

Technical Report

TR10-01 February 2010

**Colorado
State
University**

Knowledge to Go Places

Agricultural Experiment Station

College of
Agricultural Sciences

Department of
Soil and Crop Sciences

Extension

Plainsman
Research Center

Sorghum Hybrid Performance Trials in Eastern Colorado, 2009

K. J. Larson, Superintendent/Research Scientist II, Plainsman Research Center

J. J. Johnson, Extension Crop Specialist, Dept. of Soil and Crop Sciences

D. L. Thompson, Technician III, Plainsman Research Center

Funded by the National Sorghum Producers, Sorghum Checkoff Program and
the Colorado Agricultural Experiment Station,
Crop Management and Sorghum Improvement, Project No. COL00654

- **Mention of a trademark or proprietary product does not constitute endorsement by the Colorado Agricultural Experiment Station.**

Colorado State University is an equal opportunity/affirmative action institution and complies with all Federal and Colorado State laws, regulations, and executive orders regarding affirmative action requirements in all programs. The Office of Equal Opportunity is located in 101 Student Services. In order to assist Colorado State University in meeting its affirmative action responsibilities, ethnic minorities, women, and other protected class members are encouraged to apply and to so identify themselves.

SORGHUM HYBRID PERFORMANCE TRIALS IN COLORADO, 2009

	Page
Introduction:	
Seed Companies that Participated in Trials	2
Experimental Methods and Evaluations	3
Statistical Method	4
Acknowledgments	4
References	5
Dryland Grain Sorghum Performance Trial at Akron	6
Dryland Grain Sorghum Performance Trial at Brandon	8
Dryland Grain Sorghum Hybrid Performance Trial at Walsh	11
Dryland Forage Sorghum Hybrid Performance Trial at Walsh	15
Irrigated Forage Sorghum Hybrid Performance Trial at Walsh	20

SORGHUM HYBRID PERFORMANCE TRIALS IN COLORADO, 2009
K.J. Larson, J.J. Johnson and D.L. Thompson \1

The 2009 Colorado grain sorghum crop was estimated at 3.30 million bushels, 27 percent below the 2008 sorghum crop of 4.50 million bushels. For Colorado, the 3.30 million bushels is the second lowest in 25 years. The decrease in sorghum production this year was due to a reduction in harvested acreage. The harvested acreage in 2009 was 110,000 acres, which is 40,000 acres less than last year. In 2009, the average yield of 30.0 bu/acre remained unchanged from its 2008 level. There are no statistical estimates for the Colorado sorghum silage crop in 2009; however, statistics for the 2008 sorghum silage crop were recorded. In 2008, the sorghum silage crop produced 156,000 tons from 12,000 acres, which is the second lowest crop production and harvested acres in 25 years. The sorghum silage yield of 13.0 tons/acres is the modal average for the last 25 years (National Agricultural Statistics Service, Colorado Field Office, 2009).

This publication is a progress report of the sorghum hybrid performance trials conducted by the Department of Soil and Crop Sciences at Colorado State University, Colorado Agricultural Experiment Station, and Colorado State University Extension. The sorghum trials were conducted at three sites in eastern Colorado: dryland grain sorghum trials were conducted at Akron, Brandon, and Walsh; a dryland forage sorghum trial at Walsh; and an irrigated 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 trials should contact Jerry Johnson, Dept. of Soil and Crop Sciences, C12 Plant Science, Fort Collins, Colorado 80523, phone (970) 491-1454, email Jerry.Johnson@colostate.edu; or Kevin Larson, Plainsman Research Center, Box 477, Walsh, Colorado 81090, phone (719) 324-5643, email Kevin.Larson@colostate.edu for further details. Names and addresses of firms submitting entries in 2009 are shown in Table 1. Each firm selected entries for testing and furnished seed for the trials. AES researchers 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 (CoAgMet and NOAA, 2009), soil analysis, fertilization (Soil, Plant and Water 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;
Extension Crop Specialist, Dept. of Soil and Crop Sciences;
Technician III, Plainsman Research Center, Walsh.

Table 1.--Entrants in the 2009 Colorado Sorghum Performance Trials.

Brand	Entered by
AERC	AERC Inc., 34, Colonnade Road, Suite 200, Ottawa, ON K2E 7J6 Canada
ASGROW	Monsanto, 7159 N. 247 W., P.O. Box 7, Mt. Hope, KS 67108
DEKALB	Monsanto, 7159 N. 247 W., P.O. Box 7, Mt. Hope, KS 67108
MYCOGEN	Mycogen Seeds, 9330 Zionville Road, Indianapolis, IN 46268
SORGHUM PARTNERS	Sorghum Partners, Inc., P.O. Box 189, New Deal, TX 79350
TRIUMPH	Triumph Seed Co., Inc., P.O. Box 1050, Hwy. 62 Bypass, Ralls, TX 79357

AES researchers entered the following as checks: grain sorghum, TXms399 X TXR2737 (399 X 2737); forage sorghum, NB 305F; corn hybrid, Pioneer 33D49.

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:

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

Experimental Methods and Evaluations

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

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

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

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

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

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

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

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

Grain Yield. The 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 Dry Matter Analysis. Whole plant samples were taken at boot for each hybrid and sent to Ward Laboratories, Inc., Kearney, Nebraska for forage feed quality using NIR analysis.

Forage Yield. Forage yield in tons per acre was adjusted to 70% moisture content. A representative sample of fresh silage was oven-dried at 167°F (75°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 $\alpha = 0.20$ for all trials except the Akron trial where $\alpha = 0.30$ was used. Analysis of variance and regression were performed with CoStat Statistical Software a product of Cohort Software, Berkeley, California.

Acknowledgements

We are sincerely grateful to the National Sorghum Producers for providing funding through the Sorghum Checkoff Program to support these performance trials, and to Burl Scherler, the grower-cooperator for the Brandon trial for his assistance.

