BMR 208	FS	80	61	11.9	39.1	59.7	81.9	59.8	131	0.56	0.31	0.61
BUFFALO BRAND	Canex BMR 248	FS	78	61	13.2	35.8	59.3	81.2	64.4	140	0.62	0.36	0.66
BUFFALO BRAND	Canex BMR 310	FS	79	62	14.4	36.3	57.3	82.0	63.4	142	0.61	0.35	0.65
DEKALB	FS-25E	FS	92	74	9.5	38.6	62.6	76.6	62.6	123	0.57	0.32	0.64
SORGHUM PARTNERS	SS 405	FS	88	92	14.8	37.1	57.7	78.0	60.0	124	0.60	0.34	0.61
MMR	MMR 327/23	FS	86	69	13.3	35.5	58.1	80.6	62.3	135	0.63	0.36	0.64
BUFFALO BRAND	Silex BMR 501	FS	87	68	14.4	32.8	49.3	88.8	64.7	175	0.67	0.41	0.67
AERC	AERC SSH 35	FS	83	67	14.3	36.5	55.8	80.0	61.5	134	0.61	0.35	0.63
SORGHUM PARTNERS	Sordan Headless	SS	98	86	10.3	42.2	62.6	75.4	59.3	113	0.51	0.26	0.61
BUFFALO BRAND	Grazex BMR 782	SS	76	69	14.8	35.1	56.7	82.7	65.2	148	0.63	0.37	0.67
MMR	MMR 352/40	SS	92	78	11.3	38.1	59.3	78.5	63.3	131	0.58	0.32	0.65
MMR	MMR 327/52	SS	77	69	14.2	37.8	57.5	81.2	63.1	139	0.59	0.33	0.65
BUFFALO BRAND	Grazex BMR 771	SS	76	65	14.5	36.0	59.7	77.7	60.5	123	0.62	0.36	0.62
MMR	MMR 327/40	SS	90	78	15.4	35.7	54.9	82.2	65.3	149	0.62	0.36	0.67
SORGHUM PARTNERS	Trudan Headless	SS	96	89	10.1	41.5	61.2	78.2	63.1	128	0.52	0.27	0.65
CAL/WEST SEEDS	CW 1-61-14	SS	76	69	11.9	40.1	60.3	80.1	64.2	136	0.55	0.29	0.66
BUFFALO BRAND	Grazex BMR 727	SS	76	64	13.2	38.8	60.9	78.6	61.6	126	0.57	0.31	0.63
CAL/WEST SEEDS	CW 1-63-14	SS	76	72	13.0	39.2	58.9	80.8	63.6	138	0.56	0.31	0.65
MMR	MMR 327/38	SS	84	61	13.3	36.5	55.1	83.1	64.6	150	0.61	0.35	0.66
CAL/WEST SEEDS	CW 3-65-10	SS	83	66	16.6	31.2	48.7	86.2	68.2	178	0.70	0.43	0.70
CAL/WEST SEEDS	CW 3-65-11	SS	86	71	14.9	35.4	51.8	82.9	65.0	155	0.63	0.37	0.67
GARST	8292 YG1	Corn	72	77	17.3	34.3	53.2	83.4	65.3	155	0.65	0.38	0.67
Sorghum Average		FS	84	67	13.1	37.0	57.5	80.7	63.2	139	0.60	0.34	0.65

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

Infrared analysis performed on whole plant samples taken at boot.

CP, Crude Protein; ADF, Acid Detergent Fiber; NDF, Neutral Detergent Fiber; TDN, Total Digestible Nutrients; IVTD, In Vitro True Digestibility; RFQ, Relative Forage Quality; Net Energy: Maintenance, Gain, Lactation..

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 third year of our continuing study to determine the optimum Zn rate for irrigated grain sorghum under high yielding conditions.

Materials and Methods

This year we tested six seedrow Zn rates: 0, 0.2, 0.4, 0.6, 0.8, and 1.0 Lb Zn/A as Zn chelate with two replications. We mixed the Zn with 5 Gal 10-34-0/A prior to application. The site was subsurface drip irrigated with 11.7 A-in./A. We planted NC+ 5B89 on July 2 at 87,100 Seeds/A. We applied 120 Lb N/A and 20 Lb P_2O_5/A to the site. For weed control, we sprayed Roundup 16 Oz/A and Atrazine 1.0 Lb/A pre-emergence, and Banvel 4 Oz/A and Saber 10 Oz/A post-emergence. We cultivated one time. The 10 ft. X 650 ft. plots were harvested with a self-propelled combine and weighed in a digital weigh cart. For each plot at harvest, we took a sample for moisture and test weight.