References

National Agricultural Statistics Service, Colorado Field Office. November 30, 2009. Ag Update, vol. 29, no. 22. NASS, CDA, USDA. 3p.

National Agricultural Statistics Service, Colorado Field Office. 2009. Colorado agricultural statistics 2008 preliminary - 2007 revised. NASS, CDA, USDA. 127p.

NOAA, May-October, 2009. Climatological data, Colorado. vol. 114, no.5-10. NOAA, Dept. of Commerce, NWS, NESDIS, NCDC.

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.

Dryland Grain Sorghum Hybrid Performance Trial at Akron, 2009

COOPERATORS: USDA-ARS, Central Great Plains Research Station, Akron, Colorado, and Jerry Johnson, Extension Crop Specialist, Colorado State University.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2000 sorghum heat units in a Weld Silty Loam soil.

HARVEST PLOT SIZE: One 30" row, 31' long. REPLICATIONS: Three.
PLANTED: June 5, 2009.
HARVESTED: November 24 and 25, 2009.

PEST CONTROL: Roundup, Attrex, and Callisto. CULTIVATION: None.
INSECTICIDES: None.

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

SOIL: Weld Silty Loam. FERTILIZER: 40 lb N/a.

COMMENTS: Planted in good soil moisture. Weed control was good. Near normal precipitation for the growing season, however, rains were timely and June was wet and September was dry. No greenbug infestation. Only minor lodging observed. Yields were very high and test weights were low.

Summary: Growing Season Precipitation and Temperature \1
Akron, Washington County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	4.35	309	4	0	25
July	2.55	659	9	0	56
August	3.56	608	8	0	87
September	0.26	399	0	0	117
Total	10.72	1975	21	0	117

\1 Growing season from June 5 (planting) to September 30.

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Table 2.--Dryland Grain Sorghum Hybrid Performance Trial at Akron, 2009.

Brand	Hybrid	50% Flowering	Plant Height	Plant Lodging	Test Weight	Grain Yield
		DAP	in	%	lb/bu	bu/a
DEKALB	DK 28E	72	40	3	54	114
PIONEER	8925	71	41	2	54	103
DEKALB	DKS29-28	74	40	1	51	99
SORGHUM PARTNERS	251	73	40	3	54	94
SORGHUM PARTNERS	KS310	80	45	1	49	88
TRIUMPH	TR420	75	42	4	53	83
SORGHUM PARTNERS	K35-Y5	78	41	2	47	81
AERC	CGSH 8	74	48	6	50	79
AERC	CGSH 27	78	41	6	50	71
DEKALB	DKS37-07	80	47	1	44	68
SORGHUM PARTNERS	NK5418	82	42	1	44	64
SORGHUM PARTNERS	SP3303	82	43	2	43	59
Average		77	43	3	49	84
LSD 0.30						8.5
LSD 0.05						16.5

Planted: June 5; Harvested: November 24 and 25, 2009.

50% Flowering: minimum date on which a hybrid flowers on half of its population.

DAP: days after planting.

Yields are adjusted to 14.0% seed moisture content.

Dryland Grain Sorghum Hybrid Performance Trial at Brandon, 2009

COOPERATORS: Burl Scherler, Sand Creek, Inc., Brandon, Colorado, and Kevin Larson, Superintendent, Plainsman Research Center, Walsh, Colorado.

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

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 43,600 seed/a. PLANTED: June 5. HARVESTED: November 20.

EMERGENCE DATE: 10 days after planting. SOIL TEMP: 62 F.

PEST CONTROL: Preemergence Herbicides: Glyphosate 32 oz/a, Atrazine 0.9 lb/a. Post Emergence Herbicides: Ally 0.05 oz/a, 2,4-D amine 0.5 lb/a, and 2,4-D amine (with drops). CULTIVATION: None. INSECTICIDES: None.

Summary: Growing Season Precipitation and Temperature \1 Chivington, Kiowa County.

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	2.32	523	10	0	25
July	5.14	741	18	0	56
August	2.44	672	13	2	87
September	0.71	461	4	0	117
October	0.00	7	0	0	118
Total	10.61	2404	45	2	118

\1 Growing season from June 5 (planting) to October 1 (first freeze, 25 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

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

COMMENTS: Planted in good soil moisture. Weed control was very good. Near normal precipitation for the growing season, however, July was wet and September was dry. No greenbug infestation. Five hybrids had more than 10% lodging. Yields and test weights were good despite the early freeze date.

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

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.7	0.7	2.5	10	8.1	445	0.5	3.8
8"-24"				7				
Comment	Alka	VLo	VHi	Mod	Med	VHi	Lo	Marg

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	0	0
Applied	60	13	0.1	0

Yield Goal: 50 bu/a.

Actual Yield: 57 bu/a.

Available Soil Water
Dryland Grain Sorghum, Brandon, 2009

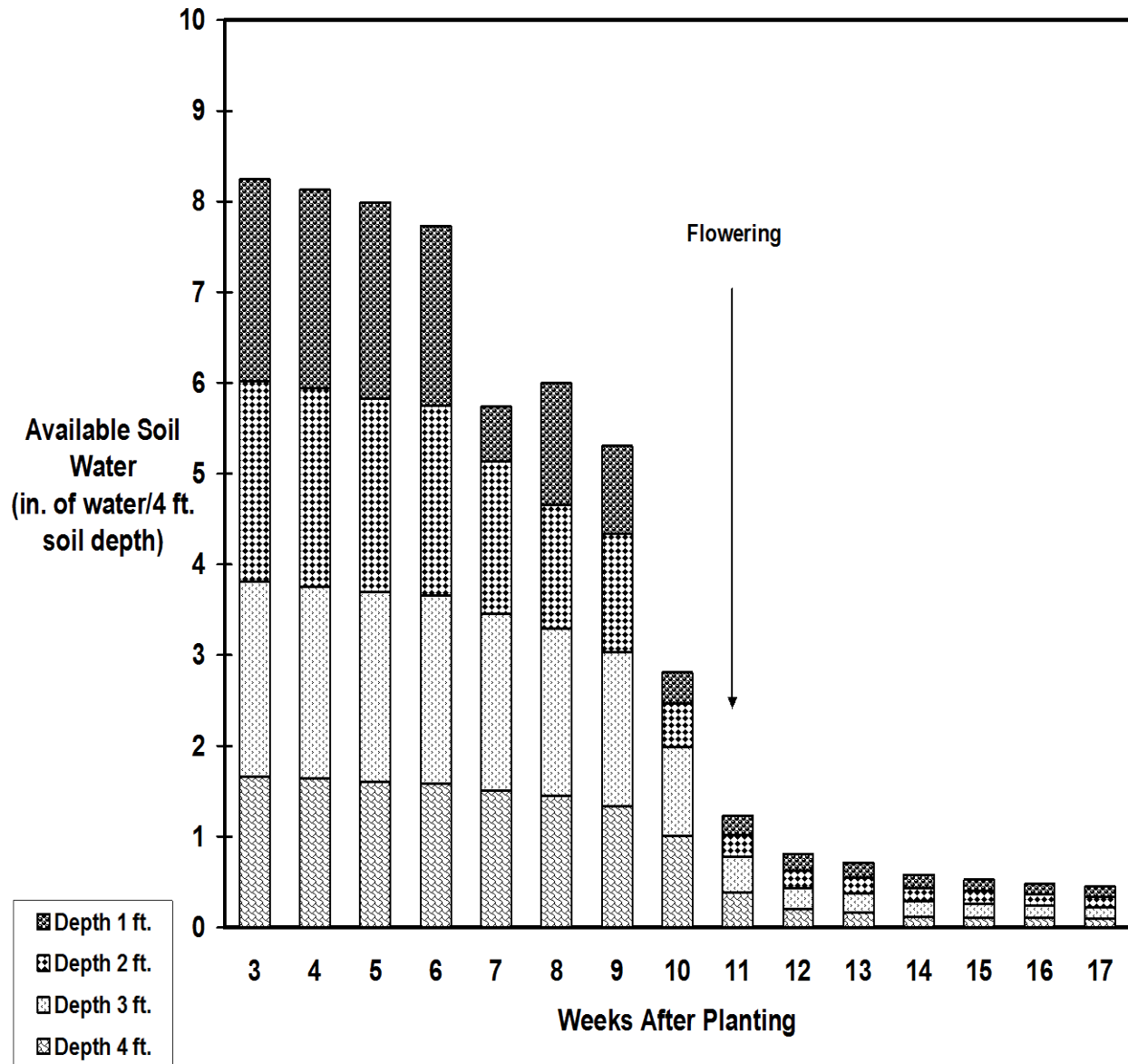


Fig. 1. Available soil water in dryland grain sorghum at Brandon. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Brandon from planting to first freeze was 10.61 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 3.--Dryland Grain Sorghum Hybrid Performance Test at Brandon, 2009. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Plants Lodged	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								in	plants/a (1000 X)	%	lb/bu	bu/a	%
MYCOGEN	1G557	10	66	1508	116	E	38	31.4	18	57	67	118	
DEKALB	DKS 28-05	11	66	1508	116	E	41	31.8	39	57	65	116	
DEKALB	DKS29-28	11	66	1508	118	E	37	25.6	14	58	64	114	
SORGHUM PARTNERS	251	11	63	1436	112	E	38	24.4	5	58	60	106	
SORGHUM PARTNERS	SP 3303	12	69	1579	118	E	41	15.1	1	56	47	84	
AERC	CGSH 8	11	65	1286	116	E	43	18.2	66	56	46	81	
AERC	CGSH 27	11	63	1436	115	E	38	10.8	93	56	40	70	
DEKALB	DKS37-07	11	74	1686	HD	ME	42	30.2	1	56	66	117	
DEKALB	DKS36-06	11	73	1670	119	ME	44	32.4	2	56	63	112	
SORGHUM PARTNERS	KS310	9	74	1686	119	ME	40	29.4	6	56	62	110	
ASGROW	Pulsar	9	73	1670	119	ME	42	25.2	5	56	58	102	
DEKALB	DK39Y	11	72	1652	119	ME	37	22.8	1	57	56	98	
SORGHUM PARTNERS	NK5418	10	80	1813	HD	ME/M	40	22.8	1	55	55	97	
TRIUMPH	TR 452	10	78	1759	HD	ME	41	25.9	1	55	54	96	
SORGHUM PARTNERS	K35Y5	9	73	1670	119	ME	37	25.6	4	56	53	94	
MYCOGEN	M3838	10	79	1788	SD	ME	39	27.9	1	53	49	87	
Average		10	67	1603	119	ME	40	25.0	16	56	57		
LSD 0.20												6.7	

\1 Planted: June 5; Harvested: November 20, 2009.

Yields are adjusted 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.

Dryland Grain Sorghum Hybrid Performance Trial at Walsh, 2009

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

PURPOSE: To identify high yielding hybrids under dryland conditions with 2550 sorghum heat units in a Silty Loam soil.

PLOT: Four rows with 30" row spacing, 50' long. **SEEDING DENSITY:** 43,600 seed/a. **PLANTED:** June 8. **HARVESTED:** November 4.

EMERGENCE DATE: 8 days after planting. **SOIL TEMP:** 74 F.

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

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

COMMENTS: Planted in good soil moisture. Weed control was good. Above normal precipitation for the growing season with a very wet July. No greenbug infestation. Only minor lodging. Early freeze date. Yields and test weights were good.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	2.18	521	11	1	22
July	7.92	824	19	5	53
August	1.75	712	15	0	84
September	2.50	467	5	0	114
October	0.00	28	1	0	116
Total	14.35	2552	51	6	116

\1 Growing season from June 8 (planting) to October 2 (first freeze, 30 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	0.6	1.7	25	5.6	379	0.3	2.4
8"-24"				24				
Comment	Alka	Vlo	Hi	Hi	Lo	VHi	VLo	Lo

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	50	20	0.3	0

Yield Goal: 45 bu/a.