Results and Discussion

This year seedrow Zn increased both grain yield and test weight with a maximum rate of 0.8 Lb/A for grain yield and 0.6 Lb/A for test weight (Fig. 9). We expected a yield response to Zn because of the late planting date (July 2) and the suggested Zn role of maturity acceleration observed last year. Last year, we observed maturity acceleration with increasing Zn rate; however, there was no yield response to applied Zn on irrigated grain sorghum at either of the Zn sites (Larson, Schweissing, Thompson, 2004). Last year with typical planting dates (late May to mid June), we suggested that the late freeze date (October 26, 22 F) allowed all Zn rates to mature. This year, we again had a late freeze date (October 25, 29 F), but because of our late planting date (July 2), the maturity acceleration gained with applied Zn increased both yield and test weight. The low test weights we recorded indicate that none of the Zn rates fully matured, but test weight increased with Zn rate from 51.5 Lb/Bu for the 0 lb/A Zn rate to 53.5 Lb/Bu for the 0.6 Lb/A rate. The optimum seedrow Zn rate of 0.8 Lb/A with a yield of 83 Bu/A is similar to the Zn response we recorded from the 2002 Vilas site with an optimum rate around 0.6 Lb Zn/A and a yield of 98 Bu/A (Larson, Schweissing, Thompson, 2003).

This is the third year of our multi-year irrigated grain sorghum Zn study. The Zn response we obtained this year suggests the Zn fertilizer may be required for high grain sorghum production when planting late. If the growing season is not long enough for full maturation, seedrow Zn may increase both grain yield and test weight. This year's response to Zn shifts our original recommendation of applying seedrow Zn to high production grain sorghum from 0.5 Lb/A of Zn with a typical planting date to 0.6 to 0.8 Lb/A of Zn with a late planting date.

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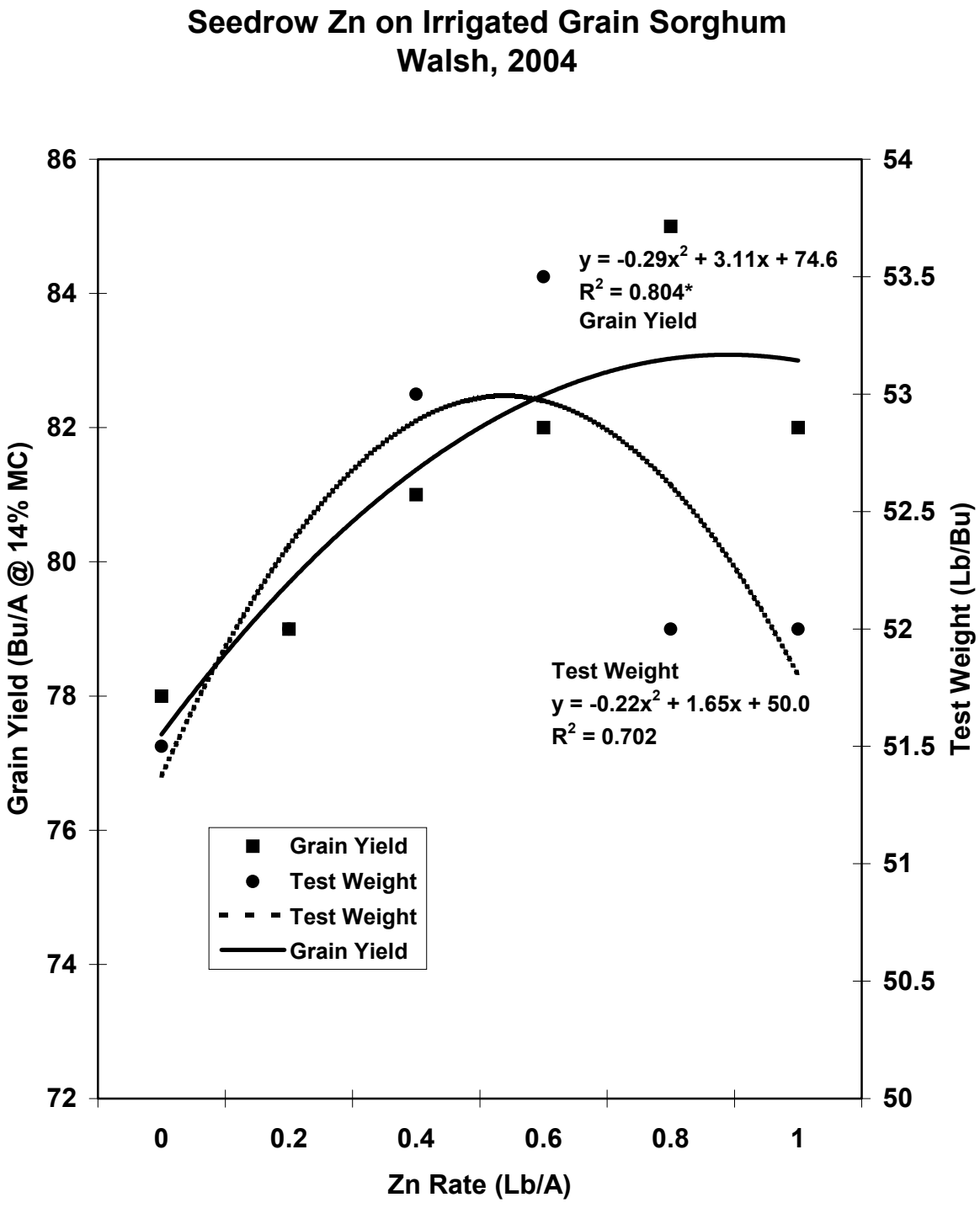

Fig. 7. Seedrow Zn rate on subsurface drip irrigated grain sorghum at Walsh. The Zn rates were 0, 0.2, 0.4, 0.6, 0.8 and 1.0 Lb Zn/A as Zn chelate. The grain sorghum hybrid was NC+ 5B89 planted at 87,100 Seeds/A on July 1.