Actual Yield: 53 bu/a.

Available Soil Water Dryland Grain Sorghum, Walsh, 2009

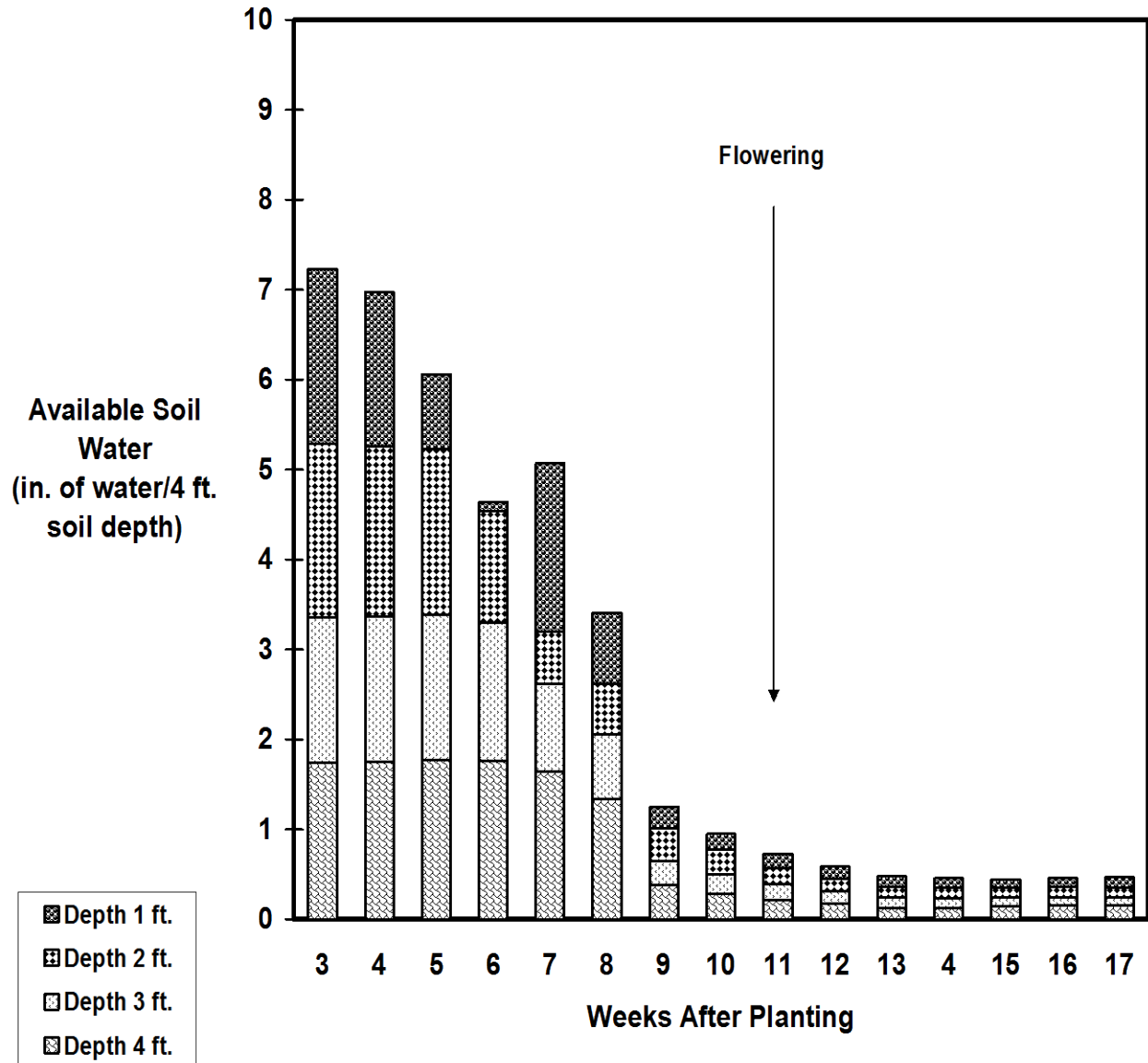


Fig. 2. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 14.35 in. Any increase in available soil water between weeks is from rain.

Table 4.--Dryland Grain Sorghum Hybrid Performance Test at Walsh, 2009. \1

Brand	Hybrid	Days to Emerge	<u>50% Bloom</u>		<u>50% Mature</u>		Plant Ht.	Harvest Density	Plants Lodged	Test Wt.	Grain Yield	Yield % of Test Average	
			DAP	GDD	DAP	Group							
								in	plants/a (1000 X)	%	lb/bu	bu/a	%
DEKALB	DKS 28-05	8	59	1501	103	E	44	26.3	0	59	61	115	
DEKALB	DKS29-28	8	61	1562	104	E	37	34.1	0	60	60	113	
SORGHUM PARTNERS	K35Y5	8	63	1612	104	E	35	24.4	0	59	55	103	
SORGHUM PARTNERS	SP 3303	10	61	1562	104	E	39	20.1	0	59	46	86	
SORGHUM PARTNERS	251	9	57	1446	99	E	34	32.5	1	59	45	83	
AERC	CGSH 8	9	58	1473	101	E	42	20.5	4	56	40	75	
AERC	CGSH 27	9	55	1345	99	E	42	19.4	3	56	25	47	
SORGHUM PARTNERS	KS310	7	66	1683	107	ME	42	30.2	0	60	72	135	
SORGHUM PARTNERS	NK5418	9	69	1760	110	ME/M	37	28.3	0	58	65	122	
TRIUMPH	TR 448	8	68	1737	114	ME	42	30.6	0	60	64	119	
TRIUMPH	TR 452	8	67	1712	107	ME	42	24.8	0	58	62	116	
TRIUMPH	TR 438	9	65	1660	105	ME	42	24.8	0	58	62	116	
ASGROW	Pulsar	9	65	1660	110	ME	41	29.4	1	59	56	104	
DEKALB	DK39Y	9	65	1660	109	ME	36	28.3	0	59	51	96	
DEKALB	DKS36-06	8	71	1795	117	M	46	30.4	0	56	67	125	
DEKALB	DKS37-07	8	72	1810	117	M	41	28.7	0	56	65	121	
TRIUMPH	X84732	8	73	1829	117	M	43	29.8	0	56	63	117	
TRIUMPH	X95003	8	76	1891	HD	M	47	27.5	0	55	56	104	
(Check)	399 X 2737	8	79	1972	SD	ML	40	25.2	0	53	38	72	
TRIUMPH	X85002	9	88	2149	SD	ML	45	28.3	0	52	15	28	
Average		8	67	1691	109	ME	41	27.2	0	57	53		
LSD	0.20										7.2		

\1 Planted: June 8; Harvested: November 4, 2009.

Yields are adjusted to 14.0% seed moisture content.

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

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

GDD: Growing Degree Days for sorghum.

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

Table 5.--Summary: Dryland Grain Sorghum Hybrid Performance Tests at Walsh, 2007-2009.

Brand	Hybrid	Grain Yield					Yield as % of Test Average				
		2007	2008	2009	2-Year Avg	3-Year Avg	2007	2008	2009	2-Year Avg	3-Year Avg
		-----bu/a-----					-----%-----				
ASGROW	Pulsar	63	75	56	66	65	108	112	104	108	108
DEKALB	DKS37-07	62	75	65	70	67	105	112	121	117	113
DEKALB	DKS36-16	60	73	67	70	67	102	110	125	118	112
DEKALB	DKS29-28	61	65	60	63	62	104	98	130	114	111
DEKALB	DK39Y	--	63	51	57	--	--	95	96	96	--
NC+	NC+ 5B89	62	69	--	66	--	105	109	109	109	--
NC+	NC+ 5C35	55	71	--	63	--	93	107	107	107	--
NC+	NC+ Y363	60	73	--	67	--	103	110	110	110	--
NC+	NC+ 6B50	61	75	--	68	--	104	113	113	113	--
NC+	NC+ 7C22	66	71	--	69	--	112	107	107	107	--
SORGHUM PARTNERS	KS310	54	63	72	68	63	92	95	135	115	107
SORGHUM PARTNERS	251	50	49	45	47	48	86	74	83	79	81
SORGHUM PARTNERS	NK5418	72	77	65	71	71	123	116	122	119	120
(Check)	399 X 2737	42	58	38	48	46	71	87	72	80	77
Average		59	66	53	60	59					

Grain Yields were adjusted to 14.0% seed moisture content.

The site was pre-irrigated with furrow irrigation in 2008.

Dryland Forage Sorghum Hybrid Performance Trial at Walsh, 2009

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

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

PLOT: Four rows with 30" row spacing, 50' long. SEEDING DENSITY: 69,700 seed/a. PLANTED: June 9. HARVESTED: October 26.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 75 F.

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

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

COMMENTS: Planted in good soil moisture. Weed control was good. Above normal precipitation for the growing season with a very wet July. No greenbug infestation. Three hybrids had greater than 10% lodging. Forage yields were good.

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

Summary: Growing Season Precipitation and Temperature \1 Walsh, Baca County.					
Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	2.18	503	11	1	21
July	7.92	824	19	5	52
August	1.75	712	15	0	83
September	2.50	467	5	0	113
October	0.00	28	1	0	115
Total	14.35	2534	51	6	115

\1 Growing season from June 9 (planting) to October 2 (first freeze, 30F).
 \2 GDD: Growing Degree Days for sorghum.
 \3 DAP: Days After Planting.

Summary: Soil Analysis of Plant Available Nutrients.								
Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	0.6	1.7	25	5.6	379	0.3	2.4
8"-24"				24				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	VLo	Lo

Manganese and Copper levels were adequate.

Summary: Fertilization.				
Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	50	20	0	0

Yield Goal: 9 ton/a.
 Actual Yield: 13.5 ton/a @ 70% MC.