Sandbur Control, Grain Yield and Net Return of Microencapsulated 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 three microencapsulated grass herbicides with Atrazine. Microencapsulated herbicides are advertised as providing slow release of herbicide that prolongs herbicide activity. Sandbur is the most prevalent grassy weed in grain sorghum in Southeastern Colorado.

Materials and Methods

We applied four pre-emergence herbicide treatments: Bicep Lite II Magnum 1.5 Qt/A, G-Max Lite 1.5 Qt/A, Micro-Tech 2.5 Qt/A with Atrazine 1.0 Lb/A, and Atrazine 1.0 Lb/A, with and without rotary hoe incorporation in a split-plot design with three replications on Richfield Silty Loam soil. All herbicide treatments had 1.0 Lb/A of Atrazine and all were applied on May 28 at 10 Gal/A with 110^{o} flat fan nozzles spaced 18 in. apart and half the 20 ft. by 1250 ft. plots were rotary hoed for herbicide incorporation the same day. The site was planted June 23 with PIONEER 87G57 at 35,000 Seeds/A. To control broadleaf weeds, we sprayed Banvel 4 Oz/A and Saber 10 Oz/A and cultivated once.

Results and Discussion

The microencapsulated herbicide treatments produced significantly higher yields than the Atrazine check (Table 16). The microencapsulated herbicide treatments provided from $8/A to $12/A more net income than the Atrazine check. All three microencapsulated treatments produced the same yield, 57 Bu/A; therefore the herbicide treatment that produced the highest variable net income was the microencapsulated treatment with the least cost, the Micro-Tech and Atrazine combination. The same yield for all three microencapsulated herbicides is surprising since the Micro-Tech and Atrazine combination had the lowest sandbur control rating, 10 to 16% less than the other two microencapsulated treatments. This year Bicep Lite II Magnum and G-Max Lite were less profitable than Micro-Tech and Atrazine; however, their higher sandbur control and subsequent weed seed reduction may justify the greater expense.

Rotary hoeing incorporation likewise increased sandbur control rating by 10% compared to without rotary hoeing incorporation, but again, there was no yield increase with rotary hoeing (Table 17). The lack of yield response to rotary hoeing and the cost of rotary hoeing make without rotary hoeing incorporation more profitable.

Herbicide efficacy may have been higher if we would have used a more aggressive incorporation method than rotary hoeing. Rotary hoeing may not have incorporated the herbicides sufficiently and volatilization may have occurred. Therefore, next year we will use a sweep plow with incorporators to assure more thorough herbicide incorporation.

Table 16.-Sandbur Control in Dryland Grain Sorghum at Walsh, 2004.

Herbicide Treatment	Rate	Sandbur Control	Test Weight	Grain Yield	Chem. Cost	Var. Net Income
	*/A	%	Lb/Bu	Bu/A	$/A	$/A
Bicep Lite II Magnum (rate applied 1.0 lb atrazine)	1.5 qt	66	58	57	20.06	89.30
G-Max Lite (rate applied 1.0 lb atrazine)	1.5 qt	60	59	57	19.85	89.51
Micro Tech & Atrazine	2.5 qt 1.0 lb	50	58	57	16.14	93.22
Atrazine	1.0 lb	24	57	44	2.38	81.24
Average		50	58	54	14.61	88.32
LSD 0.05		12.5		5.4		

Planted: June 23, Pioneer 87G57 at 35,000 Seeds/A; Harvested: November 5.
Herbicide Treatments applied May 28, 2004.
Variable Net Income: Treatment Yield x $1.98/Bu - Chemical Cost - Application Cost ($3.50/A). All treatments were cultivated.

Table 17.-Sandbur Control in Dryland Grain Sorghum Rotary Hoe Compaison at Walsh, 2004.

Herbicide Treatment	Sandbur Control	Test Weight	Grain Yield	Hoeing Cost	Var. Net Income
	%	Lb/Bu	Bu/A	$/A	$/A
All Herbicide Treatments with Rotary Hoeing	55	58	54	4.00	84.81
All Herbicide Treatments w/o Rotary Hoeing	45	58	54	0.00	88.81
Average	50	58	54	2.00	86.81
LSD 0.05	5.4		4.1		

Planted: June 23, Pioneer 87G57 at 35,000 Seeds/A; Harvested: November 5.
Herbicide Treatments and Rotary Hoeing incorporation applied May 28, 2004.
Variable Net Income: Treatment Yield x $1.98/Bu - Average Chemical Cost - Application Cost ($3.50/A) - Rotary Hoeing Cost ($4.00/A). All treatments were cultivated.

Bindweed Control in Grain Sorghum, 2004

Kevin Larson and Dennis Thompson

Bindweed has become a serious production problem in many fields. Recently, bindweed appears more prevalent with larger more numerous areas. The recent drought may have contributed to the bindweed infestations. Even in the very dry year of 2002 when crops and most weeds failed to grow, bindweed continued to thrive. We conducted this study to increase crop production and income of bindweed infested fields. We tested preplant herbicides to control bindweed. To determine residual effects of the herbicide treatments on the crop without bindweed interference, we also applied the herbicide treatments to a non-bindweed site. To determine residual longevity of the herbicide treatments on the crop, we planted both bindweed and non-bindweed sites with multiple planting dates.

Materials and Methods

The 40-acre study field had a Silty Clay Loam soil with a history of heavy bindweed infestation on east half (bindweed site) and very little bindweed on the west half (non-bindweed site). We applied seven herbicide treatments: Hi Dep (16 oz/A) 0.5 lb/A, LandMaster BW 54 oz/A, 2,4-D LoVol 6 (16 oz/A) 0.75 lb/A, Banvel 8 oz/A, Spartan 2 oz/A, Paramount 5.33 oz/A and COC 32 oz/A, and control (no bindweed herbicide) with a 40 ft. boom sprayer at 10 gal/A on May 17, 2004 to both sites. Before the herbicide treatments were applied, we sprayed the entire field with 20 oz/A of glyphosate and 75 lb N/A. For weed control, other than bindweed, we sprayed Atrazine 1.0 lb/A. We planned five planting dates with 10-day increments, but because the weather was too dry or too wet we had uneven planting date intervals. We planted grain sorghum (Mycogen 1482) at 35,000 seeds/A on five planting dates: May 18, May 27, June 7, June 25, and June 30. Bindweed control ratings were performed on June 7 and June 28. Percentage of plant stand was taken for each planting date as an indication of residual damage (crop injury) from herbicide treatments. The 20 ft. by 40 ft. plots were harvested on December 3, 5, and 6 with a self-propelled combine equipped with a digital scale. Yields were moisture adjusted to 14%.

Results

For the bindweed site, only one herbicide treatment, Hi Dep, produced significantly more income than the control ($P > 0.20$) (Table 18). In the non-bindweed site, only one herbicide treatment, LandMaster BW, produced significantly higher income than the control ($P > 0.20$) (Table 20). Both the bindweed and non-bindweed sites displayed similar grain sorghum yield response to planting dates: June 25 = June 7 > June 30 = May 27 > May 18 ($P > 0.05$) (Table 19 and 21). Overall, the bindweed site produce 1 bu/A more than the non-bindweed site. For the bindweed site, Hi Dep produced significantly higher yields and incomes than the control for the last three planting dates (June 7, June 25, and June 30) (Table 26, 28, and 30), but no herbicide treatment had significantly higher income than the control for the first two planting dates (May 18 and May 27) (Table 22 and 24). For the non-bindweed site, LandMaster BW produced significantly higher yields and incomes than the control for June 7 and June 25 planting dates (Table 27 and 29). For the non-bindweed site, Banvel at the June 7

planting date is the only other herbicide treatment besides LandMaster BW to produce both significantly higher yield and income than the control. No herbicide treatment in the non-bindweed site had significantly higher income than the control for May 18, May 27, and June 30 planting dates (Table 23, 25, and 31).

Discussion

Grain sorghum yield and income were not very responsive to bindweed control. Only the Hi Dep treatment controlled bindweed at a low enough cost to produce more yield and income than the control. LandMaster BW is the only herbicide that provided higher yield and income than the control in the site without bindweed. LandMaster BW controlled the pigweed and grasses not controlled by the Atrazine, the herbicide applied to the entire site to control weeds other than bindweed. All bindweed control treatments, except Paramount, are used for single season bindweed control. The label use directions for Paramount indicates more complete bindweed control from residual effects of Paramount applied over multiple years. Therefore, to be fair, applying Paramount as a single use bindweed herbicide may not allow its higher cost to be actualized.

It took 20 days after application for 8 oz/A of Banvel (2.5 days per oz) to produce higher yield and income than the control. Typically, we expect to delay grain sorghum planting 3 days per ounce of Banvel applied. For Banvel at 8 oz/A, we expected a grain sorghum planting delay of 24 days, which is quite close to the 20 days we encountered.

The overall grain sorghum yield response to planting dates was high yields from mid-to -later planting dates (June 7 and June 25), while the earliest planting date (May 18) produced the least yield. The dry conditions for the earliest planting dates (May 18 and May 27) undoubtedly contributed to the low plant stands and low yields. Test weight from June 30, the latest grain sorghum planting date tested, was 3 to 7 lb/bu less than the other planting dates. The low test weight from the June 30 planting date indicates that the seed was not fully mature before first freeze. The harvest of immature seed reduced yields for the June 30 planting date. Since the June planting dates achieved the highest yields, we recommend a planting date window from early June to late June for dryland grain sorghum production.

Our preliminary recommendations for bindweed control in grain sorghum, based on the first year of this study, are dependent on the bindweed infestation level. We recommend applying Hi Dep to heavily infested bindweed fields. We have observed that bindweed restricts other weeds from proliferating when fields are blanketed with bindweed. If bindweed is the predominant weed and grass weeds are not present, we recommend applying Hi Dep at least 10 days before planting as an inexpensive and effective control for bindweed in grain sorghum. For fields with scattered bindweed areas and with grass and other broadleaf weeds present, we recommend LandMaster BW for preplant, broad-spectrum weed control in grain sorghum.