Available Soil Water Dryland Forage Sorghum, Walsh, 2009

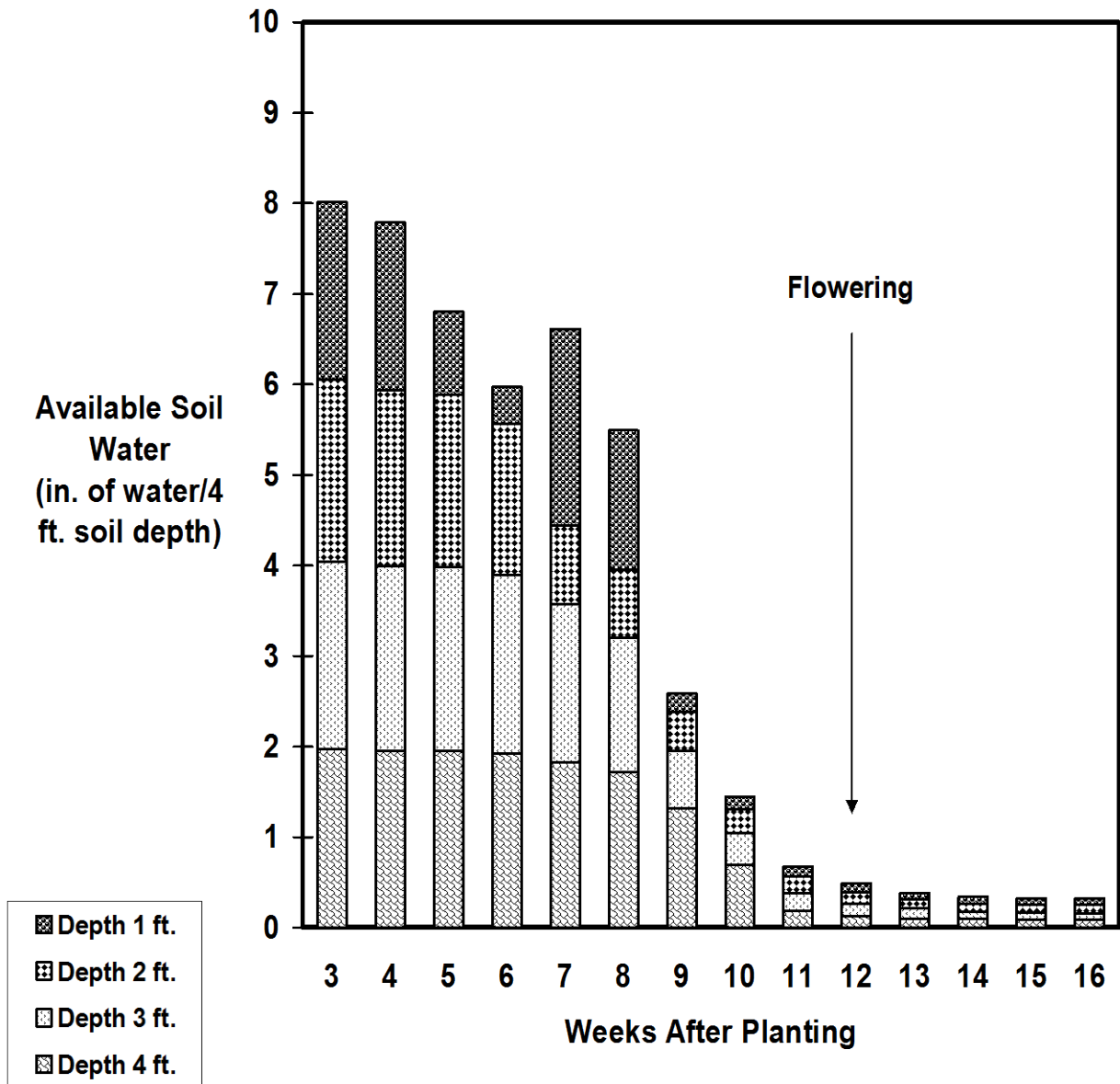


Fig. 3. Available soil water in dryland forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 14.35 in. Any increase in available soil water between weeks is from rain.

Table 6.--Dryland Forage Sorghum Hybrid Performance Trial at Walsh, 2009. \1

Brand	Hybrid	Forage Type \2	Days	Days	Harvest Density	Plant Ht.	Stage \3			Forage Yield	Yield % of Test Avg.
			to Emerg	to 50% Bloom			at Harvest	Stem Sugar %	Plant Lodg %		
					plants/a (1000 X)	in		%	%	tons/a	%
SORGHUM PARTNERS	HIKANE II	FS	8	72	43.8	79	MT	13	2	16.1	119
SORGHUM PARTNERS	Sordan Headless	SS	9	107	47.6	83	FL	17	0	15.4	114
SORGHUM PARTNERS	NK300	FS	9	85	40.3	53	HD	18	0	15.1	112
SORGHUM PARTNERS	Trudan Headless	HS	9	101	41.8	89	FL	15	0	14.0	103
MISS. STATE UNIV.	Topper 76-6	SW	9	99	36.8	76	PM	20	0	13.9	102
SORGHUM PARTNERS	Sordan 79	SS	8	70	46.1	83	MT	13	25	13.7	101
(Check)	NB 305F	FS	11	85	22.1	65	SD	19	0	13.6	101
AERC	CSSH 45	SW	9	70	29.4	78	MT	16	12	11.4	84
SORGHUM PARTNERS	Trudan 8	HS	8	65	39.9	89	MT	11	12	11.2	82
PIONEER	33D49	Corn	7	70	26.7	72	SD	11	0	11.1	82
Average		FS	9	82	37.5	77	LM	15	5	13.5	
LSD 0.20										1.91	

\1 Planted: June 9; Harvested: October 26.

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; HS, Hybrid Sudangrass; SW, Sweet Sorghum.

\3 Harvest Stage: Veg, vegetative; BT, boot; FL, flowering; PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

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

Table 7.--Summary: Dryland Forage Sorghum Hybrid Performance Tests at Walsh, 2007-2009.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		2007	2008	2009	2-Year Avg	3-Year Avg	2007	2008	2009	2-Year Avg	3-Year Avg
		-----tons/a-----					-----%-----				
MISS. STATE UNIV.	M81-E	12.4	18.5	--	15.5	--	108	117	--	113	--
MISS. STATE UNIV.	Topper 76-6	12.3	15.9	13.9	14.9	14.0	107	100	102	101	103
MISS. STATE UNIV.	Dale	11.4	15.0	--	13.2	--	99	95	--	97	--
MISS. STATE UNIV.	Theis	9.7	14.1	--	11.9	--	85	89	--	87	--
SORGHUM PARTNERS	NK 300	13.1	19.0	15.1	17.1	15.7	112	120	112	116	115
SORGHUM PARTNERS	HIKANE II	12.5	15.5	16.1	15.8	14.7	107	98	119	109	108
SORGHUM PARTNERS	Sordan 79	11.2	15.1	13.7	14.4	13.3	96	96	101	99	98
SORGHUM PARTNERS	Sordan Headless	--	19.0	15.4	17.2	--	--	120	114	117	--
SORGHUM PARTNERS	Trudan Headless	--	19.0	14.0	16.5	--	--	120	103	112	--
(Check)	NB 305F	14.0	16.2	13.6	14.9	14.6	120	103	101	102	108
(Check)	Corn	6.7	15.9	11.1	13.5	11.2	57	101	82	92	80
Average		11.7	15.8	13.5	14.7	13.7					

Forage Yields were adjusted to 70% moisture content based on oven-dried sample.
The site was pre-irrigated with furrow irrigation in 2008.

Table 8.--Dryland Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2009.