Table 18.-Chemical Control of Bindweed in Grain Sorghum (Bindweed Site), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Hi Dep	16 oz	2.31	81	59	63	49	90.31
Paramount + COC	5.33 oz/1 qt	15.75	63	73	70	46	70.74
2,4-D LoVol 6	16 oz	2.23	71	58	66	39	70.20
Banvel	8 oz	3.75	65	62	62	39	69.47
LandMaster BW	54 oz	6.86	80	67	67	39	66.56
Control	----	0.00	5	5	70	36	66.49
Spartan	2 oz	5.20	72	47	60	38	65.84
Average		5.16	62	53	65	41	71.37
LSD 0.20			14.6	8.4	2.1	3.7	6.44

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost.
Herbicide Treatments were applied May 17, 2004.
There was a very highly significant treatment x planting date interaction (***).

Table 19.-Planting Dates for Bindweed Control in Grain Sorghum (Bindweed Site), Walsh 2004.

Planting Date	Days After Application	50% Flowering Date	Plant Stand	Seed Moisture	Test Weight	Grain Yield	Gross Income
			%	%	Lb/Bu	Lb/A	$/A
PD4 June 25	38	4-Sep	95	14.2	55	60	118.60
PD3 June 7	20	26-Aug	80	14.9	56	55	109.69
PD5 June 30	43	7-Sep	94	14.4	52	37	73.85
PD2 May 27	10	23-Aug	32	15.0	56	31	61.97
PD1 May 18	1	13-Aug	27	15.3	57	19	38.41
Average	22	27-Aug	65	14.8	55	41	80.51
LSD 0.20			4.3			5.7	11.29

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Herbicide Treatments were applied May 17, 2004.

Table 20.-Chemical Control of Bindweed in Grain Sorghum (Non Bindweed Site), Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Increase	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
LandMaster BW	54 oz	6.86	64	51	44	87.12	76.26
Banvel	8 oz	3.75	62	56	41	80.19	72.44
2,4-D LoVol 6	16 oz	2.23	67	45	40	78.21	71.98
Hi Dep	16 oz	2.31	65	50	39	77.42	71.11
Control	----	0.00	68	45	37	73.26	69.26
Spartan	2 oz	5.20	66	57	39	77.22	68.02
Paramount + COC	5.33 oz/1 qt	15.75	68	48	41	81.58	61.83
Average		5.16	66	50	40	79.28	70.13
LSD 0.20			2.7	***	3.7	7.31	6.47

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
Plant Stand increase from May 27 Planting Date (PD2) to June 7 Planting Date (PD3).

Table 21.-Planting Dates for Bindweed Control in Grain Sorghum (Non Bindweed Site), Walsh 2004.

Planting Date	Days After Application	50% Flowering Date	Plant Stand	Seed Moisture	Test Weight	Grain Yield	Gross Income
			%	%	Lb/Bu	Bu/A	$/A
PD4 June 25	38	4-Sep	93	14.5	56	55	109.30
PD3 June 7	20	26-Aug	83	15.0	57	51	101.77
PD2 May 27	10	23-Aug	33	15.2	57	35	68.31
PD5 June 30	43	7-Sep	91	14.2	51	33	64.35
PD1 May 18	1	13-Aug	27	15.5	58	26	51.08
Average	22	27-Aug	66	14.9	56	40	78.96
LSD 0.20			4.3			4.0	7.92

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Herbicide Treatments were applied May 17, 2004.

Table 22.-Bindweed Control in Grain Sorghum (Bindweed Site), Planting Date 1 (PD1), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Control	----	0.00	5	5	31	20	36.39
Hi Dep	16 oz	2.31	81	59	21	21	35.47
Banvel	8 oz	3.75	65	62	22	21	34.62
Spartan	2 oz	5.20	72	47	21	21	32.78
2,4-D LoVol 6	16 oz	2.23	71	58	25	15	23.87
Paramount + COC	5.33 oz/1 qt	15.75	63	73	39	21	21.63
LandMaster BW	54 oz	6.86	80	67	28	16	20.42
Average		5.16	62	53	27	19	29.31
LSD 0.20			14.6	8.4	5.5	9.2	14.34

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost - Application.
Herbicide Treatments were applied May 17, 2004.
May 18 Planting Date (PD1) was planted 1 day after herbicide treatment application.

Table 23.Bindweed Control in Grain Sorghum (Non Bindweed Site), Planting Date 1, Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Change	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
Paramount + COC	5.33 oz/1 qt	15.75	26	14	38	75.44	55.69
LandMaster BW	54 oz	6.86	19	14	30	59.00	48.14
Control	----	0.00	36	2	25	49.70	45.70
2,4-D LoVol 6	16 oz	2.23	24	14	24	46.73	40.50
Banvel	8 oz	3.75	26	-2	24	47.72	39.97
Hi Dep	16 oz	2.31	24	9	22	42.97	36.66
Spartan	2 oz	5.20	34	-6	23	45.54	36.34
Average		5.16	27	6	26	52.44	43.28
LSD 0.20			10.7		7.1	14.06	11.82

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
May 18 Planting Date was planted 1 day after herbicide treatment application.
Plant Stand change from May 18 Planting Date (PD1) to May 27 Planting Date (PD2).