Brand	Hybrid	Forage Type \1	Days to Plant		CP	ADF	NDF	TDN	RFV	Net Energy			
			Boot	Ht						Main.	Gain	Lact.	
			in		-----%-----					-----MCal/lb-----			
SORGHUM PARTNERS	Sordan Headless	SS	97	69	5.8	33.5	49.3	64.4	119	0.66	0.39	0.66	
MISS. STATE UNIV.	Topper 76-6	SW	90	70	6.2	34.0	51.9	63.8	112	0.65	0.39	0.66	
SORGHUM PARTNERS	NK300	FS	77	40	10.5	34.0	52.1	63.8	111	0.65	0.39	0.66	
SORGHUM PARTNERS	Trudan Headless	HS	92	72	5.6	35.6	53.3	62.0	107	0.63	0.36	0.64	
MYCOGEN	2T828	Corn	65	73	11.7	35.5	55.2	62.1	103	0.63	0.36	0.64	
(Check)	NB 305F	FS	74	55	10.7	35.3	55.6	62.3	103	0.63	0.37	0.64	
SORGHUM PARTNERS	Trudan 8	HS	57	57	12.5	38.3	57.6	58.8	95	0.58	0.32	0.60	
AERC	CSSH 45	SW	63	64	8.7	38.2	58.1	59.0	95	0.58	0.32	0.60	
SORGHUM PARTNERS	HIKANE II	FS	65	62	9.1	38.9	60.6	58.2	90	0.57	0.31	0.59	
SORGHUM PARTNERS	Sordan 79	SS	61	63	9.7	40.4	61.3	56.5	87	0.54	0.29	0.57	
Sorghum Average			FS	74	63	9.1	36.4	55.5	61.1	102	0.61	0.35	0.63

\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;

RFV, Relative Feed Value; Net Energy: Maintenance, Gain, Lactation..

Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2009

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

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2550 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 8. HARVESTED: October 23.

EMERGENCE DATE: 9 days after planting. SOIL TEMP: 74 F.

IRRIGATION: Two furrow irrigations: July 10 and August 19, total applied 12 a-in./a.

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

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

COMMENTS: Planted in good soil moisture. Weed control was fair. Above normal precipitation for the growing season with a very wet July. No greenbug infestation. There was only minor lodging. Forage yields were good.

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

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

Month	Rainfall	GDD \2	>90 F	>100 F	DAP \3
	In		-----no. of days-----		
June	2.18	521	11	1	22
July	7.92	824	19	5	53
August	1.75	712	15	0	84
September	2.50	467	5	0	114
October	0.00	28	1	0	116
Total	14.35	2552	51	6	116

\1 Growing season from June 8 (planting) to October 2 (first freeze, 30F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

Summary: Soil Analysis of Plant Available Nutrients.

Depth	pH	Salts	OM	N	P	K	Zn	Fe
		mmhos/cm	%	-----ppm-----				
0-8"	7.6	1.0	2.0	41	4.3	442	0.7	2.9
8"-24"				43				
Comment	Alka	VLo	Hi	VHi	Lo	VHi	Lo	Lo

Manganese and Copper levels were adequate.

Summary: Fertilization.

Fertilizer	N	P ₂ O ₅	Zn	Fe
	-----lb/a-----			
Recommended	0	40	2	0
Applied	50	20	0	0

Yield Goal: 18 ton/a.

Actual Yield: 20.0 ton/a @ 70% MC.

Available Soil Water Irrigated Forage Sorghum, Walsh, 2009

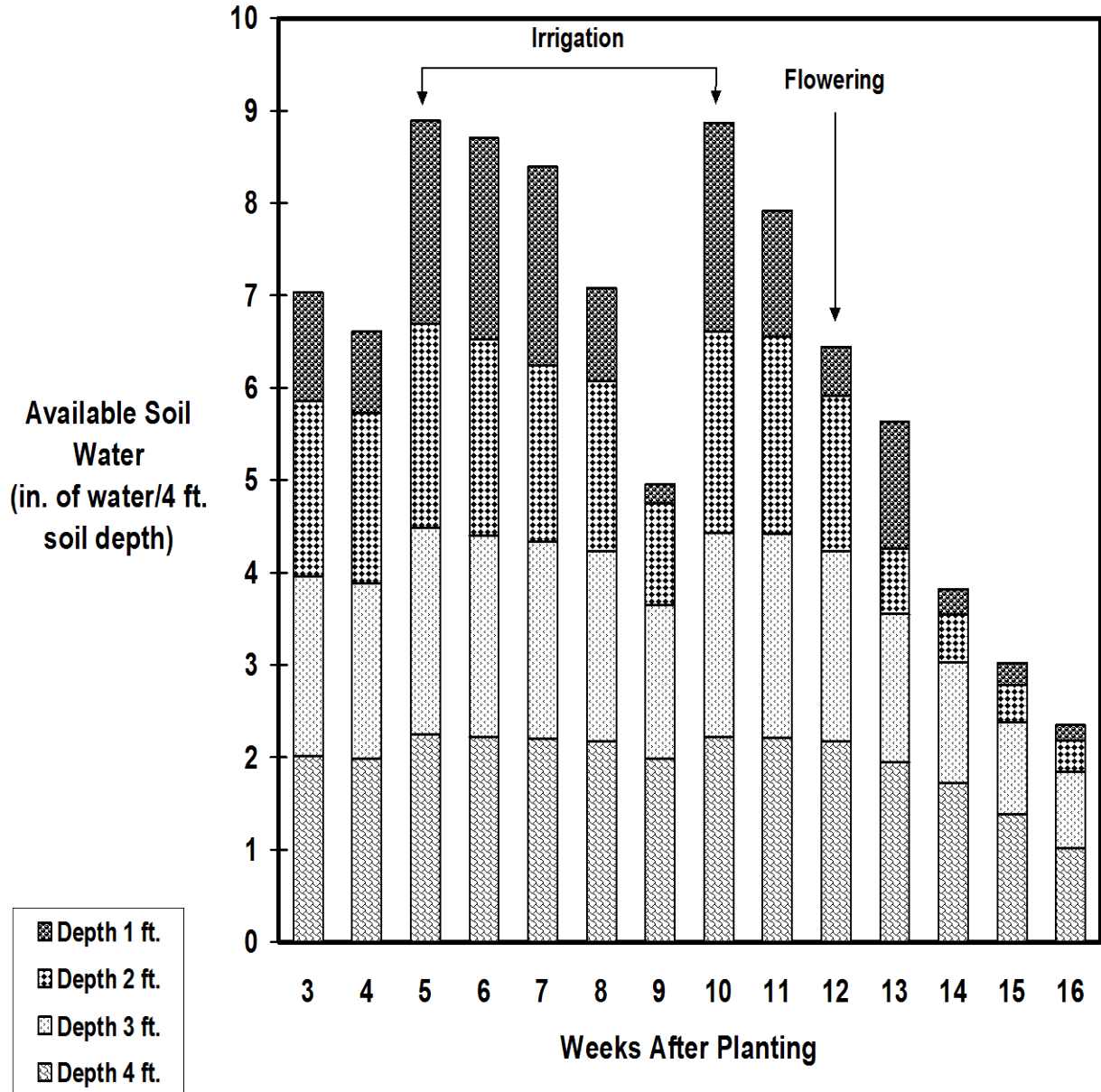


Fig. 4. Available soil water in irrigated forage sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to harvest was 14.35 in. Any increase in available soil water between weeks not attributed to applied irrigation is from rain.

Table 9.--Irrigated Forage Sorghum Hybrid Performance Trial at Walsh, 2009. \1

Brand	Hybrid	Forage Type \2	Days	Days	Harvest Density	Plant Ht.	Stage \3			Forage Yield	Yield % of Test Avg.
			to Emerg	to 50% Bloom			at Harvest	Stem Sugar %	Plant Lodg %		
					plants/a (1000 X)	in		%	%	tons/a	%
SORGHUM PARTNERS	Trudan Headless	HS	7	99	59.6	116	FL	14	0	22.0	110
SORGHUM PARTNERS	NK300	FS	7	84	54.6	77	HD	12	5	21.5	107
SORGHUM PARTNERS	Sordan Headless	SS	7	104	48.0	118	FL	14	0	21.4	107
(Check)	NB 305F	FS	7	85	29.8	90	SD	15	0	19.4	97
PIONEER	33D49	Corn	6	71	34.5	84	SD	9	0	18.4	92
AERC	CSSH 45	SW	7	71	42.2	89	MT	16	5	17.4	87
Average		FS	7	86	44.8	96	SD	13	2	20.0	
LSD 0.20										2.37	

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

\2 Forage Type: FS, Forage Sorghum; SS, Sorghum Sudangrass; HS, Hybrid Sudangrass; SW, Sweet Sorghum.

\3 Harvest Stage: Veg, vegetative; BT, boot; FL, flowering; PM, premilk; EM, early milk; MM, midmilk; LM, late milk; ED, early dough; SD, soft dough; HD, hard dough; MT, mature.

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

Table 10.--Summary: Irrigated Forage Sorghum Hybrid Performance Tests at Walsh, 2007-2009.

Brand	Hybrid	Forage Yield					Yield as % of Test Average				
		2007	2008	2009	2-Year Avg	3-Year Avg	2007	2008	2009	2-Year Avg	3-Year Avg
		-----tons/a-----					-----%-----				
MISS. STATE UNIV.	M81-E	27.9	17.2	--	22.6	--	118	102	--	110	--
MISS. STATE UNIV.	Topper 76-6	26.5	17.4	--	22.0	--	112	103	--	108	--
MISS. STATE UNIV.	Dale	24.4	18.2	--	21.3	--	103	108	--	106	--
MISS. STATE UNIV.	Theis	22.1	15.5	--	18.8	--	93	92	--	93	--
SORGHUM PARTNERS	NK 300	24.8	19.4	21.5	20.5	21.9	104	115	107	111	109
SORGHUM PARTNERS	HIKANE II	21.8	16.6	--	19.2	--	92	98	--	95	--
SORGHUM PARTNERS	Sordan 79	24.8	17.1	--	21.0	--	104	101	--	103	--
SORGHUM PARTNERS	Sordan Headless	--	19.4	21.4	20.4	--	--	115	107	111	--
SORGHUM PARTNERS	Trudan Headless	--	19.4	22.0	20.7	--	--	115	110	113	--
(Check)	NB 305F	25.6	16.4	19.4	17.9	20.5	108	97	97	97	101
(Check)	Corn	21.1	18.4	18.5	18.5	19.3	89	109	92	101	97
Average		23.7	16.9	20.0	18.5	20.2					

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

Table 11.--Irrigated Forage Sorghum Hybrid Dry Matter Analysis at Walsh, 2009.

Brand	Hybrid	Forage Type \1	Days to Boot Plant		CP	ADF	NDF	TDN	RFV	Net Energy			
			Boot	Ht						Main.	Gain	Lact.	
			in		-----%-----					-----MCal/lb-----			
MYCOGEN	2T828	Corn	66	81	8.8	38.6	58.7	58.5	93	0.57	0.32	0.60	
SORGHUM PARTNERS	NK300	FS	76	55	8.6	40.1	59.3	56.8	90	0.55	0.29	0.58	
SORGHUM PARTNERS	Sordan Headless	SS	94	94	5.6	42.3	62.5	54.3	83	0.51	0.26	0.55	
(Check)	NB 305F	FS	75	61	7.6	40.8	64.7	56.0	82	0.54	0.28	0.57	
SORGHUM PARTNERS	Trudan Headless	HS	90	94	5.3	43.6	62.8	52.9	81	0.49	0.23	0.53	
AERC	CSSH 45	SW	64	69	6.7	43.4	64.1	53.0	80	0.49	0.24	0.54	
Sorghum Average			FS	78	76	7.1	41.5	62.0	55.3	85	0.53	0.27	0.56

\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;

RFV, Relative Feed Value; Net Energy: Maintenance, Gain, Lactation..