Table 24.-Bindweed Control in Grain Sorghum (Bindweed Site), Planting Date 2 (PD2), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Hi Dep	16 oz	2.31	81	59	24	34	61.41
LandMaster BW	54 oz	6.86	80	67	38	34	55.87
2,4-D LoVol 6	16 oz	2.23	71	58	39	31	55.35
Control	----	0.00	5	5	43	28	52.03
Paramount + COC	5.33 oz/1 qt	15.75	63	73	33	35	49.55
Spartan	2 oz	5.20	72	47	23	29	48.02
Banvel	8 oz	3.75	65	62	24	28	47.49
Average		5.16	62	53	32	31	52.82
LSD 0.20			14.6	8.4	7.6	8.9	15.16

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost - Application.
Herbicide Treatments were applied May 17, 2004.
May 27 Planting Date (PD2) was planted 10 day after herbicide treatment application.

Table 25.-Bindweed Control in Grain Sorghum (Non Bindweed Site), Planting Date 2, Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Change	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
Hi Dep	16 oz	2.31	33	9	36	71.48	65.17
Control	----	0.00	38	2	33	64.75	60.75
Spartan	2 oz	5.20	28	-6	35	69.70	60.50
LandMaster BW	54 oz	6.86	33	14	36	70.49	59.63
Banvel	8 oz	3.75	24	-2	34	67.32	59.57
2,4-D LoVol 6	16 oz	2.23	38	14	33	64.94	58.71
Paramount + COC	5.33 oz/1 qt	15.75	40	14	35	68.71	48.96
Average		5.16	33	6	34	68.20	59.04
LSD 0.20			7.3		7.6	15.05	13.20

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
May 27 Planting Date was planted 10 days after herbicide treatment application.
Plant Stand change from May 18 Planting Date (PD1) to May 27 Planting Date (PD2).

Table 26.-Bindweed Control in Grain Sorghum (Bindweed Site), Planting Date 3 (PD3), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Hi Dep	16 oz	2.31	81	59	79	71	134.86
Paramount + COC	5.33 oz/1 qt	15.75	63	73	85	65	108.55
2,4-D LoVol 6	16 oz	2.23	71	58	80	53	99.50
LandMaster BW	54 oz	6.86	80	67	83	55	98.24
Banvel	8 oz	3.75	65	62	80	50	90.66
Control	----	0.00	5	5	84	46	86.68
Spartan	2 oz	5.20	72	47	70	48	85.64
Average		5.16	62	53	80	55	100.59
LSD 0.20			14.6	8.4	3.8	10.6	19.39

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost - Application.
Herbicide Treatments were applied May 17, 2004.
June 7 Planting Date (PD3) was planted 20 day after herbicide treatment application.

Table 27.-Bindweed Control in Grain Sorghum (Non Bindweed Site), Planting Date 3, Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Change	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
Banvel	8 oz	3.75	80	56	55	109.69	101.94
LandMaster BW	54 oz	6.86	84	51	57	112.27	101.41
Hi Dep	16 oz	2.31	83	50	54	107.32	101.01
2,4-D LoVol 6	16 oz	2.23	83	45	51	101.18	94.95
Spartan	2 oz	5.20	85	57	52	101.97	92.77
Paramount + COC	5.33 oz/1 qt	15.75	88	48	55	109.69	89.94
Control	----	0.00	83	45	43	85.54	81.54
Average		5.16	84	50	53	103.95	94.79
LSD 0.20			3.2		11.4	22.57	20.39

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
June 7 Planting Date was planted 20 days after herbicide treatment application.
Plant Stand change from May 27 Planting Date (PD2) to June 7 Planting Date (PD3).

Table 28.-Bindweed Control in Grain Sorghum (Bindweed Site), Planting Date 4 (PD4), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Hi Dep	16 oz	2.31	81	59	95	72	136.05
Paramount + COC	5.33 oz/1 qt	15.75	63	73	97	70	118.65
2,4-D LoVol 6	16 oz	2.23	71	58	95	57	107.42
Spartan	2 oz	5.20	72	47	94	59	107.03
Banvel	8 oz	3.75	65	62	93	55	100.16
LandMaster BW	54 oz	6.86	80	67	94	55	98.83
Control	----	0.00	5	5	96	52	98.17
Average		5.16	62	53	95	60	109.47
LSD 0.20			14.6	8.4	2.7	8.2	14.96

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost - Application.
Herbicide Treatments were applied May 17, 2004.
June 25 Planting Date (PD4) was planted 38 day after herbicide treatment application.

Table 29.-Bindweed Control in Grain Sorghum (Non Bindweed Site), Planting Date 4, Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Change	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
LandMaster BW	54 oz	6.86	95	11	63	124.34	113.48
2,4-D LoVol 6	16 oz	2.23	94	11	58	114.05	107.82
Banvel	8 oz	3.75	91	11	56	110.29	102.54
Hi Dep	16 oz	2.31	93	10	53	105.14	98.83
Control	----	0.00	94	11	51	101.77	97.77
Spartan	2 oz	5.20	91	6	54	106.33	97.13
Paramount + COC	5.33 oz/1 qt	15.75	93	5	52	103.75	84.00
Average		5.16	93	9	55	109.38	100.22
LSD 0.20			3.0		8.7	17.23	15.85

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
June 25 Planting Date was planted 38 days after herbicide treatment application.
Plant Stand change from June 7 Planting Date (PD3) to June 25 Planting Date (PD4).

Table 30.-Bindweed Control in Grain Sorghum (Bindweed Site), Planting Date 5 (PD5), Walsh 2004.

Treatment	Rate	Chemical Cost	Bindweed Control Rated 6/7	Bindweed Control Rated 6/28	Plant Stand	Grain Yield	Variable Net Income
	*/A	$/A	%	%	%	Bu/A	$/A
Hi Dep	16 oz	2.31	81	59	95	46	83.98
Banvel	8 oz	3.75	65	62	94	41	73.83
2,4-D LoVol 6	16 oz	2.23	71	58	93	36	64.46
LandMaster BW	54 oz	6.86	80	67	95	36	59.63
Control	----	0.00	5	5	95	32	59.36
Paramount + COC	5.33 oz/1 qt	15.75	63	73	95	38	55.69
Spartan	2 oz	5.20	72	47	93	33	55.35
Average		5.16	62	53	94	37	64.61
LSD 0.20			14.6	8.4	2.7	4.9	8.56

Variable Net Income: Grain Yield x Grain Sorghum Price ($1.98/bu) - Chemical Cost - Application.
Herbicide Treatments were applied May 17, 2004.
June 30 Planting Date (PD5) was planted 43 day after herbicide treatment application.

Table 31.-Bindweed Control in Grain Sorghum (Non Bindweed Site), Planting Date 5, Walsh 2004.

Treatment	Rate	Chemical Cost	Plant Stand	Plant Stand Change	Grain Yield	Gross Income	Variable Net Income
	*/A	$/A	%	%	Bu/A	$/A	$/A
Control	----	0.00	90	-4	33	64.94	60.94
LandMaster BW	54 oz	6.86	90	-5	35	69.70	58.84
2,4-D LoVol 6	16 oz	2.23	95	1	32	63.95	57.72
Banvel	8 oz	3.75	90	-1	33	65.34	57.59
Hi Dep	16 oz	2.31	91	-2	30	59.80	53.49
Spartan	2 oz	5.20	91	0	31	62.17	52.97
Paramount + COC	5.33 oz/1 qt	15.75	91	-2	33	65.34	45.59
Average		5.16	91	-2	33	64.46	55.31
LSD 0.20			1.6		5.0	9.90	8.38

Gross Income: Grain Yield x Grain Sorghum Price ($1.98/bu).
Variable Net Income: Gross Income- Chemical Cost - Application Cost ($4/A).
Herbicide Treatments were applied May 17, 2004.
June 30 Planting Date was planted 43 days after herbicide treatment application.
Plant Stand change from June 25 Planting Date (PD4) to June 30 Planting Date (PD5).

Strip-Till and Surface Applied N Comparison for Sprinkler Irrigated Grain Sorghum and Corn Production

Kevin Larson, Dennis Thompson, and Robert Wood

Strip-till is a new tillage system being adopted by many row crop producers in Southeastern Colorado. It is a modified no-till system with one tillage operation used for fertilizer placement. The crop is planted into the same rows where tillage occurred and the fertilizer was placed. In this study we compared strip-till placement of anhydrous N to surface applied liquid N for both sprinkler irrigated grain sorghum and corn production.

Materials and Methods

The previous crop at this site was wheat. We applied N at 135 Lb/A to grain sorghum or 175 Lb/A to corn as anhydrous for the strip-till treatment or liquid 32-0-0 for the surface applied treatment. We used a farmer-constructed implement for the strip-till treatment. Robert Wood, farmer-cooperator, converted a DMI ripper into a strip-till implement by attaching a cold flow anhydrous system, barring off discs, and Lillistan incorporators. We strip-tilled the site on April 8 to a depth of 10 in. and placed anhydrous N at 8 in. On April 20, we surface applied N in 18 in. spaced streams onto the untilled strips. We planned to irrigate after each N application treatment to prevent N volatilization losses, but fortunately it rained (0.38 to 0.53 in.) within two days after each treatment. We planted two corn hybrids, Garst 8377 YG1/RR and Pioneer 34N45, at 26,000 Seeds/A on April 28, and we planted two grain sorghum hybrids, Mycogen 627 and Pioneer 85G01 at 53,000 Seeds/A on May 25. For weed control, we sprayed preplant Balance 3.0 Oz/A and Atrazine 1.0 Lb/A to the corn site, and preplant Atrazine 1.0 Lb/A and post emergence Banvel 4 Oz/A and Saber 10 Oz/A to the grain sorghum site. The site was sprinkler irrigated with the corn receiving 18.0 in./A of water and the grain sorghum receiving 7.5 in./A of water. We harvested the grain sorghum on November 8 and the corn on December 9 with a self-propelled combine and weighed them in a digital scale cart. Grain yields were adjusted to 14% seed moisture for grain sorghum and 15.5% seed moisture for corn.

Results

For grain sorghum, strip-till and surface applied N produced the same yield, 118 Bu/A (Table 32). For corn, surface applied N produced significantly more than strip-till N ($P > 0.05$) (Table 34). There was a significant yield difference between the grain sorghum hybrids (Table 33), but not the corn hybrids (Table 35). There was no interaction between the hybrids and the N placement treatments: both the hybrids for the corn and grain sorghum responded similarly to strip-till N and surface applied N. There were significant plant density differences between the hybrids for both corn and grain sorghum. However, there was no significant plant density differences between strip-till N and surface applied N for corn and grain sorghum.

Discussion

The advantages of strip-till compared to no-till are the use of anhydrous N fertilizer (the least expensive form of N fertilizer), deeper and more readily available

placement of immobile nutrients, potential compaction alleviation, and early planting from enhanced soil warming (Jasa, 2003). The disadvantages of strip-till compared to no-till are the horsepower and fuel use requirements for injecting fertilizers with knives or subsoiler shanks and the potential of drying the soil where planting occurs.

We believe that one of the disadvantages of strip-till, drying of the soil, caused the corn yield reduction of strip-till N compared to surface applied N. There was only about 18 in. of moisture in the soil profile at corn planting and the extra soil moisture loss from strip-tilling may have lowered corn yield. The short temporal space between the strip-till application and the corn planting date (three weeks) did not allow sufficient time and moisture to occur. However, this moisture loss was not reflected in plant stand: there was no plant density difference in corn between strip-till N and surface applied N. A report comparing spring strip-till N, performed in April, to no-till N found no significant difference between corn yields; however, there was a significant yield difference between winter strip-till N, performed in January, to no-till N (Olsen, 2004).

We expected that corn and grain sorghum yields would be unaffected by N placement since N is a mobile nutrient. Therefore, it was no surprise that grain sorghum yields were identical for both strip-till N and surface applied N. The lack of yield response of grain sorghum to strip-till N and surface applied N was also reported for dryland grain sorghum in Northwest Kansas (Olsen, 2004).

There appears to be no benefit from strip-till placement of N compared to surface applied N. In fact, strip-till N placement may be a detriment if it is performed too close to planting. The advantage of strip-till may be placement of immobile nutrients such as P. More research in strip-till P placement needs to be conducted.

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Table. 32-Sprinkler Irrigated Grain Sorghum, Strip-Till and Surface N Comparison, 2004.

N Placement	50% Silking Date	Plant Density	Test Weight	Grain Yield
		Plants/A X 1000	Lb/Bu	Bu/A
Surface Applied (streamed, liquid 32-0-0)	16-Aug	31.7	59	118
Strip-Till (ripped, NH3 gas)	16-Aug	30.8	59	118
Average	16-Aug	31.3	59	118
LSD 0.05		2.22		5.2

N at 135 Lb/A for Strip-Till N applied April 8; Surface N applied April 20.
Planted: May 25 at 53,000 Plants/A; Harvested: November 8.
Total applied sprinkler irrigation: 7.5 in./A.

Table. 33-Sprinkler Irrigated Grain Sorghum, Hybrid Response to N Placement, 2004.

Hybrid	50% Silking Date	Plant Density	Test Weight	Grain Yield
		Plants/A X 1000	Lb/Bu	Bu/A
PIONEER 85G01	16-Aug	32.8	59	125
MYCOGEN 627	15-Aug	29.8	59	111
Average	15-Aug	31.3	59	118
LSD 0.05		2.00		1.3

N at 135 Lb/A applied strip-till and surface streamed.
Planted: May 25 at 53,000 Plants/A with seedrow applied 10-34-0 at 5 gal/A.
Harvested: November 8.
Total applied sprinkler irrigation: 7.5 in./A.

Table. 34-Sprinkler Irrigated Corn, Strip-Till and Surface Applied N Comparison, 2004.

N Placement	50% Silking Date	Plant Density	Test Weight	Grain Yield
		Plants/A X 1000	Lb/Bu	Bu/A
Surface Applied (streamed liquid 32-0-0)	22-Jul	23.0	61	157
Strip-Till (ripped NH3 gas)	22-Jul	22.2	61	142
Average	22-Jul	22.6	61	150
LSD 0.05		1.55		6.6

N at 175 Lb/A for Strip-Till N applied April 8; Surface N applied April 20.
Planted: April 28 at 26,000 Plants/A; Harvested: December 9.
Total applied sprinkler irrigation: 18.0 in./A.

Table. 35-Sprinkler Irrigated Corn, Hybrid Response to N Placement, 2004.

Hybrid	50% Silking Date	Plant Density	Test Weight	Grain Yield
		Plants/A X 1000	Lb/Bu	Bu/A
GARST 8377 YG1/RR	24-Jul	22.0	60	156
PIONEER 34N45 (Bt)	19-Jul	23.3	61	143
Average	21-Jul	22.7	61	150
LSD 0.05		0.91		20.3

N at 175 Lb/A applied strip-till and surface streamed.
Planted: April 28 at 26,000 Plants/A with seedrow applied 10-34-0 at 5 gal/A.
Harvested: December 9.
Total applied sprinkler irrigation: 18.0 in./A